# APPENDIX A

Resolution Mineral Project Claim Information

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Ace 1 | NE1/41 | 2S | 12E | 60174 |
| Ace 2 | NE1/41 | 2S | 12E | 60175 |
| Ace 3 | NE1/4SE1/41 | 2S | 12E | 60176 |
| Ace 4 | NE1/4SE1/41 | 2S | 12E | 60177 |
| Ace 5 | NE1/4SE1/41 | 2S | 12E | 60178 |
| Ace 6 | SE1/41 | 2S | 12E | 60179 |
| Ace amended | NE1/4, 1 | 2S | 12E | 60173 |
| Alto amended | NW1/4, 1 | 2S | 12E | 60180 |
| Alto No. 1 amended | NW1/4, 1 | 2S | 12E | 60181 |
| Alto No. 10 amended | NW1/4, 1 | 2S | 12E | 60190 |
| Alto No. 11 | NW1/4NE1/41 | 2S | 12E | 60191 |
| Alto No. 2 amended | NW1/41 | 2S | 12E | 60182 |
| Alto No. 3 amended | NW1/41 | 2S | 12E | 60183 |
| Alto No. 4 | NW1/4SW1/41 | 2S | 12E | 60184 |
| Alto No. 5 | SW1/41 | 2S | 12E | 60185 |
| Alto No. 7 | NW1/4NE1/4SE1/4SW1/41 | 2S | 12E | 60187 |
| Alto No. 8 amended | NW1/4, 1 | 2S | 12E | 60188 |
| Alto No. 9 amended | NW1/4, 1 | 2S | 12E | 60189 |
| Annex | NW1/41,NE1/411 | 2S | 12E | 60362 |
| Apache Leap | SW1/41,SE1/4 2 | 2S | 12E | 60224 |
| Apex | NW1/412,NE1/411 | 2S | 12E | 60363 |
| Arizona | SW1/42,NWV1/411 | 2S | 12E | 60192 |
| Ash No. 1 | SE 1/4 25 | 1S | 12E | 60084 |
| Ash No. 6 | NE1/4NWV1/4 29 | 1S | 13E | 60085 |
| Ash No. 10 | NE1/4SE1/4 25 | 1S | 12E | 60088 |
| Ash No. 11 | NE1/4 25 | 1S | 12E | 60089 |
| Ash No. 12 | NE1/4 25, NW1/4 30 | 1S | 12E | 60090 |
| Ash No. 13 | NW1/4NE1/4 30, NW1/4 29 | 1S | 13E | 60091 |
| Ash No. 14 | NW1/4 29 | 1S | 13E | 60092 |
| Ash No. 15 | NW1/4NE1/4 29 | 1S | 13E | 60093 |
| Ash No. 16 amended | NW1/4NE1/4SE1/4SW1/4 25 | 1S | 12E | 60094 |
| Ash No. 17 | NE1/4 29 | 1S | 13E | 60095 |
| Ash No. 18 | NW1/4NE1/4 29 | 1S | 13E | 60096 |
| Ash No. 19 | NW1/4 29 | 1S | 13E | 60097 |
| Ash No. 20 | NW1/4 29 | 1S | 13E | 60098 |
| Ash No. 21 | NW1/4 29 | 1S | 13E | 60099 |
| Ash No. 22 | NW1/4NE1/4 30 | 1S | 13E | 60100 |
| Ash No. 23 | NE1/4 30 | 1S | 13E | 60101 |
| Ash No. 24 | NW1/4NE1/4 30 | 1S | 13E | 60102 |
| Ash No. 25 | NW1/4 30 | 1S | 13E | 60103 |
| Ash No. 26 | NE1/4 25 | 1S | 12E | 60104 |
| Ash No. 27 | NE1/4 25 | 1S | 12E | 60105 |
| Ash No. 28 | NE1/4 25 | 1S | 12E | 60106 |
| Ash No. 29 | NW1/4NE'1/4 25 | 1S | 12E | 60107 |
| Ash No. 8 | NE1/4SE1/4SW1/4NW1/4 30 | 1S | 13E | 60086 |
| Ash No. 9 | NE1/4SE1/4 25 | 1S | 12E | 60087 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Big Ledge amended | NE1/4SE1/42 | 2S | 12E | 60193 |
| Black Foot No. 1 | SW1/4SE1/4 25 | 1S | 12E | 60125 |
| Black Rock No. 1 Amended | SW1/4SE1/4 25 | 1S | 12E | 60125 |
| Broken Hill No. 1 | SW1/4SE1/411 | 2S | 12E | 60364 |
| Broken Hill No. 2 | SE1/4 SW1/4 NW1/4 11 | 2S | 12E | 60453 |
| Brooklyn Amended No. 2 | SE1/42 | 2S | 12E | 60197 |
| Bufford 1 | SW 1/4 Section 24 | 1S | 12E | 420992 |
| Bufford 2 | SW 1/4 Section 24 | 1S | 12E | 420993 |
| Bufford 3 | SW 1/4 Section 24 | 1S | 12E | 420994 |
| Bufford 4 | SE 1/4 Section 24 | 1S | 12E | 420995 |
| Bufford 5 | SE 1/4 Section 24 | 1S | 12E | 420864 |
| Bufford 6 | SE 1/4 Section 24 | 1S | 12E | 420865 |
| Chicago amended | SW1/42 | 2S | 12E | 60198 |
| Cobre Verde | NW1/4NE1/4 11 | 2S | 12E | 60225 |
| Cobre Verde No. 1 | NW1/4NE1/4 11 | 2S | 12E | 60226 |
| Cobre Verde No.2 amended | NW1/4NE1/411 | 2S | 12E | 60365 |
| CobreVerdeNo.3 | SE1/4SW1/4NW1/4NE1/411 | 2S | 12E | 60366 |
| Connecting Link No. 1 | NW1/4NE1/4 11 | 2S | 12E | 60228 |
| Connecting Link No. 2 | NE1/4 11,SE1/4 2 | 2S | 12E | 60229 |
| Connecting Link No. 3 | NE1/4 11,SE1/4 2 | 2S | 12E | 60230 |
| Connecting Link No. 4 | NE1/4 1 1,NW1/4 12,SE1/4 2 | 2S | 12E | 60231 |
| Connecting Link Amended No. 2 | SW1/41,NW1/4NE1/4 12 | 2S | 12E | 60227 |
| Copper Bell Amended | NW1/412 | 2S | 12E | 60367 |
| Dacite No. 12 | SE1/412 | 2S | 12E | 60238 |
| Dacite No. 13 | SW1/47 | 2S | 13E | 60239 |
| Dan 1 | SE1/4 3 | 2S | 12E | 356180 |
| Dan 10 | SE1/4 1 | 2S | 12E | 356189 |
| Dan 11 | NE1/412 | 2S | 12E | 356190 |
| Dan 12 | NE1/412 | 2S | 12E | 356191 |
| Dan 13 | SE1/41,NE1/412 | 2S | 12E | 356192 |
| Dan 14 | NE1/4SE1/412 | 2S | 12E | 356193 |
| Dan 15 | NE1/4SE1/412 | 2S | 12E | 356194 |
| Dan 17 | SW1/4 1 | 2S | 12E | 356196 |
| Dan 18 | SW1/4SE1/4 1 | 2S | 12E | 356197 |
| Dan 19 | NW1/411 | 2S | 12E | 356198 |
| Dan 2 | SE1/42 | 2S | 12E | 356181 |
| Dan 20 | SW1/411 | 2S | 12E | 356199 |
| Dan 21 | NW1/4SW1/411 | 2S | 12E | 356200 |
| Dan 22 | NW1/4SW1/411 | 2S | 12E | 356201 |
| Dan 23 | NW1/4SW1/411 | 2S | 12E | 356202 |
| Dan 24 | NW1/4NE1/4 2 | 2S | 12E | 356203 |
| Dan 4 | SE1/4NE1/411 | 2S | 12E | 356183 |
| Dan 5 | NW1/4SW1/412,NEWSE1/411 | 2S | 12E | 356184 |
| Dan 6 | SE1/4SW1/4 36 | 1S | 12E | 356185 |
| Dan 7 | SE1/4SW1/4 36 | 1S | 12£ | 356186 |
| Dan 8 | SW1/4SE1/4 1,NE1/4 12 | 2S | 12E | 356187 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Dan 9 | SE1/4SW1/4 1,NE1/4 12 | 2S | 12E | 356188 |
| East No. 9A | SW1/429,SE1/429 | 1S | 13E | 355529 |
| Eric No.10 | SE1/4 17 | 1S | 13E | 347711 |
| Eric No.100 | NW1/4 16 | 1S | 13E | 347800 |
| Eric No.101 | NW1/4 16&NE1/4 16 | 1S | 13E | 347801 |
| Eric No.102 | NW1/4 16,NE1/4 16,SWV1/4 9,SE1/4 9 | 1S | 13E | 347802 |
| Eric No.103 | NW1/4 16 & SW1/4 9 | 1S | 13E | 347803 |
| Eric No.104 | SE1/4 8,NE1/4 17,SW1/4 9, NW1/4 16 | 1S | 13E | 347804 |
| Eric No.105 | SE1/4 8&NE1/4 17 | 1S | 13E | 347805 |
| Eric No.106 | SE1/4 8 | 1S | 13E | 347806 |
| Eric No.107 | SE1/4 8 & SW1/4 9 | 1S | 13E | 347807 |
| Eric No.108 | SW1/4 9 | 1S | 13E | 347808 |
| Eric No.109 | SW1/4 9 & SE1/4 9 | 1S | 13E | 347809 |
| Eric No.11 | SE1/4 17&SW1/4 16 | 1S | 13E | 374412 |
| Eric No.110 | SW1/4 9 & SE1/4 9 | 1S | 13E | 347810 |
| Eric No.111 | SW1/4 9 | 1S | 13E | 347811 |
| Eric No.112 | SE1/4 8 & SW1/4 9 | 1S | 13E | 347812 |
| Eric No.113 | SE1/4 8 | 1S | 13E | 347813 |
| Eric No.114 | SW1/4 8,SE1/4 8,NW1/4 17,NE1/4 17 | 1S | 13E | 347814 |
| Eric No.115 | NE1/4 8,SE1/4 8,NW1/4 8,SW1/4 8 | 1S | 13E | 347815 |
| Eric No.116 | SE1/4 8 | 1S | 13E | 347816 |
| Eric No.117 | SE1/4 8 " SW1/4 9 | 1S | 13E | 347817 |
| Eric No.118 | SW1/4 9 | 1S | 13E | 347818 |
| Eric No.119 | SW1/4 9 & SE1/4 9 | 1S | 13E | 347819 |
| Eric No.12 | SW1/4 16 | 1S | 13E | 347713 |
| Eric No.120 | SW1/4 9 & SE1/4 9 | 1S | 13E | 347820 |
| Eric No.121 | SW1/4 9 | 1S | 13E | 347821 |
| Eric No.122 | SE1/4 8 & SW1/4 9 | 1S | 13E | 347822 |
| Eric No.123 | SE1/4 8 | 1S | 13E | 347823 |
| Eric No.124 | NE1/4 8 & SE1/4 8 | 1S | 13E | 347824 |
| Eric No.125 | NE1/4 8,SE1/4 8,NW1/4 9,SW1/4 9 | 1S | 13E | 347825 |
| Eric No.126 | NW1/4 9 & SW1/4 9 | 1S | 13E | 347826 |
| Eric No.127 | NE1/4 9,SE1/4 9,SW1/4 9,NW1/4 9 | 1S | 13E | 347827 |
| Eric No.128 | NW1/4 9&NE1/4 9 | 1S | 13E | 347828 |
| Eric No.129 | NW1/4 9 | 1S | 13E | 347829 |
| Eric No.13 | SW1/4 16 & SE1/4 16 | 1S | 13E | 347714 |
| Eric No.130 | NE1/4 8 & NW1/4 9 | 1S | 13E | 347830 |
| Eric No.131 | NE1/4 8 & NW1/4 9 | 1S | 13E | 347831 |
| Eric No.132 | NW1/4 9 | 1S | 13E | 347832 |
| Eric No.133 | NW1/4 9&NE1/4 9 | 1S | 13E | 347833 |
| Eric No.14 | SE1/4 16 | 1S | 13E | 347715 |
| Eric No.15 | SW1/4 15 | 1S | 13E | 347716 |
| Eric No.151 | NW1/4 15&SW1/4 10 | 1S | 13E | 347850 |
| Eric No.152 | N'W1/4 15&SW1/4 10 | 1S | 13E | 347851 |
| Eric No.153 | NW1/4 15&SW1/4 10 | 1S | 13E | 347852 |
| Eric No.154 | NE1/4 16&SE1/4 9 | 1S | 13E | 347853 |
| Eric No.155 | NE1/4 16 & SE1/4 9 | 1S | 13E | 347854 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Eric No.156 | NE1/4 16 & SE1/4 9 | 1S | 13E | 347855 |
| Eric No.157 amended | NE1/4 9 | 1S | 13E | 347856 |
| Eric No.158 amended | NE1/4 9 | 1S | 13E | 347857 |
| Eric No.159 amended | NE1/4 9 | 1S | 13E | 347858 |
| Eric No.16 | SW1/4 15&S1/4 15 | 1S | 13E | 347717 |
| Eric No.160 | NW1/4 10 | 1S | 13E | 347859 |
| Eric No.161 | NW1/4 10 | 1S | 13E | 347860 |
| Eric No.162 | NW1/4 10 | 1S | 13E | 347861 |
| Eric No.192 | Nw1/4 10 | 1S | 13E | 347891 |
| Eric No.193 | NW1/4 10 | 1S | 13E | 347892 |
| Eric No.194 | NW1/4 10 | 1S | 13E | 347893 |
| Eric No.195 | NE1/4 9 | 1S | 13E | 347894 |
| Eric No.196 | NE1/4 9 | 1S | 13E | 347895 |
| Eric No.197 | NE1/4 9 | 1S | 13E | 347896 |
| Eric No.198 | SE1/4 4 & NE1/4 9 | 1S | 13E | 347897 |
| Eric No.199 | SE1/4 4 & NE1/4 9 | 1S | 13E | 347898 |
| Eric No.200 | SE1/4 4 & NE1/4 9 | 1S | 13E | 347899 |
| Eric No.201 | NW1/4 10&SW1/4 3 | 1S | 13E | 347900 |
| Eric No.202 | NW1/4 10 & SW1/4 3 | 1S | 13E | 347901 |
| Eric No.203 | NW1/4 10 & SW1/4 3 | 1S | 13E | 347902 |
| Eric No.229 amended | NW1/4 10&SW1/4 3 | 1S | 13E | 348043 |
| Eric No.241 | SE1/4 4&NE1/4 9 | 1S | 13E | 348055 |
| Eric No.243 | NW1/4 28 | 1S | 13E | 348057 |
| Eric No.244 | NW1/4 28 & NE1/4 28 | 1S | 13E | 348058 |
| Eric No.245 | NE1/4 28 | 1S | 13E | 348059 |
| Eric No.246 | NE1/4 28&NW1/4 27 | 1S | 13E | 348060 |
| Eric No.247 | NW1/4 28 | 1S | 13E | 348061 |
| Eric No.250 | NE1/4 20 &NW1/4 20 | 1S | 13E | 348064 |
| Eric No.251 | NE1/4 20, NW1/4 20,SW1/4 20,SE1/4 20 | 1S | 13E | 348065 |
| Eric No.252 | SW1/4 20 & NW1/4 20 | 1S | 13E | 348066 |
| Eric No.253 | NW1/4 20 | 1S | 13E | 348067 |
| Eric No.254 | N-W1/4 20 | 1S | 13E | 348068 |
| Eric No.255 | NW1/4 20 & SW1/4 20 | 1S | 13E | 348069 |
| Eric No.256 | NW1/4 20 & SW1/4 20 | 1S | 13E | 348070 |
| Eric No.257 | NW1/4 20 | 1S | 13E | 348071 |
| Eric No.258 | NW1/4 20 | 1S | 13E | 348072 |
| Eric No.259 | NW1/4 20 & SW1/4 20 | 1S | 13E | 348073 |
| Eric No.260 | NE1/4 19,SE1/4 19,NW1/4 20,SW1/4 20 | 1S | 13E | 348074 |
| Eric No.261 | NE1/4 19 & NW1/4 20 | 1S | 13E | 348075 |
| Eric No.262 | NW1/4 19&NE1/4 19 | 1S | 13E | 348076 |
| Eric No.263 | NE1/4 19,SE1/4 19,NW1/4 19,SW1/4 19 | 1S | 13E | 348077 |
| Eric No.264 | SW1/4 19 & SE1/4 19 | 1S | 13E | 348078 |
| Eric No.265 | SE1/4 19 & SW1/4 20 | 1S | 13E | 348079 |
| Eric No.266 | SW1/4 20 | 1S | 13E | 348080 |
| Eric No.267 | SW1/4 20 | 1S | 13E | 348081 |
| Eric No.268 | SW1/4 20 | 1S | 13E | 348082 |
| Eric No.269 | SW1/4 20 | 1S | 13E | 348083 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Eric No.270 | SE1/4 20 & SW1/4 20 | 1S | 13E | 348084 |
| Eric No.271 | SE1/4 20,SW1/4 20,NW1/4 29,NE1/4 29 | 1S | 13E | 348085 |
| Eric No.272 | SW1/4 20&NW1/4 29 | 1S | 13E | 348086 |
| Eric No.273 amended | SE1/4 19&NE1/4 30 | 1S | 13E | 348087 |
| Eric No.274 | NE1/4 20,NW1/4 20,SW1/4 17,SE1/4 17 | 1S | 13E | 348088 |
| Eric No.275 | NW1/4 20 & SW1/4 17 | 1S | 13E | 348089 |
| Eric No.276 | NW1/4 20 & SW1/4 17 | 1S | 13E | 348090 |
| Eric No.277 | NW1/4 20 & SW1/4 17 | 1S | 13E | 348091 |
| Eric No.278 | NW1/4 20 & SW1/4 17 | 1S | 13E | 348092 |
| Eric No.3 | NW1/4 22&NE1/4 22 | 1S | 13E | 347704 |
| Eric No.30 | SW1/4 15 | 1S | 13E | 347731 |
| Eric No.31 | SW1/4 15 | 1S | 13E | 347732 |
| Eric No.32 | SW1/4 15 | 1S | 13E | 347733 |
| Eric No.33 | SW1/4 16 | 1S | 13E | 347734 |
| Eric No.34 | SE1/4 16 | 1S | 13E | 347735 |
| Eric No.35 | SW1/4 16 & SE1/4 16 | 1S | 13E | 347736 |
| Eric No.36 | SW1/4 16 | 1S | 13E | 347737 |
| Eric No.37 | SE1/4 17 & SW1/4 16 | 1S | 13E | 347738 |
| Eric No.38 | SE1/4 17 | 1S | 13E | 347739 |
| Eric No.39 | SE1/4 17 | 1S | 13E | 347740 |
| Eric No.4 | NW1/4 22 | 1S | 13E | 347705 |
| Eric No.40 | SE1/4 17 & SW1/4 16 | 1S | 13E | 347741 |
| Eric No.41 | SW1/4 16 | 1S | 13E | 347742 |
| Eric No.42 | SW1/4 16&SE1/4 16 | 1S | 13E | 347743 |
| Eric No.43 | SE1/4 16 | 1S | 13E | 347744 |
| Eric No.44 | NE1/4 16&SE1/4 16 | 1S | 13E | 347745 |
| Eric No.45 | SW1/4 16&SE1/4 16 | 1S | 13E | 347746 |
| Eric No.46 | SW1/4 16 | 1S | 13E | 347747 |
| Eric No.47 | SE1/417&SW1/4 16 | 1S | 13E | 347748 |
| Eric No.48 | SE1/417 | 1S | 13E | 347749 |
| Eric No.49 | NE1/4 17&SE1/4 17 | 1S | 13E | 347750 |
| Eric No.5 | NE1/4 21 | 1S | 13E | 347706 |
| Eric No.50 | NE1/417,SE1/417,NW1/416,SW1/416 | 1S | 13E | 347751 |
| Eric No.51 | NW1/4 16 & SW1/4 16 | 1S | 13E | 347752 |
| Eric No.52 | NE1/4 16,NW1/4 16,SE1/4 16,SW1/4 16 | 1S | 13E | 347753 |
| Eric No.53 | NW1/4 16&NE1/4 16 | 1S | 13E | 347754 |
| Eric No.54 | NW1/4 16 | 1S | 13E | 347755 |
| Eric No.55 | NE1/4 17&NW1/4 16 | 1S | 13E | 347756 |
| Eric No.56 | NE1/4 17 | 1S | 13E | 347757 |
| Eric No.57 | NE1/4 16&SE1/4 16 | 1S | 13E | 347758 |
| Eric No.58 | NE1/4 16&SE1/4 16 | 1S | 13E | 347759 |
| Eric No.59 | NW1/4 15&SW1/4 15 | 1S | 13E | 347760 |
| Eric No.6 | NW1/4 21 &NE1/4 21 | 1S | 13E | 347707 |
| Eric No.60 | SW1/4 15&NW1/4 15 | 1S | 13E | 347761 |
| Eric No.61 | NW1/4 15&SW1/4 15 | 1S | I3E | 347762 |
| Eric No.7 | NW1/4 21 | 1S | 13E | 347708 |
| Eric No.8 | NE1/4 20 & NW1/4 21 | 1S | 13E | 347709 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Eric No.86 | NW1/4 I5 | 1S | 13E | 347787 |
| Eric No.87 | NW1/4 15 | 1S | 13E | 347788 |
| Eric No.88 | NW1/4 15 | 1S | 13E | 347789 |
| Eric No.89 | NE1/4 16 | 1S | 13E | 347790 |
| Eric No.9 | NE1/4 20 | 1S | 13E | 347710 |
| Eric No.90 | NE1/4 16 | 1S | 13E | 347791 |
| Eric No.91 | NE1/4 16 | 1S | 13E | 347792 |
| Eric No.92 | NW1/4 16 & NE1/4 16 | 1S | 13E | 347793 |
| Eric No.93 | NW1/4 16 | 1S | 13E | 347794 |
| Eric No.94 | NE1/4 17&NW1/4 16 | 1S | 13E | 347795 |
| Eric No.95 | NE1/4 17 | 1S | 13E | 347796 |
| Eric No.97 | NE1/4 17 | 1S | 13E | 347797 |
| Eric No.98 | NE1/4 17 | 1S | 13E | 347798 |
| Eric No.99 | NE1/4 17&NW1/4 16 | 1S | 13E | 347799 |
| Extension No. 1A | SW1/4 7 | 2S | 13E | 60402 |
| Extension No. 2 | SW1/4 SE1/4 7 | 2S | 13E | 60403 |
| Extension No. 3 | NE1/4 7 | 2S | 13E | 60404 |
| Extension No. 31 | SE1/4 7,NE1/4 18 | 2S | 13E | 60433 |
| Extension No. 32 | SE1/4 7 | 2S | 13E | 60434 |
| Extension No. 33 | SE1/4 NE1/4 7 | 2S | 13E | 60435 |
| Extension No. 34 | SE1/4 NE1/4 7 | 2S | 13E | 60436 |
| Extension No. 35 | NE1/4 7 | 2S | 13E | 60437 |
| Extension No. 36 | NE1/4 7 | 2S | 13E | 60438 |
| Extension No. 37 | NE1/4 7 | 2S | 13E | 60439 |
| Extension No. 38 | NE1/4 7 | 2S | 13E | 60440 |
| Extension No. 39 | NE1/4 7,SE1/4 6 | 2S | 13E | 60441 |
| Extension No. 4 | SW1/4 ,7,NW1/4 18 | 2S | 13E | 60405 |
| Extension No. 40 | NE1/4 7,SE1/4 6 | 2S | 13E | 60442 |
| Extension No. 41 | NE1/4 7,SE1/4 6 | 2S | 13E | 60443 |
| Extension No. 5 | SW1/4 7,NW1/4 18 | 2S | 13E | 60406 |
| Extension No. 6 | SW1/4 7,NW1/4 NE1/4 18 | 2S | 13E | 60407 |
| Extension No. 7 | SW1/4 SE1/4 NE1/4 18 | 2S | 13E | 60408 |
| Extension No. 8 | SW1/4 7,NE1/4 18 | 2S | 13E | 60409 |
| Galaxy No. 1 | SW1/41 | 2S | 12E | 359395 |
| Gardner amended No.2 | NW1/4SW1/42,NE1/4SE1/43 | 2S | 12E | 60199 |
| Gladiator No. 1 | NW1/4 32 | 1S | 13E | 359396 |
| Gladiator No. 2 | NW1/4 NE1/4 32 | 1S | 13E | 359397 |
| Gladiator No. 3 | NE1/4 32 | 1S | 13E | 359398 |
| Gladiator No. 4 | SW1/4 29,NW1/4 32 | 1S | 13E | 359399 |
| Gladiator No. 5 | SW1/4 SE1/4 29,NW1/4 NE1/4 32 | 1S | 13E | 359400 |
| Gladiator No. 6 | SE1/4 29,NE1/4 32 | 1S | 13E | 359401 |
| Gladiator No. 7 | NE1/4,SE1/4,NW1/4&SW1/429 | 1S | 13E | 359402 |
| Gladiator No. 8 | NE1/4 SE1/4 29 | 1S | 13E | 359403 |
| Gussie amended | NW1/4SW1/42 | 2S | 12E | 60200 |
| Hard Rock No. 11 | NW1/4SW1/41,NE1/4SE1/42 | 2S | 12E | 60206 |
| Hard Rock No. 12 | NE1/42,NW1/41 | 2S | 12E | 60207 |
| Hard Rock No. 13 | SE'/4 36 | 1S | 12E | 60129 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Hard Rock No. 14 | SE1/4 36 | 1S | 12E | 60130 |
| Hard Rock No. 2 Amended | NE1/42 | 2S | 12E | 60203 |
| Hard Rock No. 6 | SW1/41,NE1/4SE1/42 | 2S | 12E | 60204 |
| Hard Rock No. 7 | NE1/42 | 2S | 12E | 60205 |
| Hard Rock No. 8 | SE1/4 36 | 1S | 12E | 60126 |
| HC 1 | NE 1/4 SEC 16 | T1S | 12E | 419583 |
| HC 10 | NW 1/4 SEC 13 | T1S | 11E | 419592 |
| HC 100 | SW 1/4 Sec 15 | T1S | 11E | 419682 |
| HC 101 | SW 1/4 Sec 15 | T1S | 11E | 419683 |
| HC 102 | SW 1/4 Sec 15 | T1S | 11E | 419684 |
| HC 103 | SW 1/4 Sec 15 | T1S | 11E | 419685 |
| HC 104 | SE 1/4 Sec 15 | T1S | 11E | 419686 |
| HC 105 | SE 1/4 Sec 15 | T1S | 11E | 419687 |
| HC 106 | SE 1/4 Sec 15 | T1S | 11E | 419688 |
| HC 107 | SE 1/4 Sec 15 | T1S | 11E | 419689 |
| HC 108 | SE 1/4 Sec 15 | T1S | 11E | 419690 |
| HC 109 | SW 1/4 Sec 14 | T1S | 11E | 419691 |
| HC 11 | NE 1/4 SEC 14 | T1S | 11E | 419593 |
| HC 110 | SW 1/4 Sec 14 | T1S | 11E | 419692 |
| HC 111 | SW 1/4 Sec 14 | T1S | 11E | 419693 |
| HC 112 | SW 1/4 Sec 14 | T1S | 11E | 419694 |
| HC 113 | SE 1/4 Sec 14 | T1S | 11E | 419695 |
| HC 114 | SE 1/4 Sec 14 | T1S | 11E | 419696 |
| HC 115 | SE 1/4 Sec 14 | T1S | 11E | 419697 |
| HC 116 | SE 1/4 Sec 14 | T1S | 11E | 419698 |
| HC 117 | SE 1/4 Sec 14 | T1S | 11E | 419699 |
| HC 118 | SW 1/4 Sec 13 | T1S | 11E | 419700 |
| HC 119 | SW 1/4 Sec 13 | T1S | 11E | 419701 |
| HC 12 | NE 1/4 SEC 14 | T1S | 11E | 419594 |
| HC 120 | SW 1/4 Sec 13 | T1S | 11E | 419702 |
| HC 121 | SW 1/4 Sec 13 | T1S | 11E | 419703 |
| HC 122 | SW 1/4 Sec 13 | T1S | 11E | 419704 |
| HC 123 | SE 1/4 Sec 13 | T1S | 11E | 419705 |
| HC 124 | SE 1/4 Sec 13 | T1S | 11E | 419706 |
| HC 125 | SE 1/4 Sec 13 | T1S | 11E | 419707 |
| HC 126 | SE 1/4 Sec 13 | T1S | 11E | 419708 |
| HC 127 | SW 1/4 Sec 18 | T1S | 12E | 419709 |
| HC 128 | SW 1/4 Sec 18 | T1S | 12E | 419710 |
| HC 129 | SW 1/4 Sec 18 | T1S | 12E | 419711 |
| HC 13 | NE 1/4 SEC 14 | T1S | 11E | 419595 |
| HC 130 | SW 1/4 Sec 18 | T1S | 12E | 419712 |
| HC 131 | SW 1/4 Sec 18 | T1S | 12E | 419713 |
| HC 132 | SE 1/4 Sec 18 | T1S | 12E | 419714 |
| HC 133 | SE 1/4 Sec 18 | T1S | 12E | 419715 |
| HC 134 | SE 1/4 Sec 18 | T1S | 12E | 419716 |
| HC 135 | SE 1/4 Sec 18 | T1S | 12E | 419717 |
| HC 136 | SW 1/4 Sec 17 | T1S | 12E | 419718 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 137 | SW 1/4 Sec 17 | T1S | 12E | 419719 |
| HC 138 | SW 1/4 Sec 17 | T1S | 12E | 419720 |
| HC 139 | SW 1/4 Sec 17 | T1S | 12E | 419721 |
| HC 14 | NW 1/4 Sec 14 | T1S | 11E | 419596 |
| HC 140 | SW 1/4 Sec 17 | T1S | 12E | 419722 |
| HC 141 | NW 1/4 Sec 20 | T1S | 12E | 419723 |
| HC 142 | NW 1/4 Sec 20 | T1S | 12E | 419724 |
| HC 143 | NW 1/4 Sec 20 | T1S | 12E | 419725 |
| HC 144 | NE 1/4 Sec 19 | T1S | 12E | 419726 |
| HC 145 | NE 1/4 Sec 19 | T1S | 12E | 419727 |
| HC 146 | NE 1/4 Sec 19 | T1S | 12E | 419728 |
| HC 147 | NE 1/4 Sec 19 | T1S | 12E | 419729 |
| HC 148 | NW 1/4 Sec 19 | T1S | 12E | 419730 |
| HC 149 | NW 1/4 Sec 19 | T1S | 12E | 419731 |
| HC 15 | NW 1/4 Sec 14 | T1S | 11E | 419597 |
| HC 150 | NW 1/4 Sec 19 | T1S | 12E | 419732 |
| HC 151 | NW 1/4 Sec 19 | T1S | 12E | 419733 |
| HC 152 | NW 1/4 Sec 19 | T1S | 12E | 419734 |
| HC 153 | NE 1/4 Sec 24 | T1S | 11E | 419735 |
| HC 154 | NE 1/4 Sec 24 | T1S | 11E | 419736 |
| HC 155 | NE 1/4 Sec 24 | T1S | 11E | 419737 |
| HC 156 | NE 1/4 Sec 24 | T1S | 11E | 419738 |
| HC 157 | NW 1/4 Sec 24 | T1S | 11E | 419739 |
| HC 158 | NW 1/4 Sec 24 | T1S | 11E | 419740 |
| HC 159 | NW 1/4 Sec 24 | T1S | 11E | 419741 |
| HC 16 | NE 1/4 Sec 15 | T1S | 11E | 419598 |
| HC 160 | NW 1/4 Sec 24 | T1S | 11E | 419742 |
| HC 161 | NW 1/4 Sec 24 | T1S | 11E | 419743 |
| HC 162 | NE 1/4 Sec 23 | T1S | 11E | 419744 |
| HC 163 | NE 1/4 Sec 23 | T1S | 11E | 419745 |
| HC 164 | NE 1/4 Sec 23 | T1S | 11E | 419746 |
| HC 165 | NE 1/4 Sec 23 | T1S | 11E | 419747 |
| HC 166 | NE 1/4 Sec 23 | T1S | 11E | 419748 |
| HC 167 | NW 1/4 Sec 23 | T1S | 11E | 419749 |
| HC 168 | NW 1/4 Sec 23 | T1S | 11E | 419750 |
| HC 169 | NW 1/4 Sec 23 | T1S | 11E | 419751 |
| HC 17 | NE 1/4 Sec 15 | T1S | 11E | 419599 |
| HC 170 | NW 1/4 Sec 23 | T1S | 11E | 419752 |
| HC 171 | NE 1/4 Sec 22 | T1S | 11E | 419753 |
| HC 172 | NE 1/4 Sec 22 | T1S | 11E | 419754 |
| HC 173 | NE 1/4 Sec 22 | T1S | 11E | 419755 |
| HC 174 | NE 1/4 Sec 22 | T1S | 11E | 419756 |
| HC 175 | SE 1/4 Sec 15 | T1S | 11E | 419757 |
| HC 176 | SW 1/4 Sec 15 | T1S | 11E | 419758 |
| HC 177 | NW 1/4 Sec 22 | T1S | 11E | 419759 |
| HC 178 | NW 1/4 Sec 22 | T1S | 11E | 419760 |
| HC 179 | NW 1/4 Sec 22 | T1S | 11E | 419761 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 18 | NE 1/4 Sec 15 | T1S | 11E | 419600 |
| HC 180 | NW 1/4 Sec 22 | T1S | 11E | 419762 |
| HC 181 | NW 1/4 Sec 22 | T1S | 11E | 419763 |
| HC 182 | NW 1/4 Sec 22 | T1S | 11E | 419764 |
| HC 183 | NW 1/4 Sec 22 | T1S | 11E | 419765 |
| HC 184 | NE 1/4 Sec 22 | T1S | 11E | 419766 |
| HC 185 | NE 1/4 Sec 22 | T1S | 11E | 419767 |
| HC 186 | NE 1/4 Sec 22 | T1S | 11E | 419768 |
| HC 187 | NE 1/4 Sec 22 | T1S | 11E | 419769 |
| HC 188 | NE 1/4 Sec 22 | T1S | 11E | 419770 |
| HC 189 | NW 1/4 Sec 23 | T1S | 11E | 419771 |
| HC 19 | NE 1/4 Sec 15 | T1S | 11E | 419601 |
| HC 190 | NW 1/4 Sec 23 | T1S | 11E | 419772 |
| HC 191 | NW 1/4 Sec 23 | T1S | 11E | 419773 |
| HC 192 | NW 1/4 Sec 23 | T1S | 11E | 419774 |
| HC 193 | NE 1/4 Sec 23 | T1S | 11E | 419775 |
| HC 194 | NE 1/4 Sec 23 | T1S | 11E | 419776 |
| HC 195 | NE 1/4 Sec 23 | T1S | 11E | 419777 |
| HC 196 | NE 1/4 Sec 23 | T1S | 11E | 419778 |
| HC 197 | NE 1/4 Sec 23 | T1S | 11E | 419779 |
| HC 198 | NW 1/4 Sec 24 | T1S | 11E | 419780 |
| HC 199 | NW 1/4 Sec 24 | T1S | 11E | 419781 |
| HC 2 | NE 1/4 SEC 17 | T1S | 12E | 419584 |
| HC 20 | NE 1/4 Sec 15 | T1S | 11E | 419602 |
| HC 200 | NW 1/4 Sec 24 | T1S | 11E | 419782 |
| HC 201 | NW 1/4 Sec 24 | T1S | 11E | 419783 |
| HC 202 | NW 1/4 Sec 24 | T1S | 11E | 419784 |
| HC 203 | NE 1/4 Sec 24 | T1S | 11E | 419785 |
| HC 204 | NE 1/4 Sec 24 | T1S | 11E | 419786 |
| HC 205 | NE 1/4 Sec 24 | T1S | 11E | 419787 |
| HC 206 | NE 1/4 Sec 24 | T1S | 11E | 419788 |
| HC 207 | NW 1/4 Sec 19 | T1S | 12E | 419789 |
| HC 208 | NW 1/4 Sec 19 | T1S | 12E | 419790 |
| HC 209 | NW 1/4 Sec 19 | T1S | 12E | 419791 |
| HC 21 | NE 1/4 Sec 15 | T1S | 11E | 419603 |
| HC 210 | NW 1/4 Sec 19 | T1S | 12E | 419792 |
| HC 211 | NW 1/4 Sec 19 | T1S | 12E | 419793 |
| HC 212 | NE 1/4 Sec 19 | T1S | 12E | 419794 |
| HC 213 | NE 1/4 Sec 19 | T1S | 12E | 419795 |
| HC 214 | NE 1/4 Sec 19 | T1S | 12E | 419796 |
| HC 215 | NE 1/4 Sec 19 | T1S | 12E | 419797 |
| HC 216 | NW 1/4 Sec 20 | T1S | 12E | 419798 |
| HC 217 | NW 1/4 Sec 20 | T1S | 12E | 419799 |
| HC 218 | SW 1/4 Sec 20 | T1S | 12E | 419800 |
| HC 219 | SW 1/4 Sec 20 | T1S | 12E | 419801 |
| HC 22 | NW 1/4 Sec 14 | T1S | 11E | 419604 |
| HC 220 | SE 1/4 Sec 19 | T1S | 12E | 419802 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 221 | SE 1/4 Sec 19 | T1S | 12E | 419803 |
| HC 222 | SE 1/4 Sec 19 | T1S | 12E | 419804 |
| HC 223 | SE 1/4 Sec 19 | T1S | 12E | 419805 |
| HC 224 | SE 1/4 Sec 19 | T1S | 12E | 419806 |
| HC 225 | SW 1/4 Sec 19 | T1S | 12E | 419807 |
| HC 226 | SW 1/4 Sec 19 | T1S | 12E | 419808 |
| HC 227 | SW 1/4 Sec 19 | T1S | 12E | 419809 |
| HC 228 | NW 1/4 Sec 19 | T1S | 12E | 419810 |
| HC 229 | NE 1/4 Sec 24 | T1S | 11E | 419811 |
| HC 23 | NW 1/4 Sec 14 | T1S | 11E | 419605 |
| HC 230 | NE 1/4 Sec 24 | T1S | 11E | 419812 |
| HC 231 | NE 1/4 Sec 24 | T1S | 11E | 419813 |
| HC 232 | NE 1/4 Sec 24 | T1S | 11E | 419814 |
| HC 233 | NE 1/4 Sec 24 | T1S | 11E | 419815 |
| HC 234 | NW 1/4 Sec 24 | T1S | 11E | 419816 |
| HC 235 | NW 1/4 Sec 24 | T1S | 11E | 419817 |
| HC 236 | NW 1/4 Sec 24 | T1S | 11E | 419818 |
| HC 237 | NW 1/4 Sec 24 | T1S | 11E | 419819 |
| HC 238 | NE 1/4 Sec 23 | T1S | 11E | 419820 |
| HC 239 | NE 1/4 Sec 23 | T1S | 11E | 419821 |
| HC 24 | NW 1/4 Sec 14 | T1S | 11E | 419606 |
| HC 240 | NE 1/4 Sec 23 | T1S | 11E | 419822 |
| HC 241 | NE 1/4 Sec 23 | T1S | 11E | 419823 |
| HC 242 | NW 1/4 Sec 23 | T1S | 11E | 419824 |
| HC 243 | NW 1/4 Sec 23 | T1S | 11E | 419825 |
| HC 244 | NW 1/4 Sec 23 | T1S | 11E | 419826 |
| HC 245 | NW 1/4 Sec 23 | T1S | 11E | 419827 |
| HC 246 | NW 1/4 Sec 23 | T1S | 11E | 419828 |
| HC 247 | NE 1/4 Sec 22 | T1S | 11E | 419829 |
| HC 248 | NE 1/4 Sec 22 | T1S | 11E | 419830 |
| HC 249 | NE 1/4 Sec 22 | T1S | 11E | 419831 |
| HC 25 | NE 1/4 Sec 14 | T1S | 11E | 419607 |
| HC 250 | NE 1/4 Sec 22 | T1S | 11E | 419832 |
| HC 251 | SE 1/4 Sec 22 | T1S | 11E | 419833 |
| HC 252 | NW 1/4 Sec 22 | T1S | 11E | 419834 |
| HC 253 | NW 1/4 Sec 22 | T1S | 11E | 419835 |
| HC 254 | NW 1/4 Sec 22 | T1S | 11E | 419836 |
| HC 255 | NW 1/4 Sec 22 | T1S | 11E | 419837 |
| HC 256 | SW 1/4 Sec 22 | T1S | 11E | 419838 |
| HC 257 | SW 1/4 Sec 22 | T1S | 11E | 419839 |
| HC 258 | SW 1/4 Sec 22 | T1S | 11E | 419840 |
| HC 259 | SW 1/4 Sec 22 | T1S | 11E | 419841 |
| HC 26 | NE 1/4 Sec 14 | T1S | 11E | 419608 |
| HC 260 | SE 1/4 Sec 22 | T1S | 11E | 419842 |
| HC 261 | SE 1/4 Sec 22 | T1S | 11E | 419843 |
| HC 262 | SE 1/4 Sec 22 | T1S | 11E | 419844 |
| HC 263 | SE 1/4 Sec 22 | T1S | 11E | 419845 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 264 | SE 1/4 Sec 22 | T1S | 11E | 419846 |
| HC 265 | SW 1/4 Sec 23 | T1S | 11E | 419847 |
| HC 267 | SW 1/4 Sec 23 | T1S | 11E | 419848 |
| HC 268 | SW 1/4 Sec 23 | T1S | 11E | 419849 |
| HC 269 | SW 1/4 Sec 23 | T1S | 11E | 419850 |
| HC 27 | NE 1/4 Sec 14 | T1S | 11E | 419609 |
| HC 270 | SE 1/4 Sec 23 | T1S | 11E | 419851 |
| HC 271 | SE 1/4 Sec 23 | T1S | 11E | 419852 |
| HC 272 | SE 1/4 Sec 23 | T1S | 11E | 419853 |
| HC 273 | SE 1/4 Sec 23 | T1S | 11E | 419854 |
| HC 274 | SE 1/4 Sec 23 | T1S | 11E | 419855 |
| HC 275 | SW 1/4 Sec 24 | T1S | 11E | 419856 |
| HC 276 | SW 1/4 Sec 24 | T1S | 11E | 419857 |
| HC 277 | SW 1/4 Sec 24 | T1S | 11E | 419858 |
| HC 278 | SW 1/4 Sec 24 | T1S | 11E | 419859 |
| HC 279 | SW 1/4 Sec 24 | T1S | 11E | 419860 |
| HC 28 | NE 1/4 Sec 14 | T1S | 11E | 419610 |
| HC 280 | SE 1/4 Sec 24 | T1S | 11E | 419861 |
| HC 281 | SE 1/4 Sec 24 | T1S | 11E | 419862 |
| HC 282 | SE 1/4 Sec 24 | T1S | 11E | 419863 |
| HC 283 | SE 1/4 Sec 24 | T1S | 11E | 419864 |
| HC 284 | SW 1/4 Sec 19 | T1S | 12E | 419865 |
| HC 285 | SW 1/4 Sec 19 | T1S | 12E | 419866 |
| HC 286 | SW 1/4 Sec 20 | T1S | 12E | 419867 |
| HC 287 | SW 1/4 Sec 20 | T1S | 12E | 419868 |
| HC 288 | NW 1/4 Sec 30 | T1S | 12E | 419869 |
| HC 289 | NW 1/4 Sec 30 | T1S | 12E | 419870 |
| HC 29 | NE 1/4 Sec 14 | T1S | 11E | 419611 |
| HC 290 | NW 1/4 Sec 30 | T1S | 12E | 419871 |
| HC 291 | NW 1/4 Sec 25 | T1S | 11E | 419872 |
| HC 293 | NW 1/4 Sec 25 | T1S | 11E | 419873 |
| HC 294 | NW 1/4 Sec 25 | T1S | 11E | 419874 |
| HC 295 | NW 1/4 Sec 25 | T1S | 11E | 419875 |
| HC 296 | NW 1/4 Sec 25 | T1S | 11E | 419876 |
| HC 297 | NW 1/4 Sec 25 | T1S | 11E | 419877 |
| HC 298 | NW 1/4 Sec 25 | T1S | 11E | 419878 |
| HC 299 | NW 1/4 Sec 25 | T1S | 11E | 419879 |
| HC 3 | NW 1/4 SEC 17 | T1S | 12E | 419585 |
| HC 30 | NW 1/4 Sec 13 | T1S | 11E | 419612 |
| HC 300 | NW 1/4 Sec 25 | T1S | 11E | 419880 |
| HC 301 | NE 1/4 Sec 26 | T1S | 11E | 419881 |
| HC 302 | NE 1/4 Sec 26 | T1S | 11E | 419882 |
| HC 303 | NE 1/4 Sec 26 | T1S | 11E | 419883 |
| HC 304 | NE 1/4 Sec 26 | T1S | 11E | 419884 |
| HC 305 | NE 1/4 Sec 26 | T1S | 11E | 419885 |
| HC 306 | NW 1/4 Sec 26 | T1S | 11E | 419886 |
| HC 307 | NW 1/4 Sec 26 | T1S | 11E | 419887 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 308 | NW 1/4 Sec 26 | T1S | 11E | 419888 |
| HC 309 | NW 1/4 Sec 26 | T1S | 11E | 419889 |
| HC 31 | NW 1/4 Sec 13 | T1S | 11E | 419613 |
| HC 310 | NE 1/4 Sec 27 | T1S | 11E | 419890 |
| HC 311 | NE 1/4 Sec 27 | T1S | 11E | 419891 |
| HC 312 | NE 1/4 Sec 27 | T1S | 11E | 419892 |
| HC 313 | NE 1/4 Sec 27 | T1S | 11E | 419893 |
| HC 314 | NW 1/4 Sec 27 | T1S | 11E | 419894 |
| HC 315 | NW 1/4 Sec 27 | T1S | 11E | 419895 |
| HC 316 | NW 1/4 Sec 27 | T1S | 11E | 419896 |
| HC 317 | NW 1/4 Sec 27 | T1S | 11E | 419897 |
| HC 318 | NW 1/4 Sec 27 | T1S | 11E | 419898 |
| HC 319 | SW 1/4 Sec 27 | T1S | 11E | 419899 |
| HC 32 | NW 1/4 Sec 13 | T1S | 11E | 419614 |
| HC 320 | SW 1/4 Sec 27 | T1S | 11E | 419900 |
| HC 321 | SW 1/4 Sec 27 | T1S | 11E | 419901 |
| HC 322 | SW 1/4 Sec 27 | T1S | 11E | 419902 |
| HC 323 | NE 1/4 Sec 27 | T1S | 11E | 419903 |
| HC 324 | SE 1/4 Sec 27 | T1S | 11E | 419904 |
| HC 325 | SE 1/4 Sec 27 | T1S | 11E | 419905 |
| HC 326 | SE 1/4 Sec 27 | T1S | 11E | 419906 |
| HC 327 | SE 1/4 Sec 27 | T1S | 11E | 419907 |
| HC 328 | SW 1/4 Sec 26 | T1S | 11E | 419908 |
| HC 329 | SW 1/4 Sec 26 | T1S | 11E | 419909 |
| HC 33 | NW 1/4 Sec 13 | T1S | 11E | 419615 |
| HC 330 | SW 1/4 Sec 26 | T1S | 11E | 419910 |
| HC 331 | SW 1/4 Sec 26 | T1S | 11E | 419911 |
| HC 332 | NE 1/4 Sec 26 | T1S | 11E | 419912 |
| HC 333 | SE 1/4 Sec 26 | T1S | 11E | 419913 |
| HC 334 | SE 1/4 Sec 26 | T1S | 11E | 419914 |
| HC 335 | SE 1/4 Sec 26 | T1S | 11E | 419915 |
| HC 336 | SE 1/4 Sec 26 | T1S | 11E | 419916 |
| HC 337 | SW 1/4 Sec 25 | T1S | 11E | 419917 |
| HC 338 | SW 1/4 Sec 25 | T1S | 11E | 419918 |
| HC 339 | SW 1/4 Sec 25 | T1S | 11E | 419919 |
| HC 34 | NW 1/4 Sec 13 | T1S | 11E | 419616 |
| HC 340 | SW 1/4 Sec 25 | T1S | 11E | 419920 |
| HC 341 | SE 1/4 Sec 25 | T1S | 11E | 419921 |
| HC 342 | SE 1/4 Sec 25 | T1S | 11E | 419922 |
| HC 343 | SE 1/4 Sec 25 | T1S | 11E | 419923 |
| HC 344 | SE 1/4 Sec 25 | T1S | 11E | 419924 |
| HC 345 | SE 1/4 Sec 25 | T1S | 11E | 419925 |
| HC 346 | SW 1/4 Sec 30 | T1S | 12E | 419926 |
| HC 347 | SW 1/4 Sec 30 | T1S | 12E | 419927 |
| HC 348 | NW 1/4 Sec 30 | T1S | 12E | 419928 |
| HC 349 | NW 1/4 Sec 30 | T1S | 12E | 419929 |
| HC 35 | NE 1/4 Sec 13 | T1S | 11E | 419617 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 350 | SW 1/4 Sec 30 | T1S | 12E | 419930 |
| HC 351 | NE 1/4 Sec 30 | T1S | 12E | 419931 |
| HC 352 | NE 1/4 Sec 30 | T1S | 12E | 419932 |
| HC 353 | NE 1/4 Sec 30 | T1S | 12E | 419933 |
| HC 354 | NE 1/4 Sec 30 | T1S | 12E | 419934 |
| HC 355 | SE 1/4 Sec 30 | T1S | 12E | 419935 |
| HC 356 | SE 1/4 Sec 30 | T1S | 12E | 419936 |
| HC 357 | SE 1/4 Sec 30 | T1S | 12E | 419937 |
| HC 358 | SE 1/4 Sec 30 | T1S | 12E | 419938 |
| HC 359 | SW 1/4 Sec 30 | T1S | 12E | 419939 |
| HC 36 | NE 1/4 Sec 13 | T1S | 11E | 419618 |
| HC 360 | SW 1/4 Sec 30 | T1S | 12E | 419940 |
| HC 361 | SW 1/4 Sec 30 | T1S | 12E | 419941 |
| HC 362 | SW 1/4 Sec 30 | T1S | 12E | 419942 |
| HC 363 | SW 1/4 Sec 30 | T1S | 12E | 419943 |
| HC 364 | SE 1/4 Sec 25 | T1S | 11E | 419944 |
| HC 365 | SE 1/4 Sec 25 | T1S | 11E | 419945 |
| HC 366 | SE 1/4 Sec 25 | T1S | 11E | 419946 |
| HC 367 | SE 1/4 Sec 25 | T1S | 11E | 419947 |
| HC 368 | SW 1/4 Sec 25 | T1S | 11E | 419948 |
| HC 369 | SW 1/4 Sec 25 | T1S | 11E | 419949 |
| HC 37 | NW 1/4 Sec 18 | T1S | 12E | 419619 |
| HC 370 | SW 1/4 Sec 25 | T1S | 11E | 419950 |
| HC 371 | SW 1/4 Sec 25 | T1S | 11E | 419951 |
| HC 372 | SW 1/4 Sec 25 | T1S | 11E | 419952 |
| HC 373 | SE 1/4 Sec 26 | T1S | 11E | 419953 |
| HC 374 | SE 1/4 Sec 26 | T1S | 11E | 419954 |
| HC 375 | SE 1/4 Sec 26 | T1S | 11E | 419955 |
| HC 376 | SE 1/4 Sec 26 | T1S | 11E | 419956 |
| HC 377 | SE 1/4 Sec 26 | T1S | 11E | 419957 |
| HC 378 | SW 1/4 Sec 26 | T1S | 11E | 419958 |
| HC 379 | SW 1/4 Sec 26 | T1S | 11E | 419959 |
| HC 38 | NW 1/4 Sec 18 | T1S | 12E | 419620 |
| HC 380 | SW 1/4 Sec 26 | T1S | 11E | 419960 |
| HC 381 | SW 1/4 Sec 26 | T1S | 11E | 419961 |
| HC 382 | SE 1/4 Sec 27 | T1S | 11E | 419962 |
| HC 383 | SE 1/4 Sec 27 | T1S | 11E | 419963 |
| HC 384 | SE 1/4 Sec 27 | T1S | 11E | 419964 |
| HC 385 | SE 1/4 Sec 27 | T1S | 11E | 419965 |
| HC 386 | SE 1/4 Sec 27 | T1S | 11E | 419966 |
| HC 387 | SW 1/4 Sec 27 | T1S | 11E | 419967 |
| HC 388 | SW 1/4 Sec 27 | T1S | 11E | 419968 |
| HC 389 | SW 1/4 Sec 27 | T1S | 11E | 419969 |
| HC 39 | NW 1/4 Sec 18 | T1S | 12E | 419621 |
| HC 390 | SW 1/4 Sec 27 | T1S | 11E | 419970 |
| HC 391 | SW 1/4 Sec 27 | T1S | 11E | 419971 |
| HC 392 | SW 1/4 Sec 27 | T1S | 11E | 419972 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 393 | SW 1/4 Sec 27 | T1S | 11E | 419973 |
| HC 394 | SW 1/4 Sec 27 | T1S | 11E | 419974 |
| HC 395 | SE 1/4 Sec 27 | T1S | 11E | 419975 |
| HC 396 | SE 1/4 Sec 27 | T1S | 11E | 419976 |
| HC 397 | SE 1/4 Sec 27 | T1S | 11E | 419977 |
| HC 398 | SE 1/4 Sec 27 | T1S | 11E | 419978 |
| HC 399 | SE 1/4 Sec 27 | T1S | 11E | 419979 |
| HC 4 | NW 1/4 SEC 17 | T1S | 12E | 419586 |
| HC 40 | NW 1/4 Sec 18 | T1S | 12E | 419622 |
| HC 400 | SW 1/4 Sec 26 | T1S | 11E | 419980 |
| HC 401 | SW 1/4 Sec 26 | T1S | 11E | 419981 |
| HC 402 | SW 1/4 Sec 26 | T1S | 11E | 419982 |
| HC 403 | SW 1/4 Sec 26 | T1S | 11E | 419983 |
| HC 405 | SE 1/4 Sec 26 | T1S | 11E | 419984 |
| HC 406 | SE 1/4 Sec 26 | T1S | 11E | 419985 |
| HC 407 | SE 1/4 Sec 26 | T1S | 11E | 419986 |
| HC 408 | SE 1/4 Sec 26 | T1S | 11E | 419987 |
| HC 409 | SE 1/4 Sec 26 | T1S | 11E | 419988 |
| HC 41 | NW 1/4 Sec 18 | T1S | 12E | 419623 |
| HC 410 | SW 1/4 Sec 25 | T1S | 11E | 419989 |
| HC 411 | SW 1/4 Sec 25 | T1S | 11E | 419990 |
| HC 412 | SW 1/4 Sec 25 | T1S | 11E | 419991 |
| HC 413 | SW 1/4 Sec 25 | T1S | 11E | 419992 |
| HC 414 | SW 1/4 Sec 25 | T1S | 11E | 419993 |
| HC 415 | SE 1/4 Sec 25 | T1S | 11E | 419994 |
| HC 416 | SE 1/4 Sec 25 | T1S | 11E | 419995 |
| HC 417 | SE 1/4 Sec 25 | T1S | 11E | 419996 |
| HC 418 | SE 1/4 Sec 25 | T1S | 11E | 419997 |
| HC 419 | SW 1/4 Sec 30 | T1S | 12E | 419998 |
| HC 42 | NE 1/4 of Sec 18 | T1S | 12E | 419624 |
| HC 420 | SW 1/4 Sec 30 | T1S | 12E | 419999 |
| HC 421 | SW 1/4 Sec 30 | T1S | 12E | 420000 |
| HC 422 | SW 1/4 Sec 30 | T1S | 12E | 420001 |
| HC 423 | SW 1/4 Sec 30 | T1S | 12E | 420002 |
| HC 424 | SE 1/4 Sec 30 | T1S | 12E | 420003 |
| HC 425 | SE 1/4 Sec 30 | T1S | 12E | 420004 |
| HC 426 | SE 1/4 Sec 30 | T1S | 12E | 420005 |
| HC 427 | SE 1/4 Sec 30 | T1S | 12E | 420006 |
| HC 428 | NW 1/4 Sec 31 | T1S | 12E | 420007 |
| HC 429 | NW 1/4 Sec 31 | T1S | 12E | 420008 |
| HC 43 | NE 1/4 of Sec 18 | T1S | 12E | 419625 |
| HC 430 | NW 1/4 Sec 31 | T1S | 12E | 420009 |
| HC 431 | NE 1/4 Sec 36 | T1S | 11E | 420010 |
| HC 432 | NE 1/4 Sec 36 | T1S | 11E | 420011 |
| HC 433 | NE 1/4 Sec 36 | T1S | 11E | 420012 |
| HC 434 | NE 1/4 Sec 36 | T1S | 11E | 420013 |
| HC 435 | NW 1/4 Sec 36 | T1S | 11E | 420014 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 436 | NW 1/4 Sec 36 | T1S | 11E | 420015 |
| HC 437 | NW 1/4 Sec 36 | T1S | 11E | 420016 |
| HC 438 | NW 1/4 Sec 36 | T1S | 11E | 420017 |
| HC 439 | NW 1/4 Sec 36 | T1S | 11E | 420018 |
| HC 44 | NE 1/4 of Sec 18 | T1S | 12E | 419626 |
| HC 440 | NE 1/4 Sec 35 | T1S | 11E | 420019 |
| HC 441 | NE 1/4 Sec 35 | T1S | 11E | 420020 |
| HC 442 | NE 1/4 Sec 35 | T1S | 11E | 420021 |
| HC 443 | NE 1/4 Sec 35 | T1S | 11E | 420022 |
| HC 444 | NE 1/4 Sec 35 | T1S | 11E | 420023 |
| HC 445 | NW 1/4 Sec 35 | T1S | 11E | 420024 |
| HC 446 | NW 1/4 Sec 35 | T1S | 11E | 420025 |
| HC 447 | NW 1/4 Sec 35 | T1S | 11E | 420026 |
| HC 448 | NW 1/4 Sec 35 | T1S | 11E | 420027 |
| HC 449 | NW 1/4 Sec 35 | T1S | 11E | 420028 |
| HC 45 | NE 1/4 of Sec 18 | T1S | 12E | 419627 |
| HC 450 | SE 1/4 Sec 35 | T1S | 11E | 420029 |
| HC 451 | SE 1/4 Sec 35 | T1S | 11E | 420030 |
| HC 452 | SE 1/4 Sec 35 | T1S | 11E | 420031 |
| HC 453 | SW 1/4 Sec 36 | T1S | 11E | 420032 |
| HC 454 | SW 1/4 Sec 36 | T1S | 11E | 420033 |
| HC 455 | SW 1/4 Sec 36 | T1S | 11E | 420034 |
| HC 456 | SW 1/4 Sec 36 | T1S | 11E | 420035 |
| HC 457 | SE 1/4 Sec 36 | T1S | 11E | 420036 |
| HC 458 | SE 1/4 Sec 36 | T1S | 11E | 420037 |
| HC 459 | SE 1/4 Sec 36 | T1S | 11E | 420038 |
| HC 46 | NW 1/4 Sec 17 | T1S | 12E | 419628 |
| HC 460 | SE 1/4 Sec 36 | T1S | 11E | 420039 |
| HC 461 | SE 1/4 Sec 36 | T1S | 11E | 420040 |
| HC 462 | SW 1/4 Sec 31 | T1S | 12E | 420041 |
| HC 463 | SW 1/4 Sec 31 | T1S | 12E | 420042 |
| HC 464 | SW 1/4 Sec 31 | T1S | 12E | 420043 |
| HC 465 | SW 1/4 Sec 31 | T1S | 12E | 420044 |
| HC 466 | SW 1/4 Sec 31 | T1S | 12E | 420045 |
| HC 467 | SW 1/4 Sec 31 | T1S | 12E | 420046 |
| HC 468 | SE 1/4 Sec 36 | T1S | 11E | 420047 |
| HC 469 | SE 1/4 Sec 36 | T1S | 11E | 420048 |
| HC 47 | NW 1/4 Sec 17 | T1S | 12E | 419629 |
| HC 470 | SE 1/4 Sec 36 | T1S | 11E | 420049 |
| HC 471 | SE 1/4 Sec 36 | T1S | 11E | 420050 |
| HC 472 | SW 1/4 Sec 36 | T1S | 11E | 420051 |
| HC 473 | SW 1/4 Sec 36 | T1S | 11E | 420052 |
| HC 474 | SW 1/4 Sec 36 | T1S | 11E | 420053 |
| HC 475 | SW 1/4 Sec 36 | T1S | 11E | 420054 |
| HC 476 | SW 1/4 Sec 36 | T1S | 11E | 420055 |
| HC 477 | SE 1/4 Sec 35 | T1S | 11E | 420056 |
| HC 48 | NW 1/4 Sec 17 | T1S | 12E | 419630 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 481 | NW 1/4 Sec 30 | T1S | 12E | 420057 |
| HC 482 | SW 1/4 Sec 20 | T1S | 12E | 420058 |
| HC 483 | NW 1/4 Sec 20 | T1S | 12E | 420059 |
| HC 484 | NW 1/4 Sec 20 | T1S | 12E | 420060 |
| HC 485 | SE 1/4 Sec 17 | T1S | 12E | 420061 |
| HC 486 | SW 1/4 Sec 20 | T1S | 12E | 420062 |
| HC 487 | NE 1/4 Sec 13 | T1S | 11E | 420063 |
| HC 488 | NE 1/4 Sec 13 | T1S | 11E | 420064 |
| HC 49 | NW 1/4 Sec 17 | T1S | 12E | 419631 |
| HC 5 | NW 1/4 SEC18 | T1S | 12E | 419587 |
| HC 50 | NW 1/4 Sec 17 | T1S | 12E | 419632 |
| HC 51 | NE 1/4 Sec 17 | T1S | 12E | 419633 |
| HC 517 | SW 1/4 Section 5 | 1S | 12E | 420894 |
| HC 518 | SW 1/4 Section 5 | 1S | 12E | 420895 |
| HC 519 | SW 1/4 Section 5 | 1S | 12E | 420896 |
| HC 52 | NE 1/4 Sec 17 | T1S | 12E | 419634 |
| HC 520 | SW 1/4 Section 5 | 1S | 12E | 420897 |
| HC 521 | SE 1/4 Section 6 | 1S | 12E | 420898 |
| HC 522 | SE 1/4 Section 6 | 1S | 12E | 420899 |
| HC 523 | SE 1/4 Section 6 | 1S | 12E | 420900 |
| HC 524 | SE 1/4 Section 6 | 1S | 12E | 420901 |
| HC 525 | SW 1/4 Section 6 | 1S | 12E | 420902 |
| HC 526 | SW 1/4 Section 6 | 1S | 12E | 420903 |
| HC 527 | SW 1/4 Section 6 | 1S | 12E | 420904 |
| HC 528 | SW 1/4 Section 6 | 1S | 12E | 420905 |
| HC 529 | SW 1/4 Section 6 | 1S | 12E | 420906 |
| HC 53 | NE 1/4 Sec 17 | T1S | 12E | 419635 |
| HC 530 | SE 1/4 Section 1 | 1S | 12E | 420907 |
| HC 531 | NE 1/4 Section 12 | 1S | 12E | 420908 |
| HC 532 | NW 1/4 Section 7 | 1S | 12E | 420909 |
| HC 533 | NW 1/4 Section 7 | 1S | 12E | 420910 |
| HC 534 | NW 1/4 Section 7 | 1S | 12E | 420911 |
| HC 535 | NW 1/4 Section 7 | 1S | 12E | 420912 |
| HC 536 | NW 1/4 Section 7 | 1S | 12E | 420913 |
| HC 537 | NE 1/4 Section 7 | 1S | 12E | 420914 |
| HC 538 | NE 1/4 Section 7 | 1S | 12E | 420915 |
| HC 539 | NE 1/4 Section 7 | 1S | 12E | 420916 |
| HC 54 | NE 1/4 Sec 17 | T1S | 12E | 419636 |
| HC 540 | NE 1/4 Section 7 | 1S | 12E | 420917 |
| HC 541 | NW 1/4 Section 8 | 1S | 12E | 420918 |
| HC 542 | NW 1/4 Section 8 | 1S | 12E | 420919 |
| HC 543 | NW 1/4 Section 8 | 1S | 12E | 420920 |
| HC 544 | NW 1/4 Section 8 | 1S | 12E | 420921 |
| HC 545 | NE 1/4 Section 8 | 1S | 12E | 420922 |
| HC 546 | NE 1/4 Section 8 | 1S | 12E | 420923 |
| HC 547 | NE 1/4 Section 8 | 1S | 12E | 420924 |
| HC 548 | NE 1/4 Section 8 | 1S | 12E | 420925 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 549 | NE 1/4 Section 8 | 1S | 12E | 420926 |
| HC 55 | NE 1/4 Sec 17 | T1S | 12E | 419637 |
| HC 550 | NW 1/4 Section 8 | 1S | 12E | 420927 |
| HC 551 | NW 1/4 Section 8 | 1S | 12E | 420928 |
| HC 552 | NW 1/4 Section 8 | 1S | 12E | 420929 |
| HC 553 | NW 1/4 Section 8 | 1S | 12E | 420930 |
| HC 554 | NE 1/4 Section 7 | 1S | 12E | 420931 |
| HC 555 | NE 1/4 Section 7 | 1S | 12E | 420932 |
| HC 556 | NE 1/4 Section 7 | 1S | 12E | 420933 |
| HC 557 | NW 1/4 Section 7 | 1S | 12E | 420934 |
| HC 558 | Section 7 | 1S | 12E | 420935 |
| HC 559 | Section 7 | 1S | 12E | 420936 |
| HC 56 | NE 1/4 Sec 17 | T1S | 12E | 419638 |
| HC 560 | Section 7 | 1S | 12E | 420937 |
| HC 561 | Section 7 | 1S | 12E | 420938 |
| HC 562 | Section 12 | 1S | 12E | 420939 |
| HC563 | Section 12 | 1S | 12E | 420940 |
| HC 564 | Section 7 | 1S | 12E | 420941 |
| HC 565 | Section 7 | 1S | 12E | 420942 |
| HC 566 | Section 7 | 1S | 12E | 420943 |
| HC 567 | Section 7 | 1S | 12E | 420944 |
| HC 568 | Section 7 | 1S | 12E | 420945 |
| HC 569 | Section 7 | 1S | 12E | 420946 |
| HC 57 | NE 1/4 Sec 17 | T1S | 12E | 419639 |
| HC 570 | Section 7 | 1S | 12E | 420947 |
| HC 571 | Section 7 | 1S | 12E | 420948 |
| HC 572 | Section 7 | 1S | 12E | 420949 |
| HC 573 | Section 8 | 1S | 12E | 420950 |
| HC 574 | Section 8 | 1S | 12E | 420951 |
| HC 575 | Section 8 | 1S | 12E | 420952 |
| HC 576 | Section 8 | 1S | 12E | 420953 |
| HC 577 | Section 8 | 1S | 12E | 420954 |
| HC 578 | Section 8 | 1S | 12E | 420955 |
| HC 579 | Section 8 | 1S | 12E | 420956 |
| HC 58 | NE 1/4 Sec 17 | T1S | 12E | 419640 |
| HC 580 | Section 8 | 1S | 12E | 420957 |
| HC 581 | Section 8 | 1S | 12E | 420958 |
| HC 582 | Section 8 | 1S | 12E | 420959 |
| HC 583 | Section 8 | 1S | 12E | 420960 |
| HC 584 | Section 8 | 1S | 12E | 420961 |
| HC 585 | Section 8 | 1S | 12E | 420962 |
| HC 586 | Section 8 | 1S | 12E | 420963 |
| HC 587 | Section 8 | 1S | 12E | 420964 |
| HC 588 | Section 8 | 1S | 12E | 420965 |
| HC 589 | Section 7 | 1S | 12E | 420966 |
| HC 59 | SW 1/4 Sec 17 | T1S | 12E | 419641 |
| HC 590 | Section 7 | 1S | 12E | 420967 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 591 | Section 7 | 1S | 12E | 420968 |
| HC 592 | Section 7 | 1S | 12E | 420969 |
| HC 593 | Section 7 | 1S | 12E | 420970 |
| HC 594 | Section 7 | 1S | 12E | 420971 |
| HC 595 | Section 7 | 1S | 12E | 420972 |
| HC 596 | Section 7 | 1S | 12E | 420973 |
| HC 597 | Section 7 | 1S | 12E | 420974 |
| HC 598 | Section 12 | 1S | 12E | 420975 |
| HC 6 | NW 1/4 SEC 18 | T1S | 12E | 419588 |
| HC 60 | NW 1/4 Sec 17 | T1S | 12E | 419642 |
| HC 61 | NW 1/4 Sec 17 | T1S | 12E | 419643 |
| HC 62 | NW 1/4 Sec 17 | T1S | 12E | 419644 |
| HC 63 | NW 1/4 Sec 17 | T1S | 12E | 419645 |
| HC 64 | SW 1/4 Sec 17 | T1S | 12E | 419646 |
| HC 65 | NE 1/4 Sec 18 | T1S | 12E | 419647 |
| HC 66 | NE 1/4 Sec 18 | T1S | 12E | 419648 |
| HC 67 | NE 1/4 Sec 18 | T1S | 12E | 419649 |
| HC 68 | SW 1/4 Sec 18 | T1S | 12E | 419650 |
| HC 69 | NW 1/4 Sec 18 | T1S | 12E | 419651 |
| HC 7 | NW 1/4 SEC 18 | T1S | 12E | 419589 |
| HC 70 | NW 1/4 Sec 18 | T1S | 12E | 419652 |
| HC 71 | NW 1/4 Sec 18 | T1S | 12E | 419653 |
| HC 72 | NW 1/4 Sec 18 | T1S | 12E | 419654 |
| HC 73 | NE 1/4 SEC 13 | T1S | 11E | 419655 |
| HC 74 | NE 1/4 SEC 13 | T1S | 11E | 419656 |
| HC 75 | NE 1/4 SEC 13 | T1S | 11E | 419657 |
| HC 76 | NE 1/4 SEC 13 | T1S | 11E | 419658 |
| HC 77 | SW 1/4 SEC 13 | T1S | 11E | 419659 |
| HC 78 | NW 1/4 SEC 13 | T1S | 11E | 419660 |
| HC 79 | NW 1/4 SEC 13 | T1S | 11E | 419661 |
| HC 8 | NW 1/4 SEC18 | T1S | 12E | 419590 |
| HC 80 | NW 1/4 SEC 13 | T1S | 11E | 419662 |
| HC 81 | NW 1/4 SEC 13 | T1S | 11E | 419663 |
| HC 82 | NE 1/4 SEC 14 | T1S | 11E | 419664 |
| HC 83 | NE 1/4 SEC 14 | T1S | 11E | 419665 |
| HC 84 | NE 1/4 SEC 14 | T1S | 11E | 419666 |
| HC 85 | NE 1/4 SEC 14 | T1S | 11E | 419667 |
| HC 86 | NW 1/4 SEC 14 | T1S | 11E | 419668 |
| HC 87 | NW 1/4 SEC 14 | T1S | 11E | 419669 |
| HC 88 | NW 1/4 SEC 14 | T1S | 11E | 419670 |
| HC 89 | NW 1/4 SEC 14 | T1S | 11E | 419671 |
| HC 9 | NW 1/4 SEC 13 | T1S | 11E | 419591 |
| HC 90 | NW 1/4 SEC 14 | T1S | 11E | 419672 |
| HC 91 | NE 1/4 SEC 15 | T1S | 11E | 419673 |
| HC 92 | NE 1/4 SEC 15 | T1S | 11E | 419674 |
| HC 93 | NE 1/4 SEC 15 | T1S | 11E | 419675 |
| HC 94 | NE 1/4 SEC 15 | T1S | 11E | 419676 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| HC 95 | SE 1/4 SEC 15 | T1S | 11E | 419677 |
| HC 96 | NW 1/4 Sec 15 | T1S | 11E | 419678 |
| HC 97 | NW 1/4 Sec 15 | T1S | 11E | 419679 |
| HC 98 | SW 1/4 Sec 15 | T1S | 11E | 419680 |
| HC 99 | SW 1/4 Sec 15 | T1S | 11E | 419681 |
| Horn Silver No. 1 Amended | NE1/42 | 2S | 12E | 60209 |
| Horn Silver Amended | NE1/42 | 2S | 12E | 60208 |
| Illinois amended | NE1/411 | 2S | 12E | 60389 |
| Indiana | NE1/411 | 2S | 12E | 60390 |
| Iowa | NE1/411 | 2S | 12E | 60391 |
| Jane | NE1/42 | 2S | 12E | 60210 |
| Johnnie (Little) amended | NW1/42,NE1/4 3 | 2S | 12E | 60211 |
| Katie amended | NW1/42,NE1/4 3 | 2S | 12E | 60212 |
| Kay 1 | SW 1/4 SE 1/4 Section 21 | 1S | 13E | 312984 |
| Kay 10 | NW 1/4 Section 22 | 1S | 13E | 312993 |
| Kay 11 | NE 1/4 SE 1/4 Section 21 | 1S | 13E | 312994 |
| Kay 12 | NW 1/4 SW 1/4 Section 22 | 1S | 13E | 312995 |
| Kay 129 | NE 1/4 Section 20 | 1S | 13E | 313017 |
| Kay 13 | SE 1/4 Section 34 | 1S | 13E | 312996 |
| Kay 130 | NE 1/4 Section 20 | 1S | 13E | 313018 |
| Kay 131 | NE 1/4 Section 20 | 1S | 13E | 313019 |
| Kay 132 | NE 1/4 Section 20 | 1S | 13E | 313020 |
| Kay 133 | NE 1/4 Section 20 | 1S | 13E | 313021 |
| Kay 134 | NE 1/4 Section 20 | 1S | 13E | 313022 |
| Kay 135 | NE 1/4 SE 1/4 Section 20 | 1S | 13E | 313023 |
| Kay 136 | NE 1/4 SE 1/4 Section 20 | 1S | 13E | 313024 |
| Kay 137 | SE 1/4 Section 20 | 1S | 13E | 313025 |
| Kay 138 | SE 1/4 Section 20 | 1S | 13E | 313026 |
| Kay 14 | SW 1/4 Section 22 | 1S | 13E | 312997 |
| Kay 140A | SE 1/4 Section 20 | 1S | 13E | 357098 |
| Kay 141 | SE 1/4 Section 20 | 1S | 13E | 313027 |
| Kay 142 | SE 1/4 Section 20 | 1S | 13E | 313028 |
| Kay 143 | SE 1/4 Section 20 | 1S | 13E | 313029 |
| Kay 145 | SE 1/4 Section 20 | 1S | 13E | 313030 |
| Kay 146 | SE 1/4 Section 20 | 1S | 13E | 313031 |
| Kay 147 | SE 1/4 Section 20 | 1S | 13E | 313032 |
| Kay 148 | SE 1/4 Section 20 | 1S | 13E | 313033 |
| Kay 149 | SE 1/4 Section 20 | 1S | 13E | 313034 |
| Kay 150 | SE 1/4 Section 20 | 1S | 13E | 313035 |
| Kay 151 | NE 1/4 Section 29 | 1S | 13E | 315168 |
| Kay 152 | NW 1/4 Section 28 | 1S | 13E | 47117 |
| Kay 15A | SE 1/4 Section 34 | 1S | 13E | 357097 |
| Kay 2 | SW 1/4 SE 1/4 Section 21 | 1S | 13E | 312985 |
| Kay 3 | SW 1/4 SE 1/4 Section 21 | 1S | 13E | 312986 |
| Kay 5 | NE 1/4 Section 34 | 1S | 13E | 312988 |
| Kay 6 | NW 1/4 Section 22 | 1S | 13E | 312989 |
| Kay 7 | NE 1/4 Section 34 | 1S | 13E | 312990 |

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Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Kay 8 | NW 1/4 Section 22 | 1S | 13E | 312991 |
| Kay 81 | NE 1/4 NW 1/4 Section 21 | 1S | 13E | 313009 |
| Kay 82 | NW 1/4 Section 21 | 1S | 13E | 313010 |
| Kay 83 | NE 1/4 NW 1/4 Section 21 | 1S | 13E | 313011 |
| Kay 84 | NW 1/4 Section 21 | 1S | 13E | 313012 |
| Kay 85 | NE 1/4 NW 1/4 Section 21 | 1S | 13E | 313013 |
| Kay 86 | NW 1/4 Section 21 | 1S | 13E | 313014 |
| Kay 87 | NE 1/4 NW1/4 SW 1/4 SE 1/4 Sect 21 | 1S | 13E | 313015 |
| Kay 88 | NW 1/4 SW 1/4 Section 21 | 1S | 13E | 313016 |
| Kay 9 | NE 1/4 Section 34 | 1S | 13E | 312992 |
| Lead Hill | NE1/4SE1/411 | 2S | 12E | 60392 |
| Legal Tender 1 amended | North West 1/4 Section 1 | 2S | 12E | 356884 |
| Legal Tender 10 amended | South East 1/4 Section 1 | 2S | 12E | 356893 |
| Legal Tender 11 amended | North East 1/4 Section 1 | 2S | 12E | 356894 |
| Legal Tender 12 amended | North East 1/4 Section 1 | 2S | 12E | 356895 |
| Legal Tender 13 amended | South West 1/4 Section 6 | 2S | 13E | 356865 |
| Legal Tender 14amended | South West 1/4 Section 6 | 2S | 13E | 356866 |
| Legal Tender 15 amended | South West 1/4 Section 6 | 2S | 13E | 356867 |
| Legal Tender 16 amended | South East 1/4 Section 6 | 2S | 13E | 356896 |
| Legal Tender 17 amended | North West 1/4 Section 6 | 2S | 13E | 356868 |
| Legal Tender 18 amended | North West 1/4 Section 6 | 2S | 13E | 356869 |
| Legal Tender 19 amended | South West 1/4 Section 32 | 1S | 13E | 356897 |
| Legal Tender 2 amended | North West 1/4 Section 1 | 2S | 12E | 356885 |
| Legal Tender 20 amended | South East 1/4 Section 32 | 1S | 13E | 356870 |
| Legal Tender 21 amended | South East 1/4 Section 33 | 1S | 13E | 356871 |
| Legal Tender 22 amended | South East 1/4 Section 32 | 1S | 13E | 356872 |
| Legal Tender 23 | North West 1/4 Section 32 | 1S | 13E | 356933 |
| Legal Tender 3 amended | South West 1/4 Section 1 | 2S | 12E | 356886 |
| Legal Tender 4 amended | South West 1/4 Section 1 | 2S | 12E | 356887 |
| Legal Tender 5 amended | North West 1/4 Section 1 | 2S | 12E | 356888 |
| Legal Tender 6 amended | North West 1/4 Section 1 | 2S | 12E | 356889 |
| Legal Tender 7 amended | North West 1/4 Section 1 | 2S | 12E | 356890 |
| Legal Tender 8 amended | North West 1/4 Section 1 | 2S | 12E | 356891 |
| Legal Tender 9 amended | South East 1/4 Section 1 | 2S | 12E | 356892 |
| Libbie amended No.2 | SW1/4 2 | 2S | 12E | 60214 |
| Libbie No. 2 amended | SW1/4 2 | 2S | 12E | 60216 |
| Libbie No.1 amended | SW1/4 2 | 2S | 12E | 60215 |
| Maggie | NW1/4 2 | 2S | 12E | 60218 |
| MARGRET 162 West | NW 1/4 Section 22 | 1S | 13E | 45854 |
| MARGRET 164 West | SW 1/4 Section 22 | 1S | 13E | 45857 |
| MARGRET 166 West | NW 1/4 Section 22 | 1S | 13E | 45860 |
| MARGRET 234 | SW 1/4 Section 22 | 1S | 13E | 45917 |
| MARGRET 234 West | SW 1/4 Section 22 | 1S | 13E | 45918 |
| MARGRET 236 Amended | SW 1/4 Section 22 | 1S | 13E | 45920 |
| MARGRET 238 | SW 1/4 Section 22 | 1S | 13E | 45922 |
| MARGRET 240 | NW 1/4 Section 27 | 1S | 13E | 45924 |
| MARGRET 242 Amended | NW 1/4 Section 27 | 1S | 13E | 45926 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| MARGRET 244 Amended | NW 1/4 Section 27 | 1S | 13E | 45928 |
| MARGRET 246 | NW 1/4 Section 27 | 1S | 13E | 45930 |
| MARGRET 262 | SW 1/4 Section 27 | 1S | 13E | 45946 |
| MARGRET 264 | SW 1/4 Section 27 | 1S | 13E | 45948 |
| MARGRET 270 | SW 1/4 Section 27 | 1S | 13E | 45954 |
| MARGRET 272 | SW 1/4 Section 27 | 1S | 13E | 45956 |
| MARGRET 321 | SW 1/4 Section 27 | 1S | 13E | 46001 |
| MARGRET 322 | NW 1/4 Section 34 | 1S | 13E | 46002 |
| MARGRET 323 | NW 1/4 Section 34 | 1S | 13E | 46003 |
| MARGRET 324 | NW 1/4 Section 34 | 1S | 13E | 46004 |
| MARGRET 325 | SW 1/4 Section 22 | 1S | 13E | 46005 |
| MARGRET 327 | SW 1/4 Section 22 | 1S | 13E | 46007 |
| MARGRET 328 | SE 1/4 Section 34 | 1S | 13E | 46008 |
| MARGRET 331 Amended | SW 1/4 Section 22 | 1S | 13E | 46011 |
| MARGRET 332 Amended | NE 1/4 Section 28 | 1S | 13E | 46012 |
| MARGRET 333 | NW 1/4 Section 27 | 1S | 13E | 46013 |
| MARGRET 334 | NE 1/4 Section 28 | 1S | 13E | 46014 |
| MARGRET 335 Amended | NE 1/4 Section 28 | 1S | 13E | 46015 |
| MARGRET 336 | NE 1/4 NW 1/4 Section 28 | 1S | 13E | 46016 |
| Michigan amended | SW1/4 2 | 2S | 12E | 60219 |
| Monarch # 1 | SE1/4SW1/4 36 | 1S | 12E | 60131 |
| Nadene Amended | SE1/4 36 | 1S | 12E | 60132 |
| Nadene No. 1 amended | SE1/4 36 | 1S | 12E | 60133 |
| New York amended No.2 | SE1/4 2 | 2S | 12E | 60220 |
| Oak No. 18 | SW1/4 32 | 1S | 13E | 60141 |
| Oak No. 19 | SW1/4 32 | 1S | 13E | 60142 |
| Oak No. 20 amended | SW1/4, 32 | 1S | 13E | 60143 |
| Oak No. 21 | SW1/4 32,SE1/4SW1/4 31 | 1S | 13E | 60144 |
| Oak No. 22 | SW1/432,SE1/4SW1/431 | 1S | 13E | 60145 |
| Oak No. 23 | SW1/432,SE1/4SW1/431 | 1S | 13E | 60146 |
| Oak No. 24 | SW1/431 | 1S | 12E | 60147 |
| Oak No. 25 | SE1/436 | 1S | 12E | 60148 |
| Oak No. 26 | SE1/436 | 1S | 12E | 60149 |
| Oak No. 27 | SE1/436 | 1S | 12E | 60150 |
| Oak No. 33 | NE1/429 | 1S | 13E | 60160 |
| Oak No. 34 | NE1/429 | 1S | 13E | 60161 |
| Oak No. 35 | NE1/429,NW1/428 | 1S | 13E | 60162 |
| Oak No. 36 | NW1/428 | 1S | 13E | 60163 |
| Oak No. 37 | NW1/428 | 1S | 13E | 60164 |
| Oak No. 38 amended | NW1/4SW1/428 | 1S | 13E | 60165 |
| Oak No. 39 amended | NW1/4SW1/428 | 1S | 13E | 60166 |
| Oak No. 40 | SW1/4 Section 28 | 1S | 13E | 405556 |
| Oak No. 41 amended | NE1/4SE1/429 | 1S | 13E | 60168 |
| Oak No. 42 Amended | NE1/4SE1/429 | 1S | 13E | 60169 |
| Oak No. 43 | SE1/429NE1/432 | 1S | 13E | 60170 |
| Oak No. 44 | NE1/432 | 1S | 13E | 60171 |
| Oak No. 45 | NW1/4 29 | 1S | 13E | 60452 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Oak No. 9 | NW1/4SE1/4SW1/4 31,SW1/4NW1/4 32 | 1S | 13E | 60136 |
| Olga 1 | NW 1/4 Section 28 | 1S | 13E | 362903 |
| Olga 11 | NW 1/4 Section 34 | 1S | 13E | 365450 |
| Olga 12 | NW 1/4 Section 34 | 1S | 13E | 365451 |
| Olga 13 | NE 1/4 Section 34 | 1S | 13E | 365452 |
| Olga 14 | NE 1/4 Section 34 | 1S | 13E | 365453 |
| Olga 2 | NW 1/4 Section 28 | 1S | 13E | 362904 |
| Olga 3 | NE 1/4 Section 29 | 1S | 13E | 362905 |
| Olga 4 | NE 1/4 Section 29 | 1S | 13E | 362906 |
| Olga 5 | SW 1/4 Section 27 | 1S | 13E | 362907 |
| Olga 6 | SW 1/4 Section 27 | 1S | 13E | 362908 |
| Palace No. 1 amended | NW1/4SW1/425 | 1S | 12E | 60172 |
| Pine No. 1 | NW1/4SW1/436 | 1S | 12E | 60151 |
| Pine No. 2 | NW1/4NE1/4SE1/4SW1/436 | 1S | 12E | 60152 |
| Pine No. 3 | NE1/4SE1/436 | 1S | 12E | 60153 |
| Pine No. 4 | NE1/4SE1/436 | 1S | 12E | 60154 |
| Pine No. 5 | NE1/4SE1/436 | 1S | 12E | 60155 |
| Pine No. 7 | NE1/4SE1/436 | 1S | 12E | 60157 |
| Pine No. 8 | NE1/436 | 1S | 12E | 60158 |
| Pine No. 9 | NE1/436 | 1S | 12E | 60159 |
| Red Brick 1 (Placer) | NW1/4 4 | 2S | 12E | 60069 |
| Resolution No. 18 | NE1/4 SW1/4 SW1/4 SW1/4 34 | 1S | 13E | 355473 |
| Resolution No. 2 | SW1/4 NW1/4 NW1/4 SW1/4 34 | 1S | 13E | 355457 |
| Resolution No. 21 | S½SE1/4 SW1/4 34 | 1S | 13E | 355476 |
| Resolution No. 22 | S½SW1/4 SW1/4 34 | 1S | 13E | 355477 |
| Resolution No.1 | SW1/4 Nw1/4 NW1/4 SW1/4 34 | 1S | 13E | 355456 |
| Resolution No.17 | NE1/4 SW1/4 SW1/4 SW1/4 34 | 1S | 13E | 355472 |
| Richard 1 | NW 1/4 Section 34 | 1S | 12E | 384892 |
| Richard 10 | SW 1/4 Section 34 | 1S | 12E | 384901 |
| Richard 2 | NW 1/4 Section 34 | 1S | 12E | 384893 |
| Richard 3 | NW 1/4 Section 34 | 1S | 12E | 384894 |
| Richard 4 | NW 1/4 Section 34 | 1S | 12E | 384895 |
| Richard 5 | NW 1/4 Section 34 | 1S | 12E | 384896 |
| Richard 6 | SW 1/4 Section 34 | 1S | 12E | 384897 |
| Richard 7 | SW 1/4 Section 34 | 1S | 12E | 384898 |
| Richard 8 | SW 1/4 Section 34 | 1S | 12E | 384899 |
| Richard 9 | SW 1/4 Section 34 | 1S | 12E | 384900 |
| Roadside No. 1 | SE 1/4 Section 29 | 1S | 13E | 405551 |
| Roadside No. 2 | SE 1/4 Section 29 | 1S | 13E | 405552 |
| Roadside No. 3 | SE 1/4 Section 29 | 1S | 13E | 405553 |
| Roadside No. 4 | SW1/4 Section 28 | 1S | 13E | 405554 |
| Roadside No. 5 | SW1/4 Section 28 | 1S | 13E | 405555 |
| Rube amended | SW1/4 2 | 2S | 12E | 60221 |
| Ruby amended No.2 | NW1/4SW1/4 2 | 2S | 12E | 60222 |
| Russ No. 10 | NW1/4 25 | 1S | 12E | 60110 |
| Russ No. 11 | NW1/4 25 | 1S | 12E | 60111 |
| Russ No. 12 | NW1/4NE1/4 25 | 1S | 12E | 60112 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Russ No. 13 | NE1/4 26,SE1/4 23 | 1S | 12E | 60113 |
| Russ No. 14 | NE1/4 26,SE1/4 23 | 1S | 12E | 60114 |
| Russ No. 15 | NW1/425,NE1/426,SE1/423,SW1/424 | 1S | 12E | 60115 |
| Russ No. 16 | NW1/4 25,SW1/4 24 | 1S | 12E | 60116 |
| Russ No. 17A | NW1/4 25,SW1/4 24 | 1S | 12E | 60117 |
| Russ No. 18A | NW1/4 25,SW1/4 24 | 1S | 12E | 60118 |
| Russ No. 19A | NW1/4 25,SW1/4 24 | 1S | 12E | 60119 |
| Russ No. 20A | SE1/4SW1/4 24,NW1/4NE1/4 25 | 1S | 12E | 60120 |
| Russ No. 21 | SE1/4 24.NE1/4 25 | 1S | 12E | 60121 |
| Russ No. 22 | SE1/4 24,NE1/4 25 | 1S | 12E | 60122 |
| Russ No. 23 | SE1/4 24,NE1/4 25 | 1S | 12E | 60123 |
| Russ No. 24 | SE1/4 24,NE1/4 25 | 1S | 12E | 60124 |
| Russ No. 8 | NW1/4 25 | 1S | 12E | 60108 |
| Russ No. 9 | NW1/4 25 | 1S | 12E | 60109 |
| Sallie | NW1/42,NE1/4 3 | 2S | 12E | 60223 |
| San Juan | SE1/4SW1/42 | 2S | 12E | 60244 |
| SMASHLEY1 | NE 1/4 Section 1 | 2S | 11E | 424465 |
| SMASHLEY10 | NE 1/4 Section 2 | 2S | 11E | 424474 |
| SMASHLEY11 | NW 1/4 Section 2 | 2S | 11E | 424475 |
| SMASHLEY12 | NW 1/4 Section 2 | 2S | 11E | 424476 |
| SMASHLEY13 | NE 1/4 Section 3 | 2S | 11E | 424477 |
| SMASHLEY14 | SE 1/4 Section 3 | 2S | 11E | 424478 |
| SMASHLEY15 | SW 1/4 Section 2 | 2S | 11E | 424479 |
| SMASHLEY16 | SW 1/4 Section 2 | 2S | 11E | 424480 |
| SMASHLEY17 | SE 1/4 Section 2 | 2S | 11E | 424481 |
| SMASHLEY18 | SE 1/4 Section 2 | 2S | 11E | 424482 |
| SMASHLEY19 | SW 1/4 Section 2 | 2S | 11E | 424483 |
| SMASHLEY2 | NW 1/4 Section 1 | 2S | 11E | 424466 |
| SMASHLEY20 | SW 1/4 Section 2 | 2S | 11E | 424484 |
| SMASHLEY21 | SE 1/4 Section 2 | 2S | 11E | 424485 |
| SMASHLEY22 | SE 1/4 Section 2 | 2S | 11E | 424486 |
| SMASHLEY23 | SW 1/4 Section 1 | 2S | 11E | 424487 |
| SMASHLEY24 | SW 1/4 Section 1 | 2S | 11E | 424488 |
| SMASHLEY25 | SW 1/4 Section 1 | 2S | 11E | 424489 |
| SMASHLEY26 | SE 1/4 Section 1 | 2S | 11E | 424490 |
| SMASHLEY27 | SE 1/4 Section 1 | 2S | 11E | 424491 |
| SMASHLEY28 | SW 1/4 Section 1 | 2S | 11E | 424492 |
| SMASHLEY29 | SW 1/4 Section 1 | 2S | 11E | 424493 |
| SMASHLEY3 | NW 1/4 Section 1 | 2S | 11E | 424467 |
| SMASHLEY30 | SE 1/4 Section 1 | 2S | 11E | 424494 |
| SMASHLEY31 | SE 1/4 Section 1 | 2S | 11E | 424495 |
| SMASHLEY32 | SW 1/4 Section 6 | 2S | 12E | 424496 |
| SMASHLEY33 | SW 1/4 Section 6 | 2S | 12E | 424497 |
| SMASHLEY34 | SE 1/4 Section 6 | 2S | 12E | 424498 |
| SMASHLEY35 | SE 1/4 Section 6 | 2S | 12E | 424499 |
| SMASHLEY36 | SE 1/4 Section 6 | 2S | 12E | 424500 |
| SMASHLEY37 | NW 1/4 Section 6 | 2S | 12E | 424501 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| SMASHLEY38 | NW 1/4 Section 6 | 2S | 12E | 424502 |
| SMASHLEY39 | NE 1/4 Section 6 | 2S | 12E | 424503 |
| SMASHLEY4 | NW 1/4 Section 1 | 2S | 11E | 424468 |
| SMASHLEY40 | NE 1/4 Section 6 | 2S | 12E | 424504 |
| SMASHLEY41 | NW 1/4 Section 5 | 2S | 12E | 424505 |
| SMASHLEY42 | NW 1/4 Section 5 | 2S | 12E | 424506 |
| SMASHLEY43 | NE 1/4 Section 5 | 2S | 12E | 424507 |
| SMASHLEY44 | NE 1/4 Section 5 | 2S | 12E | 424508 |
| SMASHLEY45 | NW 1/4 Section 6 | 2S | 12E | 424509 |
| SMASHLEY46 | NW 1/4 Section 6 | 2S | 12E | 424510 |
| SMASHLEY47 | NW 1/4 Section 6 | 2S | 12E | 424511 |
| SMASHLEY48 | NE 1/4 Section 6 | 2S | 12E | 424512 |
| SMASHLEY49 | NE 1/4 Section 6 | 2S | 12E | 424513 |
| SMASHLEY5 | NE 1/4 Section 2 | 2S | 11E | 424469 |
| SMASHLEY50 | NE 1/4 Section 1 | 2S | 11E | 424514 |
| SMASHLEY51 | NE 1/4 Section 1 | 2S | 11E | 424515 |
| SMASHLEY52 | NW 1/4 Section 1 | 2S | 11E | 424516 |
| SMASHLEY53 | NW 1/4 Section 1 | 2S | 11E | 424517 |
| SMASHLEY54 | NE 1/4 Section 1 | 2S | 11E | 424518 |
| SMASHLEY55 | NE 1/4 Section 1 | 2S | 11E | 424519 |
| SMASHLEY56 | NW 1/4 Section 1 | 2S | 11E | 424520 |
| SMASHLEY57 | NW 1/4 Section 1 | 2S | 11E | 424521 |
| SMASHLEY58 | NW 1/4 Section 1 | 2S | 11E | 424522 |
| SMASHLEY59 | NE 1/4 Section 2 | 2S | 11E | 424523 |
| SMASHLEY60 | NE 1/4 Section 2 | 2S | 11E | 424524 |
| SMASHLEY61 | NW 1/4 Section 2 | 2S | 11E | 424525 |
| SMASHLEY62 | NW 1/4 Section 2 | 2S | 11E | 424526 |
| SMASHLEY63 | NE 1/4 Section 2 | 2S | 11E | 424527 |
| SMASHLEY64 | NE 1/4 Section 2 | 2S | 11E | 424528 |
| SMASHLEY65 | NW 1/4 Section 2 | 2S | 11E | 424529 |
| SMASHLEY66 | NW 1/4 Section 2 | 2S | 11E | 424530 |
| SMASHLEY67 | NE 1/4 Section 3 | 2S | 11E | 424531 |
| SMASHLEY68 | SE 1/4 Section 3 | 2S | 11E | 424532 |
| SMASHLEY69 | SW 1/4 Section 2 | 2S | 11E | 424533 |
| SMASHLEY7 | NW 1/4 Section 2 | 2S | 11E | 424471 |
| SMASHLEY70 | SW 1/4 Section 2 | 2S | 11E | 424534 |
| SMASHLEY71 | SE 1/4 Section 2 | 2S | 11E | 424535 |
| SMASHLEY72 | SE 1/4 Section 2 | 2S | 11E | 424536 |
| SMASHLEY73 | SW 1/4 Section 2 | 2S | 11E | 424537 |
| SMASHLEY74 | SW 1/4 Section 2 | 2S | 11E | 424538 |
| SMASHLEY75 | SE 1/4 Section 2 | 2S | 11E | 424539 |
| SMASHLEY76 | SE 1/4 Section 2 | 2S | 11E | 424540 |
| SMASHLEY77 | SE 1/4 Section 2 | 2S | 11E | 424541 |
| SMASHLEY78 | NE 1/4 Section 35 | 1S | 11E | 424542 |
| SMASHLEY79 | NE 1/4 Section 35 | 1S | 11E | 424543 |
| SMASHLEY8 | NW 1/4 Section 2 | 2S | 11E | 424472 |
| SMASHLEY80 | SW 1/4 Section 35 | 1S | 11E | 424544 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| SMASHLEY81 | SW 1/4 Section 35 | 1S | 11E | 424545 |
| SMASHLEY82 | SW 1/4 Section 35 | 1S | 11E | 424546 |
| SMASHLEY83 | SE 1/4 Section 36 | 1S | 11E | 424547 |
| SMASHLEY84 | SE 1/4 Section 36 | 1S | 11E | 424548 |
| SMASHLEY85 | SE 1/4 Section 36 | 1S | 11E | 424549 |
| SMASHLEY86 | SE 1/4 Section 36 | 1S | 11E | 424550 |
| SMASHLEY87 | SW 1/4 Section 36 | 1S | 11E | 424551 |
| SMASHLEY88 | SW 1/4 Section 36 | 1S | 11E | 424552 |
| SMASHLEY89 | SE 1/4 Section 35 | 1S | 11E | 424553 |
| SMASHLEY9 | NE 1/4 Section 2 | 2S | 11E | 424473 |
| SMASHLEY90 | NW 1/4 Section 2 | 2S | 11E | 424554 |
| SMASHLEY91 | NW 1/4 Section 2 | 2S | 11E | 424555 |
| South Syndicate No. 1 | SE1/41 | 2S | 12E | 60245 |
| South Syndicate No. 10 | NW1/4 SW1/4 7 | 2S | 13E | 60398 |
| South Syndicate No. 11 | NW1/4 NE1/4 SE1/4 SW1/4 7 | 2S | 13E | 60399 |
| South Syndicate No. 12 | NW1/4 NE1/4 SE1/4 7 | 2S | 13E | 60400 |
| South Syndicate No. 2 | SE1/41 | 2S | 12E | 60246 |
| South Syndicate No. 3 | SE1/41 | 2S | 12E | 60247 |
| South Syndicate No. 4 | SE1/41 | 2S | 12E | 60248 |
| South Syndicate No. 5 | SW1/46 | 2S | 13E | 60249 |
| South Syndicate No. 6 | SE1/41,NE1/412 | 2S | 12E | 60394 |
| South Syndicate No. 7 | NW1/4 7 | 2S | 13E | 60395 |
| South Syndicate No. 8 | NW1/4 7 | 2S | 13E | 60396 |
| South Syndicate No. 9 | NW1/4 NE1/4 7,SW1/4 6 | 2S | 13E | 60397 |
| Sun No. 10 | SW1/4SE1/432 | 1S | 13E | 60258 |
| Sun No. 11 | SE1/432 | 1S | 13E | 60259 |
| Sun No. 12 | SW1/4SE1/432 | 1S | 13E | 60260 |
| Sun No. 13 | SE1/42 | 1S | 13E | 60261 |
| Sun No. 14 | NW1/46 | 2S | 13E | 60262 |
| Sun No. 15 | NW1/4NE1/46 | 2S | 13E | 60263 |
| Sun No. 16 | NW1/46 | 2S | 13E | 60264 |
| Sun No. 17 | NW1/4NE1/46 | 2S | 13E | 60265 |
| Sun No. 18 | NW1/46 | 2S | 13E | 60266 |
| Sun No. 19 | NW1/4NE1/46 | 2S | 13E | 60267 |
| Sun No. 2 | NW1/4NE1/432 | 1S | 13E | 60250 |
| Sun No. 20 | NW1/46 | 2S | 13E | 60268 |
| Sun No. 21 | NW1/4NE1/46 | 2S | 13E | 60269 |
| Sun No. 22 | NW1/4SW1/46 | 2S | 13E | 60270 |
| Sun No. 23 | NW1/4NE1/4SE1/4SW11/46 | 2S | 13E | 60271 |
| Sun No. 24 | SW1/46 | 2S | 13E | 60272 |
| Sun No. 25 | SW1/4SE1/46 | 2S | 13E | 60273 |
| Sun No. 26 | SW1/46 | 2S | 13E | 60274 |
| Sun No. 27 | SW1/4SE1/46 | 2S | 13E | 60275 |
| Sun No. 28 | SW1/4SE1/46 | 2S | 13E | 60276 |
| Sun No. 29 | SE1/46 | 2S | 13E | 60277 |
| Sun No. 3 | NE1/432 | 1S | 13E | 60251 |
| Sun No. 30 | SE1/46 | 2S | 13E | 60278 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Sun No. 31 | SE1/46 | 2S | 13E | 60279 |
| Sun No. 32 | SE1/4NE1/46 | 2S | 13E | 60280 |
| Sun No. 33 | NE1/46 | 2S | 13E | 60281 |
| Sun No. 34 | NE1/46 | 2S | 13E | 60282 |
| Sun No. 35 | NE1/46 | 2S | 13E | 60283 |
| Sun No. 36 | NE1/46 | 2S | 13E | 60284 |
| Sun No. 37 | SE1/432.SW1/433 | 1S | 13E | 60285 |
| Sun No. 38 | SE1/42.SW1/433 | 1S | 13E | 60286 |
| Sun No. 4 | NW1/4NE1/4SW1/4SE1/432 | 1S | 13E | 60252 |
| Sun No. 40 | SW1/4SE1/433 | 1S | 13E | 60288 |
| Sun No. 41 | SW1/4SE1/433 | 1S | 13E | 60289 |
| Sun No. 42A | SW1/4SE1/433 | 1S | 13E | 60314 |
| Sun No. 44 | SE1/433 | 1S | 13E | 60290 |
| Sun No. 45 | SE1/433 | 1S | 13E | 60291 |
| Sun No. 46 A | SE1/433 | 1S | 13E | 60315 |
| Sun No. 48 | SE1/433,SW1/434 | 1S | 13E | 60292 |
| Sun No. 49 | SE1/433,SW1/434 | 1S | 13E | 60293 |
| Sun No. 5 | NE1/42 | 1S | 13E | 60253 |
| Sun No. 50A | SE1/433,SW1/434 | 1S | 13E | 60316 |
| Sun No. 52 | NW1/428 | 1S | 13E | 60294 |
| Sun No. 53 | NW1/428 | 1S | 13E | 60295 |
| Sun No. 54 | NW/4NE1/428 | 1S | 13E | 60296 |
| Sun No. 55 | NE1/428 | 1S | 13E | 60297 |
| Sun No. 56 | NE1/428 | 1S | 13E | 60298 |
| Sun No. 57 | NE1/428 | 1S | 13E | 60299 |
| Sun No. 58 | NE1/428,NW1/427 | 1S | 13E | 60300 |
| Sun No. 59 | NW1/427 | 1S | 13E | 60301 |
| Sun No. 6 | SW1/4SE1/432 | 1S | 13E | 60254 |
| Sun No. 60 | NW1/427 | 1S | 13E | 60302 |
| Sun No. 62 amended | SW1/4NW1/428 | 1S | 13E | 60304 |
| Sun No. 62A (new claim) | SW1/428 | 1S | 13E | 355534 |
| Sun No. 63 amended | SW1/4NW1/428 | 1S | 13E | 60305 |
| Sun No. 63A (new claim) | SW1/428 | 1S | 13E | 355535 |
| Sun No. 64 Amended | SE1/4SW1/4NW1/4NE1/428 | 1S | 13E | 60306 |
| Sun No. 64A (new claim) | SW&SE1/428 | 1S | 13E | 355536 |
| Sun No. 65 Amended | SE1/4NE1/428 | 1S | 13E | 60307 |
| Sun No. 66 Amended | SE1/4NE1/428 | 1S | 13E | 60308 |
| Sun No. 67 Amended | SE1/4NE1/428 | 1S | 13E | 60309 |
| Sun No. 68 | SE1/4NE1/428,SW1/4NW1/427 | 1S | 13E | 60310 |
| Sun No. 69 | SW1/4NW1/427 | 1S | 13E | 60311 |
| Sun No. 7 | SE1/432 | 1S | 13E | 60255 |
| Sun No. 70 | SW1/4NW1/427 | 1S | 13E | 60312 |
| Sun No. 8 | SW1/4SE1/432 | 1S | 13E | 60256 |
| Sun No. 9 | SE1/432 | 1S | 13E | 60257 |
| Superior 277 | SE 1/4 SEC 5 | T1S | 12E | 417145 |
| Superior 278 | SE 1/4 SEC 5 | T1S | 12E | 417146 |
| Superior 279 | SE 1/4 SEC 5 | T1S | 12E | 417147 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Superior 280 | SE 1/4 SEC 5 | T1S | 12E | 417148 |
| Superior 281 | SE 1/4 SEC 5 | T1S | 12E | 417149 |
| Superior 282 | SE 1/4 SEC 5 | T1S | 12E | 417150 |
| Superior 283 | SE 1/4 SEC 5 | T1S | 12E | 417151 |
| Superior 284 | SE 1/4 SEC 5 | T1S | 12E | 417152 |
| Superior 285 | NW 1/4 SEC 9 | T1S | 12E | 417153 |
| Superior 286 | NW 1/4 SEC 9 | T1S | 12E | 417154 |
| Superior 287 | NW 1/4 SEC 9 | T1S | 12E | 417155 |
| Superior 288 | NW 1/4 SEC 9 | T1S | 12E | 417156 |
| Superior 289 | NE 1/4 SEC 9 | T1S | 12E | 417157 |
| Superior 290 | NE 1/4 SEC 9 | T1S | 12E | 417158 |
| Superior 291 | NE 1/4 SEC 9 | T1S | 12E | 417159 |
| Superior 292 | NE 1/4 SEC 9 | T1S | 12E | 417160 |
| Superior 293 | NE 1/4 SEC 9 | T1S | 12E | 417161 |
| Superior 294 | NE 1/4 SEC 9 | T1S | 12E | 417162 |
| Superior 295 | NW 1/4 SEC 10 | T1S | 12E | 417163 |
| Superior 296 | NW 1/4 SEC 10 | T1S | 12E | 417164 |
| Superior 297 | NW 1/4 SEC 10 | T1S | 12E | 417165 |
| Superior 298 | NE 1/4 SEC 10 | T1S | 12E | 417166 |
| Superior 299 | NE 1/4 SEC 10 | T1S | 12E | 417167 |
| Superior 300 | NE 1/4 SEC 10 | T1S | 12E | 417168 |
| Superior 301 | NE 1/4 SEC 10 | T1S | 12E | 417169 |
| Superior 312 | NE 1/4 SEC 10 | T1S | 12E | 417170 |
| Superior 313 | NE 1/4 SEC 10 | T1S | 12E | 417171 |
| Superior 314 | NE 1/4 SEC 10 | T1S | 12E | 417172 |
| Superior 315 | NE 1/4 SEC 10 | T1S | 12E | 417173 |
| Superior 316 | NW 1/4 SEC 10 | T1S | 12E | 417174 |
| Superior 317 | NW 1/4 SEC 10 | T1S | 12E | 417175 |
| Superior 318 | NW 1/4 SEC 10 | T1S | 12E | 417176 |
| Superior 319 | NW 1/4 SEC 10 | T1S | 12E | 417177 |
| Superior 320 | NE 1/4 SEC 9 | T1S | 12E | 417178 |
| Superior 321 | NE 1/4 SEC 9 | T1S | 12E | 417179 |
| Superior 322 | NE 1/4 SEC 9 | T1S | 12E | 417180 |
| Superior 323 | NE 1/4 SEC 9 | T1S | 12E | 417181 |
| Superior 324 | NE 1/4 SEC 9 | T1S | 12E | 417182 |
| Superior 325 | NW 1/4 SEC 9 | T1S | 12E | 417183 |
| Superior 326 | NW 1/4 SEC 9 | T1S | 12E | 417184 |
| Superior 327 | NW 1/4 SEC 9 | T1S | 12E | 417185 |
| Superior 328 | NW 1/4 SEC 9 | T1S | 12E | 417186 |
| Superior 329 | SW 1/4 SEC 9 | T1S | 12E | 417187 |
| Superior 330 | SW 1/4 SEC 9 | T1S | 12E | 417188 |
| Superior 331 | SW 1/4 SEC 9 | T1S | 12E | 417189 |
| Superior 332 | SW 1/4 SEC 9 | T1S | 12E | 417190 |
| Superior 333 | SE 14 SEC 9 | T1S | 12E | 417191 |
| Superior 334 | SE 14 SEC 9 | T1S | 12E | 417192 |
| Superior 335 | SE 14 SEC 9 | T1S | 12E | 417193 |
| Superior 336 | SE 14 SEC 9 | T1S | 12E | 417194 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Superior 337 | SE 14 SEC 9 | T1S | 12E | 417195 |
| Superior 338 | SW 1/4 SEC 10 | T1S | 12E | 417196 |
| Superior 339 | SW 1/4 SEC 10 | T1S | 12E | 417197 |
| Superior 340 | SW 1/4 SEC 10 | T1S | 12E | 417198 |
| Superior 341 | SW 1/4 SEC 10 | T1S | 12E | 417199 |
| Superior 342 | NE 1/4 SEC 10 | T1S | 12E | 417200 |
| Superior 343 | SE 1/4 SEC 10 | T1S | 12E | 417201 |
| Superior 344 | SE 1/4 SEC 10 | T1S | 12E | 417202 |
| Superior 345 | SE 1/4 SEC 10 | T1S | 12E | 417203 |
| Superior 348 | NE 1/4 SEC 15 | T1S | 12E | 417204 |
| Superior 349 | NE 1/4 SEC 15 | T1S | 12E | 417205 |
| Superior 350 | NE 1/4 SEC 15 | T1S | 12E | 417206 |
| Superior 351 | NE 1/4 SEC 15 | T1S | 12E | 417207 |
| Superior 352 | NW 1/4 SEC 15 | T1S | 12E | 417208 |
| Superior 353 | NW 1/4 SEC 15 | T1S | 12E | 417209 |
| Superior 354 | NW 1/4 SEC 15 | T1S | 12E | 417210 |
| Superior 355 | NW 1/4 SEC 15 | T1S | 12E | 417211 |
| Superior 356 | NE 1/4 SEC 16 | T1S | 12E | 417212 |
| Superior 357 | NE 1/4 SEC 16 | T1S | 12E | 417213 |
| Superior 358 | NE 1/4 SEC 16 | T1S | 12E | 417214 |
| Superior 359 | NE 1/4 SEC 16 | T1S | 12E | 417215 |
| Superior 360 | NE 1/4 SEC 16 | T1S | 12E | 417216 |
| Superior 361 | NW 1/4 SEC 16 | T1S | 12E | 417217 |
| Superior 362 | NW 1/4 SEC 16 | T1S | 12E | 417218 |
| Superior 363 | NW 1/4 SEC 16 | T1S | 12E | 417219 |
| Superior 364 | NW 1/4 SEC 16 | T1S | 12E | 417220 |
| Superior 365 | NW 1/4 SEC 16 | T1S | 12E | 417221 |
| Superior 366 | NW 1/4 SEC 16 | T1S | 12E | 417222 |
| Superior 367 | NW 1/4 SEC 16 | T1S | 12E | 417223 |
| Superior 368 | NE 1/4 SEC 16 | T1S | 12E | 417224 |
| Superior 369 | NE 1/4 SEC 16 | T1S | 12E | 417225 |
| Superior 370 | NE 1/4 SEC 16 | T1S | 12E | 417226 |
| Superior 371 | NE 1/4 SEC 16 | T1S | 12E | 417227 |
| Superior 372 | NE 1/4 SEC 16 | T1S | 12E | 417228 |
| Superior 373 | NE 1/4 SEC 16 | T1S | 12E | 417229 |
| Superior 374 | NW 1/4 SEC 15 | T1S | 12E | 417230 |
| Superior 375 | NW 1/4 SEC 15 | T1S | 12E | 417231 |
| Superior 376 | NW 1/4 SEC 15 | T1S | 12E | 417232 |
| Superior 377 | NE 1/4 SEC 15 | T1S | 12E | 417233 |
| Superior 378 | NE 1/4 SEC 15 | T1S | 12E | 417234 |
| Superior 379 | SW 1/4 SEC 15 | T1S | 12E | 417235 |
| Superior 380 | SW 1/4 SEC 15 | T1S | 12E | 417236 |
| Superior 381 | SW 1/4 SEC 15 | T1S | 12E | 417237 |
| Superior 382 | SW 1/4 SEC 15 | T1S | 12E | 417238 |
| Superior 383 | SE 1/4 SEC 16 | T1S | 12E | 417239 |
| Superior 384 | SE 1/4 SEC 16 | T1S | 12E | 417240 |
| Superior 385 | SE 1/4 SEC 16 | T1S | 12E | 417241 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Superior 386 | SE 1/4 SEC 16 | T1S | 12E | 417242 |
| Superior 387 | NE 1/4 SEC 16 | T1S | 12E | 417243 |
| Superior 388 | SW 1/4 SEC 16 | T1S | 12E | 417244 |
| Superior 389 | SW 1/4 SEC 16 | T1S | 12E | 417245 |
| Superior 390 | SW 1/4 SEC 16 | T1S | 12E | 417246 |
| Superior 391 | SW 1/4 SEC 16 | T1S | 12E | 417247 |
| Superior 392 | NW 1/4 SEC 16 | T1S | 12E | 417248 |
| Superior 397 | NE 1/4 SEC 15 | T1S | 12E | 417249 |
| Superior 398 | NE 1/4 SEC 15 | T1S | 12E | 417250 |
| Superior 399 | NE 1/4 SEC 15 | T1S | 12E | 417251 |
| Superior 400 | SE 1/4 SEC 15 | T1S | 12E | 417252 |
| Superior 401 | SE 1/4 SEC 15 | T1S | 12E | 417253 |
| Superior 402 | SE 1/4 SEC 15 | T1S | 12E | 417254 |
| Superior 405 | SE 1/4 SEC 15 | T1S | 12E | 417255 |
| Superior 406 | SE 1/4 SEC 15 | T1S | 12E | 417256 |
| Superior 407 | SE 1/4 SEC 15 | T1S | 12E | 417257 |
| Superior 408 | SE 1/4 SEC 15 | T1S | 12E | 417258 |
| Superior 409 | SW 1/4 SEC 15 | T1S | 12E | 417259 |
| Superior 410 | SW 1/4 SEC 15 | T1S | 12E | 417260 |
| Superior 411 | SW 1/4 SEC 15 | T1S | 12E | 417261 |
| Superior 412 | SW 1/4 SEC 15 | T1S | 12E | 417262 |
| Superior 413 | SE 1/4 SEC 16 | T1S | 12E | 417263 |
| Superior 414 | SE 1/4 SEC 16 | T1S | 12E | 417264 |
| Superior 415 | SE 1/4 SEC 16 | T1S | 12E | 417265 |
| Superior 416 | SE 1/4 SEC 16 | T1S | 12E | 417266 |
| Superior 417 | SE 1/4 SEC 16 | T1S | 12E | 417267 |
| Superior 418 | SW 1/4 SEC 16 | T1S | 12E | 417268 |
| Superior 419 | SW 1/4 SEC 16 | T1S | 12E | 417269 |
| Superior 420 | SW 1/4 SEC 16 | T1S | 12E | 417270 |
| Superior 421 | SW 1/4 SEC 16 | T1S | 12E | 417271 |
| Superior 422 | SW 1/4 SEC 16 | T1S | 12E | 417272 |
| Superior 423 | SW 1/4 SEC 16 | T1S | 12E | 417273 |
| Superior 424 | SW 1/4 SEC 16 | T1S | 12E | 417274 |
| Superior 425 | SW 1/4 SEC 16 | T1S | 12E | 417275 |
| Superior 426 | SE 1/4 SEC 16 | T1S | 12E | 417276 |
| Superior 427 | SE 1/4 SEC 16 | T1S | 12E | 417277 |
| Superior 428 | SE 1/4 SEC 16 | T1S | 12E | 417278 |
| Superior 429 | SE 1/4 SEC 16 | T1S | 12E | 417279 |
| Superior 430 | SE 1/4 SEC 16 | T1S | 12E | 417280 |
| Superior 431 | SW 1/4 SEC 15 | T1S | 12E | 417281 |
| Superior 432 | SW 1/4 SEC 15 | T1S | 12E | 417282 |
| Superior 433 | SW 1/4 SEC 15 | T1S | 12E | 417283 |
| Superior 434 | SW 1/4 SEC 15 | T1S | 12E | 417284 |
| Superior 435 | SE 1/4 SEC 15 | T1S | 12E | 417285 |
| Superior 436 | SE 1/4 SEC 15 | T1S | 12E | 417286 |
| Superior 437 | SE 1/4 SEC 15 | T1S | 12E | 417287 |
| Superior 438 | SE 1/4 SEC 15 | T1S | 12E | 417288 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Superior 441 | NE 1/4 SEC 22 | T1S | 12E | 417289 |
| Superior 442 | NE 1/4 SEC 22 | T1S | 12E | 417290 |
| Superior 443 | NE 1/4 SEC 22 | T1S | 12E | 417291 |
| Superior 444 | NE 1/4 SEC 22 | T1S | 12E | 417292 |
| Superior 445 | NW 1/4 SEC 22 | T1S | 12E | 417293 |
| Superior 446 | NW 1/4 SEC 22 | T1S | 12E | 417294 |
| Superior 447 | NW 1/4 SEC 22 | T1S | 12E | 417295 |
| Superior 448 | NW 1/4 SEC 22 | T1S | 12E | 417296 |
| Superior 449 | NE 1/4 SEC 21 | T1S | 12E | 417297 |
| Superior 450 | NE 1/4 SEC 21 | T1S | 12E | 417298 |
| Superior 451 | NE 1/4 SEC 21 | T1S | 12E | 417299 |
| Superior 452 | NE 1/4 SEC 21 | T1S | 12E | 417300 |
| Superior 453 | NE 1/4 SEC 21 | T1S | 12E | 417301 |
| Superior 454 | NW 1/4 SEC 21 | T1S | 12E | 417302 |
| Superior 455 | NW 1/4 SEC 21 | T1S | 12E | 417303 |
| Superior 456 | NW 1/4 SEC 21 | T1S | 12E | 417304 |
| Superior 457 | NW 1/4 SEC 21 | T1S | 12E | 417305 |
| Superior 458 | SW 1/4 SEC 22 | T1S | 12E | 417306 |
| Superior 459 | SW 1/4 SEC 22 | T1S | 12E | 417307 |
| Superior 460 | SW 1/4 SEC 22 | T1S | 12E | 417308 |
| Superior 461 | SW 1/4 SEC 22 | T1S | 12E | 417309 |
| Superior 462 | NE 1/4 SEC 22 | T1S | 12E | 417310 |
| Superior 463 | SE 1/4 SEC 22 | T1S | 12E | 417311 |
| Superior 464 | SE 1/4 SEC 22 | T1S | 12E | 417312 |
| Superior 465 | SE 1/4 SEC 22 | T1S | 12E | 417313 |
| Superior 466 | SE 1/4 SEC 22 | T1S | 12E | 417314 |
| Superior 467 | NE 1/4 SEC 27 | T1S | 12E | 417315 |
| Superior 468 | NE 1/4 SEC 27 | T1S | 12E | 417316 |
| Superior 469 | NE 1/4 SEC 27 | T1S | 12E | 417317 |
| Superior 470 | NE 1/4 SEC 27 | T1S | 12E | 417318 |
| Superior 471 | NE 1/4 SEC 27 | T1S | 12E | 417319 |
| Superior 472 | NW 1/4 SEC 27 | T1S | 12E | 417320 |
| Superior 473 | NW 1/4 SEC 27 | T1S | 12E | 417321 |
| Superior 474 | NW 1/4 SEC 27 | T1S | 12E | 417322 |
| Superior 475 | NW 1/4 SEC 27 | T1S | 12E | 417323 |
| Superior 477 | NE 1/4 SEC 27 | T1S | 12E | 417325 |
| Superior 478 | NE 1/4 SEC 27 | T1S | 12E | 417326 |
| Supie 1 | NW1/4 Section 27 | 1S | 12E | 414403 |
| Supie 10 | NE 1/4 Section 27 | 1S | 12E | 414412 |
| Supie 11 | NE 1/4 Section 27 | 1S | 12E | 414413 |
| Supie 12 | NW 1/4 Section 27 | 1S | 12E | 414414 |
| Supie 13 | NW 1/4 Section 26 | 1S | 12E | 414415 |
| Supie 14 | NE 1/4 Section 26 | 1S | 12E | 414416 |
| Supie 15 | NE 1/4 Section 26 | 1S | 12E | 414417 |
| Supie 16 | NW 1/4 Section 26 | 1S | 12E | 414418 |
| Supie 17 | NW 1/4 Section 26 | 1S | 12E | 414419 |
| Supie 18 | NE 1/4 Section 26 | 1S | 12E | 414420 |

# APPENDIX A

Resolution Project Mineral Claim Information

| Name of Unpatented Claim | Section | Township | Range | AMC* Number |
|---|---|---|---|---|
| Supie 19 | NE 1/4 Section 26 | 1S | 12E | 414421 |
| Supie 2 | NE 1/4 Section 27 | 1S | 12E | 414404 |
| Supie 20 | NW 1/4 Section 26 | 1S | 12E | 414422 |
| Supie 21 | SW 1/4 Section 27 | 1S | 12E | 414423 |
| Supie 22 | SW 1/4 Section 27 | 1S | 12E | 414424 |
| Supie 23 | NE 1/4 Section 23 | 1S | 12E | 420976 |
| Supie 24 | SE 1/4 Section 23 | 1S | 12E | 420977 |
| Supie 25 | SE 1/4 Section 23 | 1S | 12E | 420978 |
| Supie 26 | SE 1/4 Section 23 | 1S | 12E | 420979 |
| Supie 27 | SW 1/4 Section 24 | 1S | 12E | 420980 |
| Supie 28 | SE 1/4 Section 23 | 1S | 12E | 420981 |
| Supie 29 | SE 1/4 Section 23 | 1S | 12E | 420982 |
| Supie 3 | NE 1/4 Section 27 | 1S | 12E | 414405 |
| Supie 30 | SE 1/4 Section 23 | 1S | 12E | 420983 |
| Supie 31 | SW 1/4 Section 23 | 1S | 12E | 420984 |
| Supie 32 | SW 1/4 Section 23 | 1S | 12E | 420985 |
| Supie 33 | SE 1/4 Section 23 | 1S | 12E | 420986 |
| Supie 34 | SE 1/4 Section 23 | 1S | 12E | 420987 |
| Supie 35 | SE 1/4 Section 23 | 1S | 12E | 420988 |
| Supie 36 | SE 1/4 Section 23 | 1S | 12E | 420989 |
| Supie 37 | SW 1/4 Section 23 | 1S | 12E | 420990 |
| Supie 38 | SW 1/4 Section 23 | 1S | 12E | 420991 |
| Supie 4 | NW 1/4 Section 26 | 1S | 12E | 414406 |
| Supie 5 | NW 1/4 Section 26 | 1S | 12E | 414407 |
| Supie 6 | NW 1/4 Section 26 | 1S | 12E | 414408 |
| Supie 7 | NW 1/4 Section 26 | 1S | 12E | 414409 |
| Supie 8 | NE 1/4 Section 27 | 1S | 12E | 414410 |
| Supie 9 | NE1/4 Section 27 | 1S | 12E | 414411 |
| Touch Not No. 2 Amended | NE1/4 SE1/4 12 | 2S | 12E | 60401 |
| Wes No. 1 | NW1/426 | 1S | 12E | 60195 |
| Wes No.2 | NW1/4NE1/426 | 1S | 12E | 60196 |

*Arizona Mining Claim (AMC)

# APPENDIX B

History of Mining

Modern history of Pinal County, and particularly the subject Mine Area, is largely defined by mining interests and production beginning in the late nineteenth century. Initially concerned with Apache raids and attacks, General George Stoneman, military commander of the Arizona Territory, sought to establish posts and communication routes in the area and ordered construction of a pack trail into the Pinal Mountains.[1] According to Government Land Office (GLO) Township plat maps of the area,[2] the trail, known as Stoneman's Grade, meandered into the mountains, 4.0 km (2.5 miles) north of present-day Superior. The trail dropped into the upper portion of Queen Creek Canyon and emerged just north of Oak Flat. At the eastern edge of Oak Flat, the trail descended into a steep, ravine the soldiers named Devils Canyon.[3] The trail continued east of the canyon and onto another flat area, known today as Pinal Ranch.

Once Stoneman's Grade was established, rumors spread of a silver find along the western end of the trail, which is in close proximity to modern-day Superior. During the summer of 1871, a group of prospectors searched for the rumored silver deposit near Stoneman's Grade but were unable to find it. [4] However, they did locate a less promising ore body 4.0 km (2.5 miles) south of the trail. They recorded a number of claims in late 1871 called, collectively, the Silver Queen Ledge, which eventually became the Silver Queen Mine and the future location of the Magma mine 30 years later.[5] While the Silver Queen mine was technically the first registered

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[1] C.T. Woody, *The Finding of the Silver King Mine: An Arizona Bonanza*, Phoenix Point West 30 (1964).
[2] (A.B. Titus, Township No. 1 South, Range No. 13 East, Gila and Salt River Meridian, Arizona. On file, BLM Arizona State Office, Phoenix (1906); Theodore Vander Meer, Township No. 1 South, Range No. 13 East, Gila and Salt River Meridian, Arizona. On file BLM Arizona State Office, Phoenix (1927))
[3] Michael W. Lindeman, *Treatment Plan for Cultural Resources on the Resolution Parcel, Pinal County, Arizona*, Desert Archaeology, Inc. (October 2006)
[4] Woody (1964).
[5] Gladys Walker and T.G. Chilton, *The History of Mining at Superior*, History of Mining in Arizona, vol. II, 231-36, edited by J. Michael Cantly and Michael N. Greely. Mining Club of the Southwest Foundation, Tucson.

set of mine claims, the mine struggled initially as a silver mine and was discovered only after a fruitless search for a far richer mine—the Silver King mine.[6]

The location of the find was rediscovered by Benjamin W. Reagan, William H. Long, Issac Copeland, and Charles G. Mason. Mason, Reagan, Long, and Copeland filed the Silver King claim on March 22, 1875.[7] Within 6 months, 50 men were working the Silver King mine.[8] In 1876, Copeland sold his interest in the mine to Charles Mason, and a few months later William Long sold his interest to Benjamin Reagan[9] The remaining original prospectors sold out to the Silver King Mining Company headed by George Barney.[10] In 1877, Barney incorporated the mine into the Silver King of Arizona Mining Company.

The Silver King mine became one of the richest mines in Arizona history, generating over 6 million dollars in silver between 1877 and 1886.[11] During the same period, mines in the eastern portion of the Pinal Mountains within the Globe Mining District were also producing rich silver and copper ore.[12] As the price of silver rose and fell, the mine opened and closed and continued to be worked on a small scale until it was permanently closed in 1955.[13]

The development of the Silver Queen mine followed a different course. As news of the rich magma vein spread through the Arizona Territory, three communities sprouted up in the Superior area: the boomtowns of Queen and Silver King along the western edge of the Pinal Mountains and Picket Post Camp at the base of its namesake mountain on the banks of Queen Creek. Picket Post Camp, renamed Pinal City in 1879, served the milling needs of the Silver

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[6] Woody and Schwartz (1977).
[7] *Id.*
[8] Wilbur A. Haak, *Arizona's Silver Belt* in *History of Mining in Arizona*, vol. II, 31-36 (edited by J. Michael Cantly and Michael N. Greely. Mining Club of the Southwest Foundation, Tucson (1991).
[9] *Weekly Journal-Miner*, Wednesday, December 8, 1909.
[10] Haak (1991).
[11] *Id.*
[12] Robert Bigando, *Globe, Arizona: The Life and Times of a Western Mining Town 1864-1917,* American Globe Publishing Co., Globe (1989)
[13] www.mindat.org

King Mine.[14] The settlement around the claims was briefly known as Queen, but renamed Hastings by 1882 after a man who ran a gold-processing mill along the creek.[15] The town of Hastings survived for only a short time, surviving on little more than mineral prospecting and cattle ranching.[16] Conversely, the town of Silver King flourished until 1888 when the quality of ore declined and prices dropped.[17] The area's silver mines were shut down, and Silver King and Pinal City quickly became ghost towns.

Silver Queen mine regained its value due to large copper deposits. Sustained growth in Hastings began in 1902 with the purchase of the Golden Eagle Group by the Lake Superior and Arizona Mining Company (L.S.&A.), and a townsite was laid out by Lobb. Lobb renamed the town Superior after the L.S.&A.[18] The L.S. & A. Mining Co. revived the mining town, and Superior prospered over the next five years. However, the future of the Silver Queen Mine was again in doubt, as operations were suspended several times between 1907 and 1911.[19] William Boyce Thompson and his partner George Gunn acquired interests in the Silver Queen mine in 1910 for $130,000 and renamed it the Magma mine. Thompson also owned the Inspiration mine in Miami.

An ore concentrator was constructed at the Magma Mine by the spring of 1914. The mine processed copper ore at a phenomenal rate, [20] and the company needed an economical and reliable way to transport their concentrates to the railroad. Several alternatives were considered, including construction of an improved haul road to Ray, an aerial tramway to Globe, and a

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[14] G. Walker and T.G. Chilton, *The History of Mining in Arizona*, edited by J. M. Canty and M.N. Greeley, 231-260 (1991), Mining Club of the Southwest Foundation, Tucson.
[15] Gustavus Cox, *Topographical Map of Pioneer Mining District and Adjacent Country, Pinal County, Arizona Territory* (no publisher) (1882); Walker and Chilton (1991).
[16] *Id.*
[17] W.A. Haak, *Arizona's Silver Belt.* in *History of Mining in Arizona*, vol. II, edited by J. M. Canty and M.N. Greeley, 31-36 (1991), Mining Club of the Southwest Foundation, Tucson; Walker and Chilton (1991).
[18] Walker and Chilton (1991).
[19] Cowan (2000); Walker and Chilton (1991).
[20] Walker and Chilton (1991).

railroad to Florence. Ultimately a 50-km- (31-mile) long narrow gauge railroad to Florence was determined to be the most feasible and practical choice. The Magma Arizona Railroad was completed by the summer of 1915. It was a boon for the town of Superior, not only in its capacity to quickly get the mine's concentrates to the Southern Pacific Railroad, but also in bringing an influx of people, goods, and supplies into the community.

The narrow gauge railroad was scrapped in 1923, and replaced by a standard gauge railroad. A smelter was built in 1924, allowing the Magma Mining Company to be self-sufficient. Also during the 1920s the Arizona Highways Department constructed a highway through the Queen Creek Gorge, providing direct, improved travel between Superior and Globe for the first time.[21] This period was defined by significant profits for the mine.

For example, in 1928, the Magma Copper Company of Superior reported a net profit of $1,952,495 (after tax, depreciation, and other charges), allowing the company to pay dividends of $1,826,503.[22] The average net selling price on copper delivered by the Magma Copper Company in 1928 was 14.79 cents per pound.[23] In 1929, the Magma mine began producing 3.3 million pounds of copper a month and expected to produce more than 40 million pound for the year.[24] However, at this point copper was only selling for 9.5 cents a pound.[25] Nevertheless, profits exceeded. $3.5 million in 1930.[26] Despite these gains, the Magma Mine production was modest compared to the Calumet and Arizona Mining Company in Globe, Arizona, which produced approximately 133 million pounds of copper in 1929.[27]

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[21] U.S.D.A. Forest Service, Crook National Forest, Arizona, Gila and Salt River Meridian Map (on file, Arizona Historical Society, Tucson).
[22] Mining Journal, *Arizona Mining News.*
[23] *Id.*
[24] Wall Street Journal, Nov. 30, 1929.
[25] *Id.*
[26] *Id.*
[27] Mining Journal, Oct. 30, 1929.

As the U.S. entered the Great Depression, dividends paid by the Magma Copper Company decreased to only $408,154 in 1930.[28] Copper prices plummeted and the mine shut down for a brief period and workers' hours were slashed.[29] The Magma Mining Company managed to keep many people employed, but mostly with busywork.[30]

The onset of World War II helped bring the country out of the depression, and once again, the Magma Mine swung into full-scale production. Many skilled workers left Superior to work for better pay in defense plants or to enlist in the military.[31] The labor shortage during the war provided employment opportunities for Mexican-Americans in the area. After World War II, the Cold War kept the Magma Mining Company busy supplying copper for the defense industry. When the price of copper fell in the 1980s, the Magma Mine was forced to close, and the town found itself once again struggling to survive. The mine reopened in the late 1980s and later closed in the early 1990s.

Finally, in parallel with the development of the Magma Mine, another mine began exploration and production in the Superior region in the late 1920s. The Belmont Copper Mining Company at Superior, Arizona was largely funded by investors from Michigan and Scotland. At the Belmont Mine, most of the development work focused on what was called the "Eureka" vein.[32] Development of this important body of copper ore was delayed until the arrival of A. MacKay of Scotland.[33] Upon the arrival of Mr. MacKay, it was understood that plans would be made for the sinking of an entirely new mine shaft below the Old Grand Pacific

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[28] Arizona Mining News Journal, Aug. 15, 1930.
[29] Collins (1999); Walker and Chilton (1991).
[30] Collins (1999).
[31] Walker and Chilton (1991).

[32] D.F. Hammer and R.F. Webster, *Some Geological Features of the Superior Area, Pinal County, Arizona,* NM Geological Society, 13th Field Conference.

[33] Mining Journal, Nov. 30, 1929.

Camp.[34] Although intensive prospecting was performed, very little ore was found.[35] Later, a copper strike discovered in 1931 was announced by Chester Hoatson, manager of the Belmont Mine.[36] According to reports, "the ore initially showed 20 percent copper, 10 ounces in silver to the ton, and good values in gold."[37] In 1955, Fred Smith became president of the Belmont Mining company. Smith later sold the company to Magma Copper Company on April 18, 1961. Ultimately, the Belmont Mine was closed.

[34] *Id.*
[35] *Id.*
[36] Mining Journal, Mar. 15, 1931.
[37] *Id.*

# APPENDIX C

Resource Studies Conducted
in Support the Resolution Project

# APPENDIX C

Resource Studies Conducted in Support of the Resolution Copper Project

| Type of Resource Study | Document Title | Document Date | Author (Organization) | Area |
|---|---|---|---|---|
| Cultural* | *Reconnaissance and Evaluation of Archaeological Resources in the Oak Flat Area* | MAR 2012 | WestLand Resources, Inc. | East Plant Site |
| Cultural* | *Resolution Project: A Cultural Resources Inventory of 4,890 Acres in the Foothills of the Superstition Mountains, Northwest of Superior, Arizona* | JUN 2015 | WestLand Resources, Inc. | Near West Tailings Site |
| Cultural* | *A Revised Cultural Resources Inventory of the Magma Arizona Railroad Right-of-Way, Pinal County, Arizona* | MAY 2012 | WestLand Resources, Inc. | MARRCO Corridor |
| Cultural* | *A Cultural Resources Inventory of 1,153 Acres within the East and West Plant Sites for the Resolution Copper Project, In and Near Superior, Pinal County, Arizona* | OCT 2015 | WestLand Resources, Inc. | East Plant Site<br>West Plant Site |
| Cultural* | *A Cultural Resources Inventory of 159.64 Acres for the Dripping Spring Land Exchange, Gila and Pinal Counties, Arizona* | SEP 2015 | WestLand Resources, Inc. | Dripping Spring Parcel |
| Cultural* | *A Cultural Resources Inventory of 940 Acres within the Appleton-Whittell Research Ranch for Resolution Copper Mining, LLC* | DEC 2015 | WestLand Resources, Inc. | Appleton Ranch Parcel |
| Cultural* | *A Cultural Resources Inventory of 159.64 Acres for the Lower San Pedro River Land Exchange (In Prep)* | In Prep | WestLand Resources, Inc. | Lower San Pedro Parcel |
| Cultural* | *A Cultural Resources Inventory of 149 Acres for the Cave Creek Land Exchange (In Prep)* | In Prep | WestLand Resources, Inc. | Cave Creek Parcel |
| Cultural* | *A Cultural Resources Inventory of 107 Acres for the Apache Leap South End Land Exchange (In Prep)* | In Prep | WestLand Resources, Inc. | Apache Leap South End Parcel |
| Cultural* | *A Cultural Resources Inventory of 29 Acres for the Fairview Cemetery Land Exchange (In Prep)* | In Prep | WestLand Resources, Inc. | Fairview Cemetery |
| Cultural* | *A Cultural Resources Inventory of 250 Acres for the Superior Airport Land Exchange (In Prep)* | In Prep | WestLand Resources, Inc. | Superior Airport Contiguous Parcels |
| Cultural* | *A Cultural Resources Inventory of 148 Acres for the Tangle Creek Land Exchange (In Prep)* | In Prep | WestLand Resources, Inc. | Tangle Creek Parcel |
| Cultural* | *A Cultural Resources Inventory of 147 Acres for the Turkey Creek Land Exchange (In Prep)* | In Prep | WestLand Resources, Inc. | Turkey Creek Parcel |
| Cultural* | *A Cultural Resources Inventory of 634 Acres for the East Clear Creek Land Exchange (In Prep)* | In Prep | WestLand Resources, Inc. | East Clear Creek Parcel |

# APPENDIX C

Resource Studies Conducted in Support of the Resolution Copper Project

| Type of Resource Study | Document Title | Document Date | Author (Organization) | Area |
|---|---|---|---|---|
| Cultural* | *The Resolution Project: Results of an Archaeological Survey in Pinal County, Arizona - Technical Report No. 2003-10* | SEP 2005 | Desert Archaeology | East Plant Site<br>Oak Flat |
| Cultural* | *Treatment Plan for Cultural Resources on the Resolution Parcel, Pinal County, Arizona* | OCT 2006 | Desert Archaeology | East Plant Site<br>Oak Flat |
| Cultural* | *An Archaeological Survey of the Transamerica Land Exchange A-7877 Apache Sitgreaves, Coconino, and Tonto National Forests, Arizona* | JUN 1974 | USFS - Green, Dee F. | Superior Airport<br>Contiguous Parcels |
| Cultural* | *Settlement and Reoccupation along Queen Creek, Central Arizona An Archeological Survey of the Superior Proposed Base for Exchange (South Half) Globe Ranger District Tonto National Forest Cultural Resources Report No. 29 USDA Forest Service Southwestern Region May 1979* | MAY 1979 | Wood, J. Scott | Fairview Cemetery,<br>Superior Airport<br>Contiguous Parcels |
| Cultural* | *An Archaeological Survey of the Lakeside Land Exchange, Superior Parcel, Superior Arizona, Globe Range District, Tonto National Forest. Cultural Resources Inventory Report 76-09, Tonto National Forest October 1976* | OCT 1976 | Wood, J. Scott | Superior Airport<br>Contiguous Parcels |
| Cultural* | *Note: An Archaeological Survey of the Filter Plant and Loadout Facility was completed by SWCA for the prior owner of that parcel.* | | SWCA | Filter Plant and<br>Loadout Facility |
| Geochemistry | *Technical Memorandum - Geochemical Characterization of Development Rock for Proposed Shaft No. 10, Resolution Project :ADEQ Tier 1 Results and Inertness Analysis* | JAN 2007 | Logsdon, Mark<br>Geochemica | East Plant Site |
| Geochemistry | *Addendum to Geochemical Characterization of Resolution Tailings, Resolution Copper Mining, Pinal County, Arizona (In Prep)* | In Prep | Duke HydroChem | Tailings Storage<br>Facility |
| Geology | *Site Specific Seismic Hazard Analyses for the Resolution Copper Mining Company Tailings Storage Facilities Options, Southern Arizona* | JUN 2013 | URS Corporation | Tailings Storage<br>Facility |
| Geology | *Geology and Exploration Progress at the Resolution Porphyry Cu-Mo Deposit, Arizona: : Society of Economic Geologists, Inc. Special Publication 16, pp. 147-156* | 2012 | Hehnke, Carl<br>et al. | East Plant Site |
| Hydrogeology | *Technical Memorandum, Phase I Hydrogeologic Field Investigations, Near West Tailings Site, Pinal County, Arizona* | MAY 2013 | Montgomery &<br>Associates | Tailings Storage<br>Facility |
| Hydrogeology | *Technical Memorandum, Phase II Hydrogeologic Field Investigations, Near West Tailings Site, Pinal County, Arizona* | MAY 2013 | Montgomery &<br>Associates | Tailings Storage<br>Facility |

# APPENDIX C

Resource Studies Conducted in Support of the Resolution Copper Project

| Type of Resource Study | Document Title | Document Date | Author (Organization) | Area |
|---|---|---|---|---|
| Hydrology | *Resolution Copper Company Surface Water Baseline Report, October 2002 through February 2006, Volume I of II* | JUN 2006 | Golder and Associates | East Plant Site |
| Hydrology | *Groundwater Assessment Update: West Plant Site, Superior, Arizona: Technical Memorandum prepared for Resolution Copper Company* | MAR 2013 | Golder and Associates | West Plant Site |
| Hydrology | *Interim Results of Groundwater Monitoring Upper Queen Creek and Devils Canyon Watersheds* | FEB 2010 | Montgomery & Associates | East Plant Site |
| Hydrology | *Addendum to Interim Results of Groundwater Monitoring Upper Queen Creek and Devils Canyon Watersheds (In Prep)* | In Prep | Montgomery & Associates | West Plant Site, East Plant Site, Tailings Storage Facility |
| Hydrology | *Results of Hydrochemical Characterization of Groundwater, Upper Queen Creek/Devils Canyon Study area, Resolution Copper Mining LLC, Pinal County, Arizona* | MAR 2012 | Montgomery & Associates | East Plant Site |
| Hydrology | *Addendum to Results of Hydrochemical Characterization of Groundwater, Upper Queen Creek/Devils Canyon Study Area, Resolution Copper Mining LLC, Pinal County, Arizona (In Prep)* | In Prep | Montgomery & Associates | West Plant Site, East Plant Site, Tailings Storage Facility |
| Hydrology | *Results of Queen Creek Corridor Survey, Superior Basin, Pinal County Arizona.* | FEB 2013 | Montgomery & Associates | West Plant Site, East Plant Site |
| Hydrology | *Surface Water Baseline Report, Devils Canyon, Mineral Creek and Queen Creek Watersheds, Resolution Copper Mining LLC, Pinal County Arizona* | MAY 2013 | Montgomery & Associates | East Plant Site |
| Hydrology | *Addendum to Surface Water Baseline Report, Devils Canyon, Mineral Creek and Queen Creek Watersheds, Resolution Copper Mining LLC, Pinal County Arizona (In Prep)* | In Prep | Montgomery & Associates | West Plant Site, East Plant Site |
| Hydrology | *Baseline Hydrological Characterization of Near West Tailings Storage Facility* | undated | Montgomery & Associates | Tailings Storage Facility |
| Hydrology | *Jurisdictional Waters Determination for the Parcel 210-34-022A Analysis Area, Pinal County* | JAN 2013 | WestLand Resources, Inc. | Filter Plant and Loadout Facility |
| Hydrology | *Wetland and Floodplain Analysis for the Federal Land Exchange Parcel (Oak Flat and Surrounding Lands) In Pinal County, Arizona* | SEP 2015 | WestLand Resources, Inc. | East Plant Site |
| Hydrology | *Jurisdictional Waters Determination for the Resolution West Plant and East Plant Analysis Areas, Pinal, County, Arizona* | JUL 2011 | WestLand Resources, Inc. | West Plant Site, East Plant Site |

# APPENDIX C

Resource Studies Conducted in Support of the Resolution Copper Project

| Type of Resource Study | Document Title | Document Date | Author (Organization) | Area |
|---|---|---|---|---|
| Hydrology | *Centerline Delineation of Potentially Jurisdictional Waters within the Proposed Resolution Project Area* | JAN 2011 | WestLand Resources, Inc. | West Plant Site, East Plant Site |
| Hydrology | *Jurisdictional Waters Determination for the Near West Analysis Area, Pinal County, Arizona* | JAN 2014 | WestLand Resources, Inc. | Tailings Storage Facility |
| Hydrology | *RCM East Plant Spill Prevention, Control, and Countermeasure Plan* | JAN 2014 | WestLand Resources, Inc. | East Plant Site |
| Hydrology | *RCM West Plant Spill Prevention, Control, and Countermeasure Plan* | JAN 2014 | WestLand Resources, Inc. | West Plant Site |
| Hydrology | *Jurisdictional Water Determination Supplement for the MARRCO Analysis Area, Pinal County, Arizona Corps File Nos. SPL-2013-00050-MWL and SPL-2014-00064-MWL* | MAY 2014 | WestLand Resources, Inc. | MARRCO Corridor |
| Other; Air Quality | *Baseline Meteorological and Air Quality Data Annual Report, Resolution Copper Mining Project (April 1, 2012 – March 31, 2013)* | AUG 2013 | Air Sciences, Inc. | West Plant Site, East Plant Site |
| Other; Air Quality | *Baseline Meteorological and Air Quality Data Report, Resolution Copper Mining Project (December 31, 2012 – March 31, 2013)* | JUN 2013 | Air Sciences, Inc. | West Plant Site, East Plant Site |
| Other; Air Quality | *Baseline Meteorological and Air Quality Data Report, Resolution Copper Mining Project (October 1, 2012 – December 31, 2012)* | APR 2013 | Air Sciences, Inc. | West Plant Site, East Plant Site |
| Other; Air Quality | *Baseline Meteorological and Air Quality Data Report, Resolution Copper Mining Project (July 1, 2012 – September 30, 2012)* | JAN 2013 | Air Sciences, Inc. | West Plant Site, East Plant Site |
| Other; Air Quality | *Baseline Meteorological and Air Quality Data Report, Resolution Copper Mining Project (April 1, 2012 –June 30, 2012)* | NOV 2012 | Air Sciences, Inc. | West Plant Site, East Plant Site |
| Other; Air Quality | *Resolution Baseline Report - Air Sciences (Final Report)* | JUN 2012 | Air Sciences, Inc. | West Plant Site, East Plant Site |
| Vegetation | *2012 Prefeasibility Activities Arizona Hedgehog Cactus Action Area Survey (Conservation Measure 5)* | 2013 MAR | WestLand Resources, Inc. | East Plant Site |
| Vegetation | *Arizona Hedgehog Cactus Survey of Proposed Re-Alignment of Magma Mine Road* | 2013 FEB | WestLand Resources, Inc. | East Plant Site |
| Vegetation | *2010 Arizona Hedgehog Cactus Survey Report Pinal County, Arizona* | 2010 DEC | WestLand Resources, Inc. | East Plant Site |
| Vegetation | *Arizona Hedgehog Cactus Compiled Survey Report Resolution Pre-feasibility Activities Plan of Operations* | 2009 AUG | WestLand Resources, Inc. | East Plant Site |

# APPENDIX C

Resource Studies Conducted in Support of the Resolution Copper Project

| Type of Resource Study | Document Title | Document Date | Author (Organization) | Area |
|---|---|---|---|---|
| Vegetation | *Noxious Weed Survey of the Baseline Activities Area* | 2014 MAY | WestLand Resources, Inc. | Tailings Storage Facility |
| Vegetation | *2004 Arizona Hedgehog Cactus Survey Federal Parcel, Pinal County, Arizona* | 2004 DEC | WestLand Resources, Inc. | East Plant Site |
| Vegetation; Wildlife | *Biological Evaluation of the Near West Analysis Area* | 2013 MAR | WestLand Resources, Inc. | Tailings Storage Facility |
| Vegetation; Wildlife | *Vegetation and Wildlife Assessment of the Mineral Creek Study Area* | 2012 SEP | WestLand Resources, Inc. | East Plant Site |
| Vegetation; Wildlife | *Biological Evaluation Baseline Hydrologic & Geotechnical Gathering Activities on Tonto National Forest (DRAFT)* | JUL 2015 | WestLand Resources, Inc. | Tailings Storage Facility |
| Wildlife | *Migratory Bird Treaty Act Report for Baseline Hydrologic & Geotechnical Gathering Activities on Tonto National Forest, Pinal County, Arizona (DRAFT)* | JUL 2015 | WestLand Resources, Inc. | Tailings Storage Facility |
| Wildlife | *Management Indicator Species Report for Baseline Hydrologic & Geotechnical Gathering Activities on Tonto National Forest, Pinal County, Arizona (DRAFT)* | JUN 2015 | WestLand Resources, Inc. | Tailings Storage Facility |
| Vegetation; Wildlife | *Biological Evaluation for General Plan of Operations Activities on Tonto National Forest, Pinal County, Arizona (In Prep)* | In Prep | WestLand Resources, Inc. | East Plant Site, West Plant Site, Tailings Storage Facility, MARRCO Corridor, Filter Plant and Loadout Facility |
| Wildlife | *Migratory Bird Treaty Act Report for General Plan of Operations Activities on Tonto National Forest, Pinal County, Arizona (In Prep)* | In Prep | WestLand Resources, Inc. | East and West Plant Sites, West Plant Site, Tailings Storage Facility, MARRCO Corridor, Filter Plant and Loadout Facility |
| Wildlife | *Management Indicator Species Report for General Plan of Operations Activities on Tonto National Forest, Pinal County, Arizona (In Prep)* | In Prep | WestLand Resources, Inc. | East Plant Site, West Plant Site, Tailings Storage Facility, MARRCO Corridor |

# APPENDIX C

Resource Studies Conducted in Support of the Resolution Copper Project

| Type of Resource Study | Document Title | Document Date | Author (Organization) | Area |
|---|---|---|---|---|
| Wildlife | *2012 Western Yellow-Billed Cuckoo Survey Devils Canyon and Pinto Creek* | 2013 MAR | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2012 Far West Desert Tortoise Survey* | FEB 2013 FEB | WestLand Resources, Inc. | MARRCO Corridor |
| Wildlife | *Amphibian and Reptile Surveys* | 2012 DEC | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2011 Reptile Survey of the Far West Parcel and Vicinity* | 2012 DEC | WestLand Resources, Inc. | MARRCO Corridor |
| Wildlife | *Aquatic Resources Studies in The Resolution Study Area* | 2012 SEP | WestLand Resources, Inc. | Devils Canyon, Mineral Creek, East Plant Site |
| Wildlife | *Bird Survey and Occurrence Record Compilation* | 2012 SEP | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *Wildlife Camera Monitoring in Devils Canyon and East Plant Mine Site Vicinity* | 2012 JUL | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2011 Raptor Surveys of Mine and Vicinity* | 2012 JUL | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2011 Bat Species Survey* | 2012 JUL | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *Results of Raptor Surveys Conducted at Far West 2011* | 2012 MAY | WestLand Resources, Inc. | MARRCO Corridor |
| Wildlife | *2011 Western Yellow-billed Cuckoo Survey Devils Canyon and Mineral Creek* | 2011 DEC | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2009 Bird Census Resolution Copper Mine Study Area* | 2010 SEP | WestLand Resources, Inc. | West Plant Site, East Plant Site |
| Wildlife | *Raptor Survey and 2008 Bird Census* | 2009 MAR | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2007-2008 Fish Survey Resolution Baseline Biological Surveys Pinal County, Arizona* | 2009 FEB | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *Resolution 2008 - Baseline Biological Surveys Motion Sensitive Camera Results* | 2009 FEB | WestLand Resources, Inc. | East Plant Site |

# APPENDIX C

Resource Studies Conducted in Support of the Resolution Copper Project

| Type of Resource Study | Document Title | Document Date | Author (Organization) | Area |
|---|---|---|---|---|
| Wildlife | *Results of Bird Surveys Conducted at Near West 2013* | 2013 DEC | WestLand Resources, Inc. | Tailings Storage Facility |
| Wildlife | *Raptor Surveys Conducted at Near West 2013* | 2014 APR | WestLand Resources, Inc. | Tailings Storage Facility |
| Wildlife | *Wildlife Camera Monitoring Report* | 2014 MAY | WestLand Resources, Inc. | East Plant Site, Tailings Storage Facility |
| Wildlife | *Results of Sonoran Desert Tortoise Survey in the Tonto National Forest Near Superior, Arizona 2013* | 2014 MAY | WestLand Resources, Inc. | Tailings Storage Facility |
| Wildlife | *2004 Reptile and Amphibian Survey Federal Parcel, Pinal County, Arizona* | 2004 DEC | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2004 Bat Survey Federal Parcel, Pinal County, Arizona* | 2004 DEC | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2004 Raptor Survey Federal Parcel, Pinal County, Arizona* | 2004 DEC | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2015 Sonoran Desert Tortoise Habitat Assessment Resolution Project and Land Exchange Areas, Pinal County, Arizona (In Prep)* | In Prep | WestLand Resources, Inc. | All Areas (GPO and Land Exchange) |
| Wildlife | *2016 Yellow-billed Cuckoo Survey Whitlow Ranch Dam, Devils Canyon, and Mineral Creek, Pinal County, Arizona (Planned)* | Planned | WestLand Resources, Inc. | Queen Creek, Mineral Creek, Devils Canyon |
| Vegetation | *2015 Riparian and Aquatic Resources Resolution Project Area and Vicinity, Pinal County, Arizona (In Prep)* | In Prep | WestLand Resources, Inc. | Queen Creek, Devils Canyon |
| Vegetation | *2016 Riparian and Aquatic Resources Resolution Project Area and Vicinity, Pinal County, Arizona (Planned)* | Planned | WestLand Resources, Inc. | Queen Creek, Devils Canyon |
| Wildlife | *Sonoran Desert Tortoise Habitat Reconnaissance of the MARRCO Corridor, Pinal County, Arizona (In Prep)* | In Prep | WestLand Resources, Inc. | MARRCO Corridor |
| Vegetation; Wildlife | *Ecological Overview East Clear Creek Parcel Coconino County, Arizona Resolution Copper Mining (In Prep)* | In Prep | WestLand Resources, Inc. | East Clear Creek |
| Vegetation; Wildlife | *Ecological Overview Dripping Springs Parcel Coconino County, Arizona Resolution Copper Mining (In Prep)* | In Prep | WestLand Resources, Inc. | Dripping Springs |
| Vegetation; Wildlife | *Ecological Overview Apache Leap South End Parcels Pinal County, Arizona Resolution Copper Mining (In Prep)* | In Prep | WestLand Resources, Inc. | Apache Leap South End |

# APPENDIX C

Resource Studies Conducted in Support of the Resolution Copper Project

| Type of Resource Study | Document Title | Document Date | Author (Organization) | Area |
|---|---|---|---|---|
| Vegetation; Wildlife | *Ecological Overview San Pedro River Parcel Pinal County, Arizona* | 2003 SEP | WestLand Resources, Inc. | Land Exchange |
| Vegetation; Wildlife | *Wetlands and Floodplains Report* | 2004 OCT | WestLand Resources, Inc. | Land Exchange |
| Vegetation; Wildlife | *Baseline Biology and Land Use Report* | 2004 MAR | WestLand Resources, Inc. | Land Exchange |
| Vegetation; Wildlife | *Ecological Review Summary: Federal Parcel and Offered Lands Parcels* | 2004 NOV | WestLand Resources, Inc. | Land Exchange |
| Vegetation; Wildlife | *Ecological Review Appleton Ranch Parcel Santa Cruz County, Arizona* | 2004 MAY | WestLand Resources, Inc. | Appleton Ranch |
| Vegetation; Wildlife | *Ecological Review 6L Ranch Parcel, Yavapai County, Arizona* | 2004 JUN | WestLand Resources, Inc. | Cave Creek |
| Vegetation; Wildlife | *Ecological Review JX Ranch Parcel, Gila County, Arizona* | 2004 MAR | WestLand Resources, Inc. | Turkey Creek |
| Vegetation; Wildlife | *Ecological Review LX Bar Ranch parcel, Yavapai County, Arizona* | 2004 MAR | WestLand Resources, Inc. | Tangle Creek |
| Wildlife | *Baseline Biological Winter Bird Surveys* | 2008 APR | WestLand Resources, Inc. | East Plant Site |
| Vegetation | *Resolution Pre-Feasibility Activities 2007-2008 Arizona Hedgehog Cactus Survey Pinal County, Arizona* | 2008 MAY | WestLand Resources, Inc. | East Plant Site |
| Vegetation | *Arizona Hedgehog Cactus Database* | 2013 AUG | WestLand Resources, Inc. | East Plant Site |
| Vegetation | *2014 Arizona Hedgehog Cactus Survey Report* | 2014 NOV | WestLand Resources, Inc. | East Plant Site |
| Wildlife | *2015 Yellow-billed Cuckoo Survey Whitlow Ranch Dam, Devils Canyon, and Mineral Creek, Pinal, County, Arizona* | 2015 NOV | WestLand Resources, Inc. | Devils Canyon, Queen Creek, Mineral Creek |
| Vegetation | *Soil and Range Resource Inventory of the National Audubon Society Appleton-Whittell Research Ranch Santa Cruz County, Arizona Special Report* | 2001 APR | Natural Resources Conservation Service | Appleton Ranch |
| Vegetation; Wildlife | *A History of the Land in the National Audubon Society's Research Ranch Near Elgin, in Santa Cruz County, Arizona* | 2008 JUN | Collins, Glendon E. | Appleton Ranch |

# APPENDIX C

Resource Studies Conducted in Support of the Resolution Copper Project

| Type of Resource Study | Document Title | Document Date | Author (Organization) | Area |
|---|---|---|---|---|
| Wildlife | *Avian surveys conducted by Audubon Arizona IBA Program at 7B Ranch, Lower San Pedro River, Mammoth, Arizona, 2006-2010, by Audubon's Important Bird Areas Program, Avian Science Initiative, Tucson Audubon Society* | Undated | Audubon Society | Lower San Pedro |
| Wildlife | *Mammals of the Research Ranch* | 2007 NOV | Audubon Society | Appleton Ranch |
| Wildlife | *Bird Checklist* | 2014 JUN | Audubon Society | Appleton Ranch |
| Wildlife | *Western yellow billed cuckoo (Coccyzus americanus occidentalis) 2015 Yellow-billed Cuckoo Surveys on Queen and Arnett Creeks* | 2015 | Audubon Arizona | Queen Creek, Arnett Creek |
| Wildlife | *Herpetofauna of the Appleton-Whittell Research Ranch* | 2012 NOV | Audubon Society | Appleton Ranch |
| Wildlife | *Herpetofauna Species list for the Appleton-Whittell Research Ranch of the National Audubon Society* | 2011 JUL | Audubon Society | Appleton Ranch |

* Cultural resources reports are not provided to the public; information regarding the location of archaeological sites is protected by state and federal laws including (but not limited to): Arizona Revised Statute (ARS) §39-125; the National Historic Preservation Act (NHPA), Title III, §304; and the Archaeological Resource Protection Act, 16 United States Code (USC) 470aa *et seq*.).

# APPENDIX D

Emissions Inventory

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 1 | SHEET: README |
| AIR EMISSION CALCULATIONS | SUBJECT: Assumptions, Notes and Questions | DATE: August 21, 2014 | | |

*This workbook and any attachments are being transmitted and shared in confidence for the use of the individual(s) or entity to which it is addressed and may contain information that is confidential, privileged, proprietary, or exempt from disclosure. Any use not in accordance with its purpose, any distribution or any copying by persons other than the intended recipient(s) is prohibited. If you received this workbook in error, please notify the sender and delete the material.*

**This version of the EI is considered to be Revision 1 of the final inventory.**
**Use of the emissions estimates should be limited to permitting strategy and general characterization of emissions from the project.**

Listed below are the assumptions used in the emission calculations in this workbook.

Surface emission factors used for underground operations
Blasting agent is 100% ANFO
There is no gasoline used; all fuel is diesel - project wide
There are no exposed stockpiles
Control efficiencies taken from AP-42 where applicable
Diesel fuel tank size and refuel frequency estimated based on reasonable tank size and gal/hr fuel usages
10% of ore mined is recycled to oversize
The emergency generators at the mill are placeholders. Update with new info as available.
Refrigeration cooling towers have a constant water flow rate, making ton/hr * 8760 = ton/yr
1 RT LHD takes 2 minutes. It is moving for 1 min @ 9km/hr.
Mill is at West Plant
All Dust Collectors have 100% Capture
Dust collectors have a grain loading of 0.002 gr/dscf per Donaldson Torit, manufacturer
"Mill" = "Concentrator"
"Loadout" = "Filter Plant"
Year 30 is max production year

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 2 | SHEET: Gen Info |
| AIR EMISSION CALCULATIONS | SUBJECT: General Mining and Milling Information | DATE: July 25, 2014 | | |

**Mining Information**

**Mine Throughput**

| | Production |
|---|---|
| *tonne/hr* | 6,250 |
| *tonne/day* | 150,000 |
| *tonne/yr* | 43,800,000 |
| *ton/hr* | 6,889 |
| *ton/day* | 165,347 |
| *ton/yr* | 48,281,178 |

**Material Moisture Content and Wind Speed**

| Location | Solids* % | Ore Moisture Content % | Air/Wind Speed *mph* | *m/s* | Notes |
|---|---|---|---|---|---|
| *EAST PLANT* | | | | | |
| LHD/Ore Pass/Grizzly | | 4.0 | 1.4 | 0.6 | a, b |
| Rail Haulage Ore Flow | | 4.0 | 2.2 | 1.0 | a |
| Primary Crushing Ore Flow | | 4.0 | 4.0 | 1.8 | a |
| Lower Level Conveyor Ore Flow | | 4.0 | 2.4 | 1.1 | a |
| Hoisting System Ore Flow | | 4.0 | 1.3 | 0.6 | a |
| Upper Level Conveyor System Ore Flow | | 4.0 | 4.5 | 2.0 | b |
| *MILL* | | | | | |
| Incline Conveyor to Mine Transfer Conveyor | 96.0 | 4.0 | 1.3 | | |
| Enclosed Stockpile | 95.8 | 4.2 | 1.3 | | |
| Stockpile Reclaim | 95.8 | 4.2 | 1.3 | | |
| SAG Feeder Conveyors | | 4.8 | 1.3 | | |
| Pebble Recycle | | 4.8 | 1.3 | | |
| Holoflite Dryer - In | | 4.8 | 1.3 | | |
| Holoflite Dryer - Out | | 4.8 | 1.3 | | |
| *LOADOUT* | | | | | |
| All | | 4.8 | 1.3 | | |

**Mill Flowcharts (6000-FS-601 through 623)*

[a] *Email from C. Pascoe to K. Ballard 7/27/2014*

[b] *RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf*

**Ore Silt Content**

| |
|---|
| 2.0% |

*Email from K. Ballard, 6/5/14, based on grindability studies*

**Conversions**

| | |
|---|---|
| 1.10231 | *ton/tonne* |
| 907.185 | *kg/ton* |
| 2.237 | *mph/mps* |
| 24 | *hr/day* |
| 365 | *day/yr* |
| 8,760 | *hr/yr* |

*Blue values are input , black values are calculated or linked*

**Milling Information**

| Mill Availability |
|---|
| 92% |

**Mill Throughput**

| | SAG Mill Stockpile | Entering Each SAG Mill (2) | Each SAG Mill Processing (2) | Each Screen Screen O'Size (2) | Entering Each Ball Mill (4) |
|---|---|---|---|---|---|
| *tonne/hr* | 8,214 | 5,000 | 5,000 | 1,875 | 6,810 |
| *tonne/day* | 138,000 | 138,000 | 138,000 | 45,000 | 163,447 |
| *tonne/yr* | 43,800,000 | 42,048,876 | 42,048,876 | 5,475,000 | 53,408,844 |
| | | | | | |
| *ton/hr* | 9,054 | 5,512 | 5,512 | 2,067 | 7,507 |
| *ton/day* | 152,119 | 152,119 | 152,119 | 49,604 | 180,169 |
| *ton/yr* | 48,281,178 | 46,350,897 | 46,350,897 | 6,035,147 | 58,873,103 |

**Mill Throughput Continued**

| | Pebble Circuit | Moly Filter Cake to Dryer | Dried Moly Concentrate | Cu Concentrate Loadout |
|---|---|---|---|---|
| *tonne/hr* | 1,875 | 3.1 | 2.8 | 263 |
| *tonne/day* | 45,000 | 74 | 67 | 6,310 |
| *tonne/yr* | 13,711,590 | 22,670 | 20,476 | 1,922,548 |
| | | | | |
| *ton/hr* | 2,067 | 3 | 3 | 290 |
| *ton/day* | 49,604 | 82 | 74 | 6,955 |
| *ton/yr* | 15,114,423 | 24,989 | 22,571 | 2,119,244 |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 2 | SHEET: Atty_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Emission by Class | DATE: August 20, 2014 | | |

**FACILITY - CONTROLLED - EMISSIONS SUMMARY (INCLUDING FUGITIVES)**

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Location** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| East Plant Surface | | | | | | | | | | | | |
| *Stack** | *32.6* | *8.1* | *134* | *33.5* | *0.69* | *0.17* | *4.8* | *2.2* | *4.6* | *1.3* | *13.3* | *3.3* |
| *Process Fugitive** | | | | | | | | | | | | |
| *Fugitive* | | | | | | | *98.2* | *38.3* | *14.8* | *5.7* | *3.3E-4* | *1.4E-3* |
| *Mobile* | *1.8* | *1.7* | *0.20* | *0.19* | *1.8E-3* | *1.7E-3* | *0.01* | *0.01* | *0.01* | *0.01* | *0.10* | *0.09* |
| *Subtotal* | *34.3* | *9.8* | *134* | *33.6* | *0.70* | *0.18* | *103* | *40.5* | *19.4* | *7.1* | *13.4* | *3.4* |
| East Plant Underground | | | | | | | | | | | | |
| *Stack* | | | | | | | *3.8* | *16.6* | *3.7* | *16.4* | | |
| *Process Fugitive* | | | | | | | *11.5* | *40.2* | *1.4* | *4.8* | | |
| *Fugitive* | *136* | *30.2* | *25.9* | *5.7* | *8.4* | *1.9* | *74.3* | *92.0* | *7.9* | *10.9* | *4.8E-3* | *0.02* |
| *Mobile* | *136* | *80.4* | *12.2* | *7.4* | *0.11* | *0.07* | *0.61* | *0.37* | *0.61* | *0.37* | *5.8* | *3.5* |
| *Subtotal* | *272* | *111* | *38.0* | *13.1* | *8.5* | *1.9* | *90.2* | *149* | *13.6* | *32.4* | *5.8* | *3.5* |
| Mill | | | | | | | | | | | | |
| *Stack** | *8.4* | *3.2* | *8.0* | *2.2* | *0.02* | *0.01* | *0.90* | *2.7* | *0.90* | *2.7* | *4.3* | *1.1* |
| *Process Fugitive** | | | | | | | *2.8* | *10.0* | *0.40* | *1.4* | | |
| *Fugitive* | | | | | | | *45.2* | *26.9* | *6.3* | *3.6* | *0.02* | *0.09* |
| *Mobile* | *28.9* | *34.8* | *4.6* | *5.2* | *0.05* | *0.05* | *0.17* | *0.22* | *0.17* | *0.22* | *3.0* | *3.3* |
| *Subtotal* | *37.3* | *38.1* | *12.6* | *7.4* | *0.06* | *0.06* | *49.1* | *39.8* | *7.8* | *7.9* | *7.4* | *4.5* |
| Loadout | | | | | | | | | | | | |
| *Stack** | | | | | | | | | | | | |
| *Process Fugitive** | | | | | | | *0.21* | *0.79* | *0.03* | *0.12* | | |
| *Fugitive* | | | | | | | *0.05* | *0.02* | *0.01* | *2.0E-3* | *3.1E-3* | *0.01* |
| *Mobile* | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *0.05* | *0.13* | *0.05* | *0.13* | *0.51* | *1.3* |
| *Subtotal* | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *0.32* | *0.94* | *0.09* | *0.25* | *0.51* | *1.3* |
| Tailings | | | | | | | | | | | | |
| *Stack** | | | | | | | | | | | | |
| *Process Fugitive** | | | | | | | | | | | | |
| *Fugitive* | | | | | | | *92.1* | *93.6* | *11.5* | *10.9* | *0.02* | *0.09* |
| *Mobile* | *108* | *159* | *13.1* | *18.2* | *0.20* | *0.25* | *0.62* | *0.89* | *0.62* | *0.89* | *6.9* | *9.0* |
| *Subtotal* | *108* | *159* | *13.1* | *18.2* | *0.20* | *0.25* | *92.8* | *94.5* | *12.1* | *11.8* | *6.9* | *9.1* |
| **FACILITY TOTAL** | ***460*** | ***341*** | ***199*** | ***75.0*** | ***9.4*** | ***2.4*** | ***335*** | ***325*** | ***53.0*** | ***59.4*** | ***34.0*** | ***21.9*** |

**Stack and process fugitive sources considered "process" sources*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: Resolution Copper EI | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 2 | OF: 2 | SHEET: Atty_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Emission by Class | DATE: August 20, 2014 | | |

**FACILITY - UNCONTROLLED - EMISSIONS SUMMARY (INCLUDING FUGITIVES)**

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Location** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| East Plant Surface | | | | | | | | | | | | |
| *Stack** | *32.6* | *8.1* | *134* | *33.5* | *0.69* | *0.17* | *4.8* | *2.2* | *4.6* | *1.3* | *13.3* | *3.3* |
| *Process Fugitive** | | | | | | | | | | | | |
| *Fugitive* | | | | | | | *146* | *59.9* | *20.1* | *8.1* | *3.3E-4* | *1.4E-3* |
| *Mobile* | *1.8* | *1.7* | *0.20* | *0.19* | *1.8E-3* | *1.7E-3* | *0.01* | *0.01* | *0.01* | *0.01* | *0.10* | *0.09* |
| *Subtotal* | *34.3* | *9.8* | *134* | *33.6* | *0.70* | *0.18* | *150* | *62.1* | *24.6* | *9.4* | *13.4* | *3.4* |
| East Plant Underground | | | | | | | | | | | | |
| *Stack** | | | | | | | *30.0* | *105* | *18.6* | *65.1* | | |
| *Process Fugitive** | | | | | | | *66.3* | *232* | *61.0* | *214* | | |
| *Fugitive* | *136* | *30.2* | *25.9* | *5.7* | *8.4* | *1.9* | *1,397* | *1,743* | *139* | *175* | *4.8E-3* | *0.02* |
| *Mobile* | *136* | *80.4* | *12.2* | *7.4* | *0.11* | *0.07* | *0.61* | *0.37* | *0.61* | *0.37* | *5.8* | *3.5* |
| *Subtotal* | *272* | *111* | *38.0* | *13.1* | *8.5* | *1.9* | *1,494* | *2,081* | *219* | *454* | *5.8* | *3.5* |
| Mill | | | | | | | | | | | | |
| *Stack** | *8.4* | *3.2* | *8.0* | *2.2* | *0.02* | *0.01* | *5.7* | *19.3* | *4.4* | *13.9* | *4.3* | *1.1* |
| *Process Fugitive** | | | | | | | *34.4* | *111* | *18.5* | *67.5* | | |
| *Fugitive* | | | | | | | *220* | *190* | *23.4* | *19.4* | *0.02* | *0.09* |
| *Mobile* | *28.9* | *34.8* | *4.6* | *5.2* | *0.05* | *0.05* | *0.17* | *0.22* | *0.17* | *0.22* | *3.0* | *3.3* |
| *Subtotal* | *37.3* | *38.1* | *12.6* | *7.4* | *0.06* | *0.06* | *260* | *321* | *46.5* | *101* | *7.4* | *4.5* |
| Loadout | | | | | | | | | | | | |
| *Stack** | | | | | | | | | | | | |
| *Process Fugitive** | | | | | | | *0.21* | *0.79* | *0.03* | *0.12* | | |
| *Fugitive* | | | | | | | *1.1* | *0.39* | *0.11* | *0.04* | *3.1E-3* | *0.01* |
| *Mobile* | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *0.05* | *0.13* | *0.05* | *0.13* | *0.51* | *1.3* |
| *Subtotal* | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *1.3* | *1.3* | *0.19* | *0.29* | *0.51* | *1.3* |
| Tailings | | | | | | | | | | | | |
| *Stack** | | | | | | | | | | | | |
| *Process Fugitive** | | | | | | | | | | | | |
| *Fugitive* | | | | | | | *1,381* | *1,355* | *165* | *146* | *0.02* | *0.09* |
| *Mobile* | *108* | *159* | *13.1* | *18.2* | *0.20* | *0.25* | *0.62* | *0.89* | *0.62* | *0.89* | *6.9* | *9.0* |
| *Subtotal* | *108* | *159* | *13.1* | *18.2* | *0.20* | *0.25* | *1,382* | *1,356* | *165* | *147* | *6.9* | *9.1* |
| **FACILITY TOTAL** | ***460*** | ***341*** | ***199*** | ***75.0*** | ***9.4*** | ***2.4*** | ***3,288*** | ***3,821*** | ***456*** | ***711*** | ***34.0*** | ***21.9*** |

**Stack and process fugitive sources considered "process" sources*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 2 | SHEET: Summary_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Facility-Wide Emissions | DATE: April 1, 2014 | | |

## FACILITY - CONTROLLED - EMISSIONS SUMMARY (INCLUDING FUGITIVES)

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| Location | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| *EP Surface Subtotal* | *34.3* | *9.8* | *134* | *33.6* | *0.70* | *0.18* | *103* | *40.5* | *19.4* | *7.1* | *13.4* | *3.4* |
| *EP UG Subtotal* | *272* | *111* | *38.0* | *13.1* | *8.5* | *1.9* | *90.2* | *149* | *13.6* | *32.4* | *5.8* | *3.5* |
| *Mill Subtotal* | *37.3* | *38.1* | *12.6* | *7.4* | *0.06* | *0.06* | *49.1* | *39.8* | *7.8* | *7.9* | *7.4* | *4.5* |
| *Loadout Subtotal* | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *0.32* | *0.94* | *0.09* | *0.25* | *0.51* | *1.3* |
| *Tailings Subtotal* | *108* | *159* | *13.1* | *18.2* | *0.20* | *0.25* | *92.8* | *94.5* | *12.1* | *11.8* | *6.9* | *9.1* |
| **FACILITY TOTAL** | ***460*** | ***341*** | ***199*** | ***75.0*** | ***9.4*** | ***2.4*** | ***335*** | ***325*** | ***53.0*** | ***59.4*** | ***34.0*** | ***21.9*** |

## FACILITY - UNCONTROLLED - EMISSIONS SUMMARY (INCLUDING FUGITIVES)

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| Location | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| *EP Surface Subtotal* | *34.3* | *9.8* | *134* | *33.6* | *0.70* | *0.18* | *150* | *62.1* | *24.6* | *9.4* | *13.4* | *3.4* |
| *EP UG Subtotal* | *272* | *111* | *38.0* | *13.1* | *8.5* | *1.9* | *1,494* | *2,081* | *219* | *454* | *5.8* | *3.5* |
| *Mill Subtotal* | *37.3* | *38.1* | *12.6* | *7.4* | *0.06* | *0.06* | *260* | *321* | *46.5* | *101* | *7.4* | *4.5* |
| *Loadout Subtotal* | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *1.3* | *1.3* | *0.19* | *0.29* | *0.51* | *1.3* |
| *Tailings Subtotal* | *108* | *159* | *13.1* | *18.2* | *0.20* | *0.25* | *1,382* | *1,356* | *165* | *147* | *6.9* | *9.1* |
| **FACILITY TOTAL** | ***460*** | ***341*** | ***199*** | ***75.0*** | ***9.4*** | ***2.4*** | ***3,288*** | ***3,821*** | ***456*** | ***711*** | ***34.0*** | ***21.9*** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 2 | OF: 2 | SHEET: Summary_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Facility-Wide Emissions | DATE: April 1, 2014 | | |

## FACILITY - CONTROLLED - EMISSIONS SUMMARY (EXCLUDING FUGITIVES)

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Location** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| *EP Surface Subtotal (NF)** | *32.6* | *8.1* | *134* | *33.5* | *0.69* | *0.17* | *4.8* | *2.2* | *4.6* | *1.3* | *13.3* | *3.3* |
| *EP UG Subtotal (NF)** | | | | | | | *15.3* | *56.9* | *5.1* | *21.1* | | |
| *Mill Subtotal (NF)** | *8.4* | *3.2* | *8.0* | *2.2* | *0.02* | *0.01* | *3.7* | *12.7* | *1.3* | *4.1* | *4.3* | *1.1* |
| *Loadout Subtotal (NF)** | | | | | | | *0.21* | *0.79* | *0.03* | *0.12* | | |
| *Tailings Subtotal (NF)** | | | | | | | | | | | | |
| **FACILITY TOTAL** | ***41.0*** | ***11.4*** | ***142*** | ***35.7*** | ***0.71*** | ***0.19*** | ***24.0*** | ***72.6*** | ***11.0*** | ***26.7*** | ***17.6*** | ***4.5*** |

*(NF)* no fugitive or mobile emissions*

## FACILITY - UNCONTROLLED - EMISSIONS SUMMARY (EXCLUDING FUGITIVES)

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Location** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| *EP Surface Subtotal (NF)** | *32.6* | *8.1* | *134* | *33.5* | *0.69* | *0.17* | *4.8* | *2.2* | *4.6* | *1.3* | *13.3* | *3.3* |
| *EP UG Subtotal (NF)** | | | | | | | *96.3* | *337* | *79.5* | *279* | | |
| *Mill Subtotal (NF)** | *8.4* | *3.2* | *8.0* | *2.2* | *0.02* | *0.01* | *40.1* | *130* | *22.9* | *81.4* | *4.3* | *1.1* |
| *Loadout Subtotal (NF)** | | | | | | | *0.21* | *0.79* | *0.03* | *0.12* | | |
| *Tailings Subtotal (NF)** | | | | | | | | | | | | |
| **FACILITY TOTAL** | ***41.0*** | ***11.4*** | ***142*** | ***35.7*** | ***0.71*** | ***0.19*** | ***141*** | ***471*** | ***107*** | ***361*** | ***17.6*** | ***4.5*** |

*(NF)* no fugitive or mobile emissions*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 18 | SHEET: EP_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: East Plant | DATE: July 25, 2014 | | |

c_COpph c_COtpy c_NOXpph c_NOXtpy c_SO2pph c_SO2tpy c_PM10pph c_PM10tpy c_PM25pph c_PM25tpy c_VOCpph c_VOCtpy

## EAST PLANT - CONTROLLED UNDERGROUND - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_EP_UG_DB | *Drilling & Blasting* | | | | | | | | | | | |
| EP_UG_DRILL | | | | | | | *0.55* | *1.9* | *0.55* | *1.9* | | |
| EP_UG_BLAST | *136* | *30.2* | *25.9* | *5.7* | *8.4* | *1.9* | *0.87* | *1.8* | *0.05* | *0.10* | | |
| 2_EP_UG_EXTRACT | *Extraction Level Ore Flow* | | | | | | | | | | | |
| EP_UG_OVER | | | | | | | *0.06* | *0.19* | *0.06* | *0.19* | | |
| 2_EP_UG_OREPASS | *LHD/Ore Pass/Grizzly* | | | | | | | | | | | |
| EP_UG_GRIZ | | | | | | | *5.1* | *17.9* | *0.34* | *1.2* | | |
| 2_EP_UG_RAIL | *Rail Haulage Ore Flow* | | | | | | | | | | | |
| EP_UG_TRAIN | | | | | | | *1.0* | *3.6* | *0.16* | *0.55* | | |
| EP_UG_COARSE | | | | | | | *0.78* | *3.4* | *0.78* | *3.4* | | |
| 2_EP_UG_1CRUSH | *Primary Crushing Ore Flow* | | | | | | | | | | | |
| EP_UG_FINE | | | | | | | | | | | | |
| 2_EP_UG_LOW_ORE | *Lower Level Conveyor Ore Flow* | | | | | | | | | | | |
| EP_UG_CV103 | | | | | | | | | | | | |
| EP_UG_CV104 | | | | | | | *0.18* | *0.78* | *0.18* | *0.78* | | |
| EP_UG_CV105 | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| EP_UG_SILO | | | | | | | *0.78* | *3.4* | *0.78* | *3.4* | | |
| EP_UG_FEED | | | | | | | | | | | | |
| EP_UG_CV106_111 | | | | | | | | | | | | |
| EP_UG_CHUTE | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| EP_UG_FLASK | | | | | | | *1.2* | *5.2* | *1.2* | *5.2* | | |
| 2_EP_UG_HOIST | *Hoisting System Ore Flow* | | | | | | | | | | | |
| EP_UG_SKIP | | | | | | | | | | | | |
| EP_UG_BIN | | | | | | | *0.53* | *1.9* | *0.08* | *0.28* | | |
| 2_EP_UG_UP_ORE | *Upper Level Conveyor System Ore Flow* | | | | | | | | | | | |
| EP_UG_FEED112_115 | | | | | | | *0.79* | *3.5* | *0.79* | *3.5* | | |
| EP_UG_CV102_105 | | | | | | | | | | | | |
| EP_UG_INC_CONV115 | | | | | | | *2.5* | *8.9* | *0.38* | *1.3* | | |
| 2_EP_UG_D | *Non-Emergency Underground Diesel Fleet* | | | | | | | | | | | |
| EP_UG_D_C | *136* | *80.4* | *12.2* | *7.4* | *0.11* | *0.07* | *0.61* | *0.37* | *0.61* | *0.37* | *5.8* | *3.5* |
| EP_UG_D_DOZ | | | | | | | *3.2* | *1.4* | *0.45* | *0.20* | | |
| EP_UG_D_FUG | | | | | | | *69.6* | *86.9* | *6.9* | *8.6* | | |
| 2_EP_UG_REF | *Underground Refrigeration Plant* | | | | | | | | | | | |
| EP_UG_COOL | | | | | | | *0.07* | *0.33* | *0.01* | *0.05* | | |
| 2_EP_UG_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| EP_UG_FUEL1 | | | | | | | | | | | *4.8E-3* | *0.02* |
| **3_EP_UG_TOTAL** | ***272*** | ***111*** | ***38.0*** | ***13.1*** | ***8.5*** | ***1.9*** | ***90.2*** | ***149*** | ***13.6*** | ***32.4*** | ***5.8*** | ***3.5*** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 2 | OF: 18 | SHEET: EP_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: East Plant | DATE: July 25, 2014 | | |

c_COpph c_COtpy c_NOXpph c_NOXtpy c_SO2pph c_SO2tpy c_PM10pph c_PM10tpy c_PM25pph c_PM25tpy c_VOCpph c_VOCtpy

## EAST PLANT - CONTROLLED SURFACE - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_EP_S_EGEN | *Emergency Generators (Total)* | | | | | | | | | | | |
| EP_S_EGEN | *32.6* | *8.1* | *134* | *33.5* | *0.69* | *0.17* | *4.5* | *1.1* | *4.5* | *1.1* | *13.3* | *3.3* |
| 2_EP_S_REF | *Surface Refrigeration Plant* | | | | | | | | | | | |
| EP_S_COOL | | | | | | | *0.25* | *1.1* | *0.04* | *0.17* | | |
| 2_EP_S_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| EP_S_FUEL1 | | | | | | | | | | | *3.3E-4* | *1.4E-3* |
| 2_EP_S_WE | *Miscellaneous Fugitive Dust* | | | | | | | | | | | |
| EP_S_WE_FT | | | | | | | *13.9* | *5.4* | *2.1* | *0.82* | | |
| EP_S_WE_FTS | | | | | | | *82.4* | *32.0* | *12.5* | *4.8* | | |
| EP_S_EFD | | | | | | | *1.6* | *0.58* | *0.16* | *0.06* | | |
| 2_EP_S_D | *Non-Emergency Surface Diesel Fleet* | | | | | | | | | | | |
| EP_S_D_C | *1.8* | *1.7* | *0.20* | *0.19* | *1.8E-3* | *1.7E-3* | *0.01* | *0.01* | *0.01* | *0.01* | *0.10* | *0.09* |
| EP_S_D_DOZ | | | | | | | | | | | | |
| EP_S_D_FUG | | | | | | | *0.35* | *0.34* | *0.04* | *0.03* | | |
| **3_EP_S_TOTAL** | ***34.3*** | ***9.8*** | ***134*** | ***33.6*** | ***0.70*** | ***0.18*** | ***103*** | ***40.5*** | ***19.4*** | ***7.1*** | ***13.4*** | ***3.4*** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 3 | OF: 18 | SHEET: EP_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: East Plant | DATE: July 25, 2014 | | |

u_COpph u_COtpy u_NOXpph u_NOXtpy u_SO2pph u_SO2tpy u_PM10pph u_PM10tpy u_PM25pph u_PM25tpy u_VOCpph u_VOCtpy

## EAST PLANT - UNCONTROLLED UNDERGROUND - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_EP_UG_DB | *Drilling & Blasting* | | | | | | | | | | | |
| EP_UG_DRILL | | | | | | | *0.55* | *1.9* | *0.55* | *1.9* | | |
| EP_UG_BLAST | *136* | *30.2* | *25.9* | *5.7* | *8.4* | *1.9* | *0.87* | *1.8* | *0.05* | *0.10* | | |
| 2_EP_UG_EXTRACT | *Extraction Level Ore Flow* | | | | | | | | | | | |
| EP_UG_OVER | | | | | | | *0.06* | *0.19* | *0.06* | *0.19* | | |
| 2_EP_UG_OREPASS | *LHD/Ore Pass/Grizzly* | | | | | | | | | | | |
| EP_UG_GRIZ | | | | | | | *59.9* | *210* | *59.9* | *210* | | |
| 2_EP_UG_RAIL | *Rail Haulage Ore Flow* | | | | | | | | | | | |
| EP_UG_TRAIN | | | | | | | *1.0* | *3.6* | *0.16* | *0.55* | | |
| EP_UG_COARSE | | | | | | | *1.0* | *3.6* | *0.16* | *0.55* | | |
| 2_EP_UG_1CRUSH | *Primary Crushing Ore Flow* | | | | | | | | | | | |
| EP_UG_FINE | | | | | | | *16.5* | *57.9* | *16.5* | *57.9* | | |
| 2_EP_UG_LOW_ORE | *Lower Level Conveyor Ore Flow* | | | | | | | | | | | |
| EP_UG_CV103 | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| EP_UG_CV104 | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| EP_UG_CV105 | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| EP_UG_SILO | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| EP_UG_FEED | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| EP_UG_CV106_111 | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| EP_UG_CHUTE | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| EP_UG_FLASK | | | | | | | *1.1* | *3.9* | *0.17* | *0.60* | | |
| 2_EP_UG_HOIST | *Hoisting System Ore Flow* | | | | | | | | | | | |
| EP_UG_SKIP | | | | | | | *0.53* | *1.9* | *0.08* | *0.28* | | |
| EP_UG_BIN | | | | | | | *0.53* | *1.9* | *0.08* | *0.28* | | |
| 2_EP_UG_UP_ORE | *Upper Level Conveyor System Ore Flow* | | | | | | | | | | | |
| EP_UG_FEED112_115 | | | | | | | *2.5* | *8.9* | *0.38* | *1.3* | | |
| EP_UG_CV102_105 | | | | | | | *2.5* | *8.9* | *0.38* | *1.3* | | |
| EP_UG_INC_CONV115 | | | | | | | *2.5* | *8.9* | *0.38* | *1.3* | | |
| 2_EP_UG_D | *Non-Emergency Underground Diesel Fleet* | | | | | | | | | | | |
| EP_UG_D_C | *136* | *80.4* | *12.2* | *7.4* | *0.11* | *0.07* | *0.61* | *0.37* | *0.61* | *0.37* | *5.8* | *3.5* |
| EP_UG_D_DOZ | | | | | | | *3.2* | *1.4* | *0.45* | *0.20* | | |
| EP_UG_D_FUG | | | | | | | *1,393* | *1,738* | *138* | *173* | | |
| 2_EP_UG_REF | *Underground Refrigeration Plant* | | | | | | | | | | | |
| EP_UG_COOL | | | | | | | *0.07* | *0.33* | *0.01* | *0.05* | | |
| 2_EP_UG_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| EP_UG_FUEL1 | | | | | | | | | | | *4.8E-3* | *0.02* |
| **3_EP_UG_TOTAL** | ***272*** | ***111*** | ***38.0*** | ***13.1*** | ***8.5*** | ***1.9*** | ***1,494*** | ***2,081*** | ***219*** | ***454*** | ***5.8*** | ***3.5*** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 4 | OF: 18 | SHEET: EP_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: East Plant | DATE: July 25, 2014 | | |

u_COpph u_COtpy u_NOXpph u_NOXtpy u_SO2pph u_SO2tpy u_PM10pph u_PM10tpy u_PM25pph u_PM25tpy u_VOCpph u_VOCtpy

## EAST PLANT - UNCONTROLLED SURFACE - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_EP_S_EGEN | *Emergency Generators (Total)* | | | | | | | | | | | |
| EP_S_EGEN | *32.6* | *8.1* | *134* | *33.5* | *0.69* | *0.17* | *4.5* | *1.1* | *4.5* | *1.1* | *13.3* | *3.3* |
| 2_EP_S_REF | *Surface Refrigeration Plant* | | | | | | | | | | | |
| EP_S_COOL | | | | | | | *0.25* | *1.1* | *0.04* | *0.17* | | |
| 2_EP_S_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| EP_S_FUEL1 | | | | | | | | | | | *3.3E-4* | *1.4E-3* |
| 2_EP_S_WE | *Miscellaneous Fugitive Dust* | | | | | | | | | | | |
| EP_S_WE_FT | | | | | | | *13.9* | *5.4* | *2.1* | *0.82* | | |
| EP_S_WE_FTS | | | | | | | *92.8* | *36.0* | *14.1* | *5.5* | | |
| EP_S_EFD | | | | | | | *32.0* | *11.7* | *3.2* | *1.2* | | |
| 2_EP_S_D | *Non-Emergency Surface Diesel Fleet* | | | | | | | | | | | |
| EP_S_D_C | *1.8* | *1.7* | *0.20* | *0.19* | *1.8E-3* | *1.7E-3* | *0.01* | *0.01* | *0.01* | *0.01* | *0.10* | *0.09* |
| EP_S_D_DOZ | | | | | | | | | | | | |
| EP_S_D_FUG | | | | | | | *7.0* | *6.8* | *0.70* | *0.68* | | |
| **3_EP_S_TOTAL** | ***34.3*** | ***9.8*** | ***134*** | ***33.6*** | ***0.70*** | ***0.18*** | ***150*** | ***62.1*** | ***24.6*** | ***9.4*** | ***13.4*** | ***3.4*** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
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| | PROJECT NO: 262-9-01 | PAGE: 5 | OF: 18 | SHEET: EP_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: East Plant | DATE: July 25, 2014 | | |

c_COEF c_NOXEF c_SO2EF c_PM10EF c_PM25EF c_VOCEF c_EFunits

## EAST PLANT - CONTROLLED UNDERGROUND - EMISSION FACTORS

| | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|
| **Source ID** | **CO** | **$NO_X$** | **$SO_2$** | **$PM_{10}$** | **$PM_{2.5}$** | **VOC** | **Units & Notes** |
| 2_EP_UG_DB | *Drilling & Blasting* | | | | | | |
| EP_UG_DRILL | | | | | | | *See "Drill & Blast" Sheet* |
| EP_UG_BLAST | | | | | | | *See "Drill & Blast" Sheet* |
| 2_EP_UG_EXTRACT | *Extraction Level Ore Flow* | | | | | | |
| EP_UG_OVER | | | | *8.0E-5* | *8.0E-5* | | *lb/ton* |
| 2_EP_UG_OREPASS | *LHD/Ore Pass/Grizzly* | | | | | | |
| EP_UG_GRIZ | | | | *7.4E-4* | *5.0E-5* | | *lb/ton* |
| 2_EP_UG_RAIL | *Rail Haulage Ore Flow* | | | | | | |
| EP_UG_TRAIN | | | | *1.5E-4* | *2.3E-5* | | *lb/ton* |
| EP_UG_COARSE | | | | | | | *Dust Collectors (915420 dscf/hr, 0.002 gr/dscf)* |
| 2_EP_UG_1CRUSH | *Primary Crushing Ore Flow* | | | | | | |
| EP_UG_FINE | | | | | | | *Emissions accounted for in EP_UG_COARSE* |
| 2_EP_UG_LOW_ORE | *Lower Level Conveyor Ore Flow* | | | | | | |
| EP_UG_CV103 | | | | | | | *Emissions accounted for in EP_UG_COARSE* |
| EP_UG_CV104 | | | | | | | *Dust Collectors (207495 dscf/hr, 0.002 gr/dscf)* |
| EP_UG_CV105 | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| EP_UG_SILO | | | | | | | *Dust Collectors (915420 dscf/hr, 0.002 gr/dscf)* |
| EP_UG_FEED | | | | | | | *Emissions accounted for in EP_UG_SILO* |
| EP_UG_CV106_111 | | | | | | | *Emissions accounted for in EP_UG_SILO* |
| EP_UG_CHUTE | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| EP_UG_FLASK | | | | | | | *Dust Collectors (691651 dscf/hr, 0.002 gr/dscf)* |
| 2_EP_UG_HOIST | *Hoisting System Ore Flow* | | | | | | |
| EP_UG_SKIP | | | | | | | *Emissions accounted for in EP_UG_FLASK* |
| EP_UG_BIN | | | | *7.7E-5* | *1.2E-5* | | *lb/ton* |
| 2_EP_UG_UP_ORE | *Upper Level Conveyor System Ore Flow* | | | | | | |
| EP_UG_FEED112_115 | | | | | | | *Dust Collectors (691651 dscf/hr, 0.002 gr/dscf)* |
| EP_UG_CV102_105 | | | | | | | *Emissions accounted for in EP_UG_FEED112_115* |
| EP_UG_INC_CONV115 | | | | *3.7E-4* | *5.6E-5* | | *lb/ton* |
| 2_EP_UG_D | *Non-Emergency Underground Diesel Fleet* | | | | | | |
| EP_UG_D_C | | | | | | | *See "EP_Fleet" Sheet* |
| EP_UG_D_DOZ | | | | | | | *See "EP_Fleet" Sheet* |
| EP_UG_D_FUG | | | | | | | *See "EP_Fleet" Sheet* |
| 2_EP_UG_REF | *Underground Refrigeration Plant* | | | | | | |
| EP_UG_COOL | | | | | | | *See "EP Cooling" Sheet* |
| 2_EP_UG_FUEL | *Diesel Storage Tanks* | | | | | | |
| EP_UG_FUEL1 | | | | | | | *See "Fuel Tanks" Sheet* |

c_COEF c_NOXEF c_SO2EF c_PM10EF c_PM25EF c_VOCEF c_EFunits

## EAST PLANT - CONTROLLED SURFACE - EMISSION FACTORS

| | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|
| **Source ID** | **CO** | **$NO_X$** | **$SO_2$** | **$PM_{10}$** | **$PM_{2.5}$** | **VOC** | **Units & Notes** |
| 2_EP_S_EGEN | *Emergency Generators (Total)* | | | | | | |
| EP_S_EGEN | | | | | | | *See "E_Gen" Sheet* |
| 2_EP_S_REF | *Surface Refrigeration Plant* | | | | | | |
| EP_S_COOL | | | | | | | *See "EP Cooling" Sheet* |
| 2_EP_S_FUEL | *Diesel Storage Tanks* | | | | | | |
| EP_S_FUEL1 | | | | | | | *See "Fuel Tanks" Sheet* |
| 2_EP_S_WE | *Miscellaneous Fugitive Dust* | | | | | | |
| EP_S_WE_FT | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| EP_S_WE_FTS | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| EP_S_EFD | | | | *0.14* | *0.01* | | *lb/VMT* |
| 2_EP_S_D | *Non-Emergency Surface Diesel Fleet* | | | | | | |
| EP_S_D_C | | | | | | | *See "EP_Fleet" Sheet* |
| EP_S_D_DOZ | | | | | | | *See "EP_Fleet" Sheet* |
| EP_S_D_FUG | | | | | | | *See "EP_Fleet" Sheet* |

u_COEF u_NOXEF u_SO2EF u_PM10EF u_PM25EF u_VOCEF u_EFunits

## EAST PLANT - UNCONTROLLED UNDERGROUND - EMISSION FACTORS

| | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|
| Source ID | CO | $NO_X$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | VOC | Units & Notes |
| 2_EP_UG_DB | *Drilling & Blasting* | | | | | | |
| EP_UG_DRILL | | | | | | | *See "Drill & Blast" Sheet* |
| EP_UG_BLAST | | | | | | | *See "Drill & Blast" Sheet* |
| 2_EP_UG_EXTRACT | *Extraction Level Ore Flow* | | | | | | |
| EP_UG_OVER | | | | *8.0E-5* | *8.0E-5* | | *lb/ton* |
| 2_EP_UG_OREPASS | *LHD/Ore Pass/Grizzly* | | | | | | |
| EP_UG_GRIZ | | | | *0.01* | *0.01* | | *lb/ton* |
| 2_EP_UG_RAIL | *Rail Haulage Ore Flow* | | | | | | |
| EP_UG_TRAIN | | | | *1.5E-4* | *2.3E-5* | | *lb/ton* |
| EP_UG_COARSE | | | | *1.5E-4* | *2.3E-5* | | *lb/ton* |
| 2_EP_UG_1CRUSH | *Primary Crushing Ore Flow* | | | | | | |
| EP_UG_FINE | | | | *2.4E-3* | *2.4E-3* | | *lb/ton* |
| 2_EP_UG_LOW_ORE | *Lower Level Conveyor Ore Flow* | | | | | | |
| EP_UG_CV103 | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| EP_UG_CV104 | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| EP_UG_CV105 | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| EP_UG_SILO | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| EP_UG_FEED | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| EP_UG_CV106_111 | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| EP_UG_CHUTE | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| EP_UG_FLASK | | | | *1.6E-4* | *2.5E-5* | | *lb/ton* |
| 2_EP_UG_HOIST | *Hoisting System Ore Flow* | | | | | | |
| EP_UG_SKIP | | | | *7.7E-5* | *1.2E-5* | | *lb/ton* |
| EP_UG_BIN | | | | *7.7E-5* | *1.2E-5* | | *lb/ton* |
| 2_EP_UG_UP_ORE | *Upper Level Conveyor System Ore Flow* | | | | | | |
| EP_UG_FEED112_115 | | | | *3.7E-4* | *5.6E-5* | | *lb/ton* |
| EP_UG_CV102_105 | | | | *3.7E-4* | *5.6E-5* | | *lb/ton* |
| EP_UG_INC_CONV115 | | | | *3.7E-4* | *5.6E-5* | | *lb/ton* |
| 2_EP_UG_D | *Non-Emergency Underground Diesel Fleet* | | | | | | |
| EP_UG_D_C | | | | | | | *See "EP_Fleet" Sheet* |
| EP_UG_D_DOZ | | | | | | | *See "EP_Fleet" Sheet* |
| EP_UG_D_FUG | | | | | | | *See "EP_Fleet" Sheet* |
| 2_EP_UG_REF | *Underground Refrigeration Plant* | | | | | | |
| EP_UG_COOL | | | | | | | *See "EP Cooling" Sheet* |
| 2_EP_UG_FUEL | *Diesel Storage Tanks* | | | | | | |
| EP_UG_FUEL1 | | | | | | | *See "Fuel Tanks" Sheet* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 8 | OF: 18 | SHEET: EP_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: East Plant | DATE: July 25, 2014 | | |

u_COEF u_NOXEF u_SO2EF u_PM10EF u_PM25EF u_VOCEF u_EFunits

## EAST PLANT - UNCONTROLLED SURFACE - EMISSION FACTORS

| | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|
| **Source ID** | **CO** | **$NO_X$** | **$SO_2$** | **$PM_{10}$** | **$PM_{2.5}$** | **VOC** | **Units & Notes** |
| 2_EP_S_EGEN | *Emergency Generators (Total)* | | | | | | |
| EP_S_EGEN | | | | | | | *See "E_Gen" Sheet* |
| 2_EP_S_REF | *Surface Refrigeration Plant* | | | | | | |
| EP_S_COOL | | | | | | | *See "EP Cooling" Sheet* |
| 2_EP_S_FUEL | *Diesel Storage Tanks* | | | | | | |
| EP_S_FUEL1 | | | | | | | *See "Fuel Tanks" Sheet* |
| 2_EP_S_WE | *Miscellaneous Fugitive Dust* | | | | | | |
| EP_S_WE_FT | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| EP_S_WE_FTS | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| EP_S_EFD | | | | *0.14* | *0.01* | | *lb/VMT* |
| 2_EP_S_D | *Non-Emergency Surface Diesel Fleet* | | | | | | |
| EP_S_D_C | | | | | | | *See "EP_Fleet" Sheet* |
| EP_S_D_DOZ | | | | | | | *See "EP_Fleet" Sheet* |
| EP_S_D_FUG | | | | | | | *See "EP_Fleet" Sheet* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 9 | OF: 18 | SHEET: EP_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: East Plant | DATE: July 25, 2014 | | |

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## EAST PLANT - UNDERGROUND - PROCESS RATES

| | Process Rates | | |
|---|---|---|---|
| Source ID | Unit/Hr | Unit/Yr | Units & Notes |
| 2_EP_UG_DB | *Drilling & Blasting* | | |
| EP_UG_DRILL | | | *See "Drill & Blast" Sheet* |
| EP_UG_BLAST | | | *See "Drill & Blast" Sheet* |
| 2_EP_UG_EXTRA | *Extraction Level Ore Flow* | | |
| EP_UG_OVER | *689* | *4,828,118* | *ton* |
| 2_EP_UG_OREPA | *LHD/Ore Pass/Grizzly* | | |
| EP_UG_GRIZ | *6,889* | *48,281,178* | *ton* |
| 2_EP_UG_RAIL | *Rail Haulage Ore Flow* | | |
| EP_UG_TRAIN | *6,889* | *48,281,178* | *ton* |
| EP_UG_COARSE | *6,889* | *48,281,178* | *ton* |
| 2_EP_UG_1CRUS | *Primary Crushing Ore Flow* | | |
| EP_UG_FINE | *6,889* | *48,281,178* | *ton* |
| 2_EP_UG_LOW_ | *Lower Level Conveyor Ore Flow* | | |
| EP_UG_CV103 | *6,889* | *48,281,178* | *ton* |
| EP_UG_CV104 | *6,889* | *48,281,178* | *ton* |
| EP_UG_CV105 | *6,889* | *48,281,178* | *ton* |
| EP_UG_SILO | *6,889* | *48,281,178* | *ton* |
| EP_UG_FEED | *6,889* | *48,281,178* | *ton* |
| EP_UG_CV106_111 | *6,889* | *48,281,178* | *ton* |
| EP_UG_CHUTE | *6,889* | *48,281,178* | *ton* |
| EP_UG_FLASK | *6,889* | *48,281,178* | *ton* |
| 2_EP_UG_HOIST | *Hoisting System Ore Flow* | | |
| EP_UG_SKIP | *6,889* | *48,281,178* | *ton* |
| EP_UG_BIN | *6,889* | *48,281,178* | *ton* |
| 2_EP_UG_UP_OI | *Upper Level Conveyor System Ore Flow* | | |
| EP_UG_FEED112_115 | *6,889* | *48,281,178* | *ton* |
| EP_UG_CV102_105 | *6,889* | *48,281,178* | *ton* |
| EP_UG_INC_CONV115 | *6,889* | *48,281,178* | *ton* |
| 2_EP_UG_D | *Non-Emergency Underground Diesel Fleet* | | |
| EP_UG_D_C | | | *See "EP_Fleet" Sheet* |
| EP_UG_D_DOZ | | | *See "EP_Fleet" Sheet* |
| EP_UG_D_FUG | | | *See "EP_Fleet" Sheet* |
| 2_EP_UG_REF | *Underground Refrigeration Plant* | | |
| EP_UG_COOL | | | *See "EP Cooling" Sheet* |
| 2_EP_UG_FUEL | *Diesel Storage Tanks* | | |
| EP_UG_FUEL1 | *521* | *655,607* | *gal* |

oretonhr oretonyr procunit

## EAST PLANT - SURFACE - PROCESS RATES

| Source ID | | Process Rates Unit/Hr | Unit/Yr | Units & Notes |
|---|---|---|---|---|
| 2_EP_S_EGEN | *Emergency Generators (Total)* | | | |
| EP_S_EGEN | | | | *See "E_Gen" Sheet* |
| 2_EP_S_REF | *Surface Refrigeration Plant* | | | |
| EP_S_COOL | | | | *See "EP Cooling" Sheet* |
| 2_EP_S_FUEL | *Diesel Storage Tanks* | | | |
| EP_S_FUEL1 | | *8.4* | *16,259* | *gal* |
| 2_EP_S_WE | *Miscellaneous Fugitive Dust* | | | |
| EP_S_WE_FT | | | *30.0* | *acre* |
| EP_S_WE_FTS | | | *200* | *acre* |
| EP_S_EFD | | | | *See "Employees" Sheet* |
| 2_EP_S_D | *Non-Emergency Surface Diesel Fleet* | | | |
| EP_S_D_C | | | | *See "EP_Fleet" Sheet* |
| EP_S_D_DOZ | | | | *See "EP_Fleet" Sheet* |
| EP_S_D_FUG | | | | *See "EP_Fleet" Sheet* |

ContTech ContEff CE_EF

## EAST PLANT - UNDERGROUND - CONTROLS

| Source ID | Control Technology | Control Efficiency | Notes |
|---|---|---|---|
| 2_EP_UG_DB | | | |
| EP_UG_DRILL | | *0%* | |
| EP_UG_BLAST | | *0%* | |
| 2_EP_UG_EXTRA | | | |
| EP_UG_OVER | | *0%* | |
| 2_EP_UG_OREP/ | | | |
| EP_UG_GRIZ | *moisture* | *0%* | *Control accounted for in EF* |
| 2_EP_UG_RAIL | | | |
| EP_UG_TRAIN | *moisture* | *0%* | *Control accounted for in EF* |
| EP_UG_COARSE | *3 dust collectors* | | *Control accounted for in emission calculation* |
| 2_EP_UG_1CRUS | | | |
| EP_UG_FINE | | | *Emissions accounted for in EP_UG_COARSE* |
| 2_EP_UG_LOW_ | | | |
| EP_UG_CV103 | | | *Emissions accounted for in EP_UG_COARSE* |
| EP_UG_CV104 | *3 dust collectors* | | *Control accounted for in emission calculation* |
| EP_UG_CV105 | *moisture* | *0%* | *Control accounted for in EF* |
| EP_UG_SILO | *3 dust collectors* | | *Control accounted for in emission calculation* |
| EP_UG_FEED | | | *Emissions accounted for in EP_UG_SILO* |
| EP_UG_CV106_111 | | | *Emissions accounted for in EP_UG_SILO* |
| EP_UG_CHUTE | *moisture* | *0%* | *Control accounted for in EF* |
| EP_UG_FLASK | *6 dust collectors* | | *Control accounted for in emission calculation* |
| 2_EP_UG_HOIST | | | |
| EP_UG_SKIP | | | *Emissions accounted for in EP_UG_FLASK* |
| EP_UG_BIN | *moisture* | *0%* | *Control accounted for in EF* |
| 2_EP_UG_UP_OF | | | |
| EP_UG_FEED112_115 | *4 dust collectors* | | *Control accounted for in emission calculation* |
| EP_UG_CV102_105 | | | *Emissions accounted for in EP_UG_FEED112_115* |
| EP_UG_INC_CONV115 | *moisture* | *0%* | *Control accounted for in EF* |
| 2_EP_UG_D | | | |
| EP_UG_D_C | | *0%* | |
| EP_UG_D_DOZ | | *0%* | |
| EP_UG_D_FUG | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |
| 2_EP_UG_REF | | | |
| EP_UG_COOL | *drift eliminators* | | *Control accounted for in EF* |
| 2_EP_UG_FUEL | | | |
| EP_UG_FUEL1 | | *0%* | |

ContTech ContEff CE_EF

## EAST PLANT - SURFACE - CONTROLS

| Source ID | Control Technology | Control Efficiency | Notes |
|---|---|---|---|
| 2_EP_S_EGEN | | | |
| EP_S_EGEN | | *0%* | |
| 2_EP_S_REF | | | |
| EP_S_COOL | *drift eliminators* | | |
| 2_EP_S_FUEL | | | |
| EP_S_FUEL1 | | *0%* | |
| 2_EP_S_WE | | | |
| EP_S_WE_FT | | *0%* | |
| EP_S_WE_FTS | *precipitation* | *11%* | |
| EP_S_EFD | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |
| 2_EP_S_D | | | |
| EP_S_D_C | | *0%* | |
| EP_S_D_DOZ | | *0%* | |
| EP_S_D_FUG | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
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description

## EAST PLANT - UNDERGROUND - SOURCE IDENTIFICATION

| Source ID | Source Identification |
|---|---|
| 2_EP_UG_DB | ***Drilling & Blasting*** |
| EP_UG_DRILL | *Drilling* |
| EP_UG_BLAST | *Blasting* |
| 2_EP_UG_EXTRACT | ***Extraction Level Ore Flow*** |
| EP_UG_OVER | *Oversize Rock Drill Rig* |
| 2_EP_UG_OREPASS | ***LHD/Ore Pass/Grizzly*** |
| EP_UG_GRIZ | *Grizzly with Rock Breaker and associated transfers in (LHD) & out (Chute via Ore Pass)* |
| 2_EP_UG_RAIL | ***Rail Haulage Ore Flow*** |
| EP_UG_TRAIN | *Chute to Train Car (Electric)* |
| EP_UG_COARSE | *Train Car to Coarse Ore Bin* |
| 2_EP_UG_1CRUSH | ***Primary Crushing Ore Flow*** |
| EP_UG_FINE | *Gyratory Crushers (3) and associated transfers in (Coarse Ore Bin) and out (Feeders)* |
| 2_EP_UG_LOW_ORE | ***Lower Level Conveyor Ore Flow*** |
| EP_UG_CV103 | *Feeders (FE-101 - 103) to Conveyors (CV-101 - 103) and Spillage Chute* |
| EP_UG_CV104 | *Conveyors (CV-101 - 103) to Conveyor (CV-104)* |
| EP_UG_CV105 | *Conveyor (CV-104) to Tilt Conveyor (CV-105)* |
| EP_UG_SILO | *Tilt Conveyor (CV-105) to Silos (S1-101 - 103)* |
| EP_UG_FEED | *Silos S1-101 thru S1-103 to Feeders FE-106 thru FE-111* |
| EP_UG_CV106_111 | *Feeders (FE-106 - 111) to Conveyors (CV-106 - 111)* |
| EP_UG_CHUTE | *Conveyors (CV-106 - 111) to Shuttle Chutes (A - F)* |
| EP_UG_FLASK | *Shuttle Chutes (A - F) to Flasks (101 - 112)* |
| 2_EP_UG_HOIST | ***Hoisting System Ore Flow*** |
| EP_UG_SKIP | *Flasks (101 - 112) to Skips (SS-101 - 112)* |
| EP_UG_BIN | *Skips (SS-101 - 112) to Bins (1 - 4) and Spillage Chute* |
| 2_EP_UG_UP_ORE | ***Upper Level Conveyor System Ore Flow*** |
| EP_UG_FEED112_115 | *Bins (1 - 4) to Discharge Feeders (12)* |
| EP_UG_CV102_105 | *Discharge Feeders (12) to Conveyors (CV-112 - 115)* |
| EP_UG_INC_CONV115 | *Conveyors (CV-112 - 115) to Incline Conveyor (CV-201)* |
| 2_EP_UG_D | ***Non-Emergency Underground Diesel Fleet*** |
| EP_UG_D_C | *Underground Combustion* |
| EP_UG_D_DOZ | *Underground Fugitive Dust (Dozing)* |
| EP_UG_D_FUG | *Underground Fugitive Dust (Grading, Vehicle Travel)* |
| 2_EP_UG_REF | ***Underground Refrigeration Plant*** |
| EP_UG_COOL | *Underground Cooling Towers* |
| 2_EP_UG_FUEL | ***Diesel Storage Tanks*** |
| EP_UG_FUEL1 | *Underground Usage and Volume Estimated (Estimated Quantity: 6)* |
| 3_EP_UG_TOTAL | ***EP UG Subtotal*** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
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description

## EAST PLANT - SURFACE - SOURCE IDENTIFICATION

| Source ID | Source Identification |
|---|---|
| 2_EP_S_EGEN | ***Emergency Generators (Total)*** |
| EP_S_EGEN | *East Plant Emergency Generators* |
| 2_EP_S_REF | ***Surface Refrigeration Plant*** |
| EP_S_COOL | *Surface Cooling Towers* |
| 2_EP_S_FUEL | ***Diesel Storage Tanks*** |
| EP_S_FUEL1 | *Surface Usage and Volume Estimated (Estimated Quantity: 1)* |
| 2_EP_S_WE | ***Miscellaneous Fugitive Dust*** |
| EP_S_WE_FT | *East Plant Exposed Areas* |
| EP_S_WE_FTS | *East Plant Exposed Subsidence Area* |
| EP_S_EFD | *East Plant Employee Fugitive Dust* |
| 2_EP_S_D | ***Non-Emergency Surface Diesel Fleet*** |
| EP_S_D_C | *Surface Combustion* |
| EP_S_D_DOZ | *Surface Fugitive Dust (Dozing)* |
| EP_S_D_FUG | *Surface Fugitive Dust (Grading, Vehicle Travel)* |
| 3_EP_S_TOTAL | ***EP Surface Subtotal*** |

c_EFref

## EAST PLANT - CONTROLLED UNDERGROUND - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_EP_UG_DB | |
| EP_UG_DRILL | *See "Drill & Blast" Sheet* |
| EP_UG_BLAST | *See "Drill & Blast" Sheet* |
| 2_EP_UG_EXTRACT | |
| EP_UG_OVER | *AP-42, Table 11.19.2-2, Wet Drilling, Rev. 8/04* |
| 2_EP_UG_OREPASS | |
| EP_UG_GRIZ | *AP-42, Table 11.19.2-2, Screening (controlled), Rev. 8/04* |
| 2_EP_UG_RAIL | |
| EP_UG_TRAIN | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.2 mph)* |
| EP_UG_COARSE | *Assumed Grain Loading (0.002 gr/dscf)* |
| 2_EP_UG_1CRUSH | |
| EP_UG_FINE | *Emissions accounted for in EP_UG_COARSE* |
| 2_EP_UG_LOW_ORE | |
| EP_UG_CV103 | *Emissions accounted for in EP_UG_COARSE* |
| EP_UG_CV104 | *Assumed Grain Loading (0.002 gr/dscf)* |
| EP_UG_CV105 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| EP_UG_SILO | *Assumed Grain Loading (0.002 gr/dscf)* |
| EP_UG_FEED | *Emissions accounted for in EP_UG_SILO* |
| EP_UG_CV106_111 | *Emissions accounted for in EP_UG_SILO* |
| EP_UG_CHUTE | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| EP_UG_FLASK | *Assumed Grain Loading (0.002 gr/dscf)* |
| 2_EP_UG_HOIST | |
| EP_UG_SKIP | *Emissions accounted for in EP_UG_FLASK* |
| EP_UG_BIN | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 1.3 mph)* |
| 2_EP_UG_UP_ORE | |
| EP_UG_FEED112_115 | *Assumed Grain Loading (0.002 gr/dscf)* |
| EP_UG_CV102_105 | *Emissions accounted for in EP_UG_FEED112_115* |
| EP_UG_INC_CONV115 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 4.5 mph)* |
| 2_EP_UG_D | |
| EP_UG_D_C | *See "EP_Fleet" Sheet* |
| EP_UG_D_DOZ | *See "EP_Fleet" Sheet* |
| EP_UG_D_FUG | *See "EP_Fleet" Sheet* |
| 2_EP_UG_REF | |
| EP_UG_COOL | *See "EP Cooling" Sheet* |
| 2_EP_UG_FUEL | |
| EP_UG_FUEL1 | *See "Fuel Tanks" Sheet* |

c_EFref

## EAST PLANT - CONTROLLED SURFACE - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_EP_S_EGEN | |
| EP_S_EGEN | *See "E_Gen" Sheet* |
| 2_EP_S_REF | |
| EP_S_COOL | *See "EP Cooling" Sheet* |
| 2_EP_S_FUEL | |
| EP_S_FUEL1 | *See "Fuel Tanks" Sheet* |
| 2_EP_S_WE | |
| EP_S_WE_FT | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| EP_S_WE_FTS | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| EP_S_EFD | *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04* |
| 2_EP_S_D | |
| EP_S_D_C | *See "EP_Fleet" Sheet* |
| EP_S_D_DOZ | *See "EP_Fleet" Sheet* |
| EP_S_D_FUG | *See "EP_Fleet" Sheet* |

u_EFref

## EAST PLANT - UNCONTROLLED UNDERGROUND - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_EP_UG_DB | |
| EP_UG_DRILL | *See "Drill & Blast" Sheet* |
| EP_UG_BLAST | *See "Drill & Blast" Sheet* |
| 2_EP_UG_EXTRACT | |
| EP_UG_OVER | *AP-42, 11.19.2, Wet Drilling, Rev. 8/04* |
| 2_EP_UG_OREPASS | |
| EP_UG_GRIZ | *AP-42, Table 11.19.2-2, Screening (uncontrolled), Rev. 8/04* |
| 2_EP_UG_RAIL | |
| EP_UG_TRAIN | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.2 mph)* |
| EP_UG_COARSE | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.2 mph)* |
| 2_EP_UG_1CRUSH | |
| EP_UG_FINE | *AP-42, Table 11.19.2-2, Tertiary Crushing (uncontrolled), Rev. 8/04* |
| 2_EP_UG_LOW_ORE | |
| EP_UG_CV103 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| EP_UG_CV104 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| EP_UG_CV105 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| EP_UG_SILO | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| EP_UG_FEED | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| EP_UG_CV106_111 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| EP_UG_CHUTE | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| EP_UG_FLASK | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 2.4 mph)* |
| 2_EP_UG_HOIST | |
| EP_UG_SKIP | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 1.3 mph)* |
| EP_UG_BIN | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 1.3 mph)* |
| 2_EP_UG_UP_ORE | |
| EP_UG_FEED112_115 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 4.5 mph)* |
| EP_UG_CV102_105 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 4.5 mph)* |
| EP_UG_INC_CONV115 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 4.5 mph)* |
| 2_EP_UG_D | |
| EP_UG_D_C | *See "EP_Fleet" Sheet* |
| EP_UG_D_DOZ | *See "EP_Fleet" Sheet* |
| EP_UG_D_FUG | *See "EP_Fleet" Sheet* |
| 2_EP_UG_REF | |
| EP_UG_COOL | *See "EP Cooling" Sheet* |
| 2_EP_UG_FUEL | |
| EP_UG_FUEL1 | *See "Fuel Tanks" Sheet* |

u_EFref

## EAST PLANT - UNCONTROLLED SURFACE - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_EP_S_EGEN | |
| EP_S_EGEN | *See "E_Gen" Sheet* |
| 2_EP_S_REF | |
| EP_S_COOL | *See "EP Cooling" Sheet* |
| 2_EP_S_FUEL | |
| EP_S_FUEL1 | *See "Fuel Tanks" Sheet* |
| 2_EP_S_WE | |
| EP_S_WE_FT | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| EP_S_WE_FTS | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| EP_S_EFD | *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04* |
| 2_EP_S_D | |
| EP_S_D_C | *See "EP_Fleet" Sheet* |
| EP_S_D_DOZ | *See "EP_Fleet" Sheet* |
| EP_S_D_FUG | *See "EP_Fleet" Sheet* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
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c_COpph c_COtpy c_NOXpph c_NOXtpy c_SO2pph c_SO2tpy c_PM10pph c_PM10tpy c_PM25pph c_PM25tpy c_VOCpph c_VOCtpy

## MILL - CONTROLLED - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_M_MAT | *Material Handling - Stockpile & SAG* | | | | | | | | | | | |
| M_TCV | | | | | | | *0.67* | *1.8* | *0.10* | *0.27* | | |
| M_STKP_1 | | | | | | | *0.01* | *0.02* | *1.0E-3* | *2.7E-3* | | |
| M_STKP_2 | | | | | | | *0.01* | *0.02* | *9.4E-4* | *2.5E-3* | | |
| M_RECL1 | | | | | | | | | | | | |
| M_SAG1_CV | | | | | | | *0.30* | *1.3* | *0.30* | *1.3* | | |
| M_RECL2 | | | | | | | | | | | | |
| M_SAG2_CV | | | | | | | *0.30* | *1.3* | *0.30* | *1.3* | | |
| 2_M_SAG1 | *SAG Line 1* | | | | | | | | | | | |
| M_SAG1_XF | | | | | | | *0.31* | *1.3* | *0.05* | *0.20* | | |
| M_SAG1 | | | | | | | | | | | | |
| M_TR_SC1 | | | | | | | | | | | | |
| M_V_SC1 | | | | | | | | | | | | |
| M_BALL1A | | | | | | | | | | | | |
| M_BALL1B | | | | | | | | | | | | |
| 2_M_SAG2 | *SAG Line 2* | | | | | | | | | | | |
| M_SAG2_XF | | | | | | | *0.31* | *1.3* | *0.05* | *0.20* | | |
| M_SAG2 | | | | | | | | | | | | |
| M_TR_SC2 | | | | | | | | | | | | |
| M_V_SC2 | | | | | | | | | | | | |
| M_BALL2A | | | | | | | | | | | | |
| M_BALL2B | | | | | | | | | | | | |
| 2_M_PEBB | *Pebble Recycle* | | | | | | | | | | | |
| M_SAG_DIS_SC | | | | | | | *0.76* | *2.8* | *0.05* | *0.19* | | |
| M_REC3 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_BIN | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_009 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_109 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_004 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_104 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |

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c_COpph c_COtpy c_NOXpph c_NOXtpy c_SO2pph c_SO2tpy c_PM10pph c_PM10tpy c_PM25pph c_PM25tpy c_VOCpph c_VOCtpy

## MILL - CONTROLLED - EMISSIONS SUMMARY CONT.

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_M_MOLY_FL | *Moly Flotation* | | | | | | | | | | | |
| M_CONC_XF_DRY | | | | | | | *2.0E-4* | *7.1E-4* | *3.0E-5* | *1.1E-4* | | |
| M_CONC_DRY | | | | | | | *1.8E-4* | *6.4E-4* | *2.7E-5* | *9.8E-5* | | |
| M_CONC_XF_DAY | | | | | | | *1.8E-4* | *6.4E-4* | *2.7E-5* | *9.8E-5* | | |
| 2_M_LIME | *Lime System* | | | | | | | | | | | |
| M_LIME1 | | | | | | | *1.4E-3* | *4.6E-3* | *1.4E-3* | *4.6E-3* | | |
| M_VERT1 | | | | | | | *0.01* | *0.04* | *0.01* | *0.04* | | |
| M_LTK1 | | | | | | | *0.01* | *0.04* | *0.01* | *0.04* | | |
| M_LIME2 | | | | | | | *1.4E-3* | *4.6E-3* | *1.4E-3* | *4.6E-3* | | |
| M_VERT2 | | | | | | | *0.01* | *0.04* | *0.01* | *0.04* | | |
| M_LTK2 | | | | | | | *0.01* | *0.04* | *0.01* | *0.04* | | |
| 2_M_EGEN | *Emergency Generators (Calculated using placeholder values - update when known)* | | | | | | | | | | | |
| M_EGEN | *4.8* | *1.2* | *7.6* | *1.9* | *0.01* | *1.9E-3* | *0.28* | *0.07* | *0.28* | *0.07* | *4.1* | *1.0* |
| 2_M_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| M_FUEL1 | | | | | | | | | | | *4.0E-3* | *0.02* |
| 2_M_REAG | *Reagent Storage, Handling, and Use* | | | | | | | | | | | |
| M_SIPX | | | | | | | *4.9E-3* | *0.02* | *4.9E-3* | *0.02* | | |
| M_MIBC | | | | | | | | | | | *0.02* | *0.07* |
| M_NAHS | | | | | | | | | | | | |
| M_CIBA155 | | | | | | | *9.3E-4* | *3.6E-3* | *9.3E-4* | *3.6E-3* | | |
| M_CIBA10 | | | | | | | *2.4E-4* | *8.6E-4* | *2.4E-4* | *8.6E-4* | | |
| M_CYTEC8989 | | | | | | | | | | | *1.1E-5* | *5.0E-5* |
| M_MCO | | | | | | | | | | | *1.1E-3* | *4.8E-3* |
| 2_M_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | | | | | | |
| M_D_C_STAT | *3.7* | *2.0* | *0.42* | *0.23* | *0.01* | *3.3E-3* | *0.02* | *0.01* | *0.02* | *0.01* | *0.20* | *0.11* |
| M_D_C_MOB | *28.9* | *34.8* | *4.6* | *5.2* | *0.05* | *0.05* | *0.17* | *0.22* | *0.17* | *0.22* | *3.0* | *3.3* |
| M_D_DOZ | | | | | | | *1.6* | *5.7* | *0.23* | *0.80* | | |
| M_D_FUG | | | | | | | *7.1* | *7.9* | *0.69* | *0.76* | | |
| 2_M_HEAT | *Propane Building Heaters* | | | | | | | | | | | |
| M_HEAT1 | *3.7E-3* | *0.02* | *0.01* | *0.03* | *7.9E-4* | *3.5E-3* | *3.5E-4* | *1.5E-3* | *3.5E-4* | *1.5E-3* | *4.0E-4* | *1.7E-3* |
| M_HEAT2 | *0.01* | *0.02* | *0.01* | *0.04* | *1.1E-3* | *0.01* | *5.0E-4* | *2.2E-3* | *5.0E-4* | *2.2E-3* | *5.7E-4* | *2.5E-3* |
| 2_M_WE | *Miscellaneous Fugitive Dust* | | | | | | | | | | | |
| M_WE_FT | | | | | | | *34.4* | *12.6* | *5.2* | *1.9* | | |
| M_S_EFD | | | | | | | *2.0* | *0.74* | *0.20* | *0.07* | | |
| 3_M_TOTAL | *37.3* | *38.1* | *12.6* | *7.4* | *0.06* | *0.06* | *49.1* | *39.8* | *7.8* | *7.9* | *7.4* | *4.5* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 3 | OF: 18 | SHEET: Mill_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Mill | DATE: July 25, 2014 | | |

u_COpph u_COtpy u_NOXpph u_NOXtpy u_SO2pph u_SO2tpy u_PM10pph u_PM10tpy u_PM25pph u_PM25tpy u_VOCpph u_VOCtpy

## MILL - UNCONTROLLED - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_M_MAT | *Material Handling - Stockpile & SAG* | | | | | | | | | | | |
| M_TCV | | | | | | | *5.0* | *13.3* | *0.10* | *0.27* | | |
| M_STKP_1 | | | | | | | *5.0* | *13.3* | *0.10* | *0.27* | | |
| M_STKP_2 | | | | | | | *5.0* | *13.3* | *0.09* | *0.25* | | |
| M_RECL1 | | | | | | | *0.38* | *1.6* | *0.06* | *0.24* | | |
| M_SAG1_CV | | | | | | | *0.38* | *1.6* | *0.06* | *0.24* | | |
| M_RECL2 | | | | | | | *0.38* | *1.6* | *0.06* | *0.24* | | |
| M_SAG2_CV | | | | | | | *0.38* | *1.6* | *0.06* | *0.24* | | |
| 2_M_SAG1 | *SAG Line 1* | | | | | | | | | | | |
| M_SAG1_XF | | | | | | | *0.31* | *1.3* | *0.05* | *0.20* | | |
| M_SAG1 | | | | | | | | | | | | |
| M_TR_SC1 | | | | | | | | | | | | |
| M_V_SC1 | | | | | | | | | | | | |
| M_BALL1A | | | | | | | | | | | | |
| M_BALL1B | | | | | | | | | | | | |
| 2_M_SAG2 | *SAG Line 2* | | | | | | | | | | | |
| M_SAG2_XF | | | | | | | *0.31* | *1.3* | *0.05* | *0.20* | | |
| M_SAG2 | | | | | | | | | | | | |
| M_TR_SC2 | | | | | | | | | | | | |
| M_V_SC2 | | | | | | | | | | | | |
| M_BALL2A | | | | | | | | | | | | |
| M_BALL2B | | | | | | | | | | | | |
| 2_M_PEBB | *Pebble Recycle* | | | | | | | | | | | |
| M_SAG_DIS_SC | | | | | | | *18.0* | *65.7* | *18.0* | *65.7* | | |
| M_REC3 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_BIN | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_009 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_109 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_004 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |
| M_PEBB_104 | | | | | | | *0.12* | *0.43* | *0.02* | *0.07* | | |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 4 | OF: 18 | SHEET: Mill_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Mill | DATE: July 25, 2014 | | |

u_COpph u_COtpy u_NOXpph u_NOXtpy u_SO2pph u_SO2tpy u_PM10pph u_PM10tpy u_PM25pph u_PM25tpy u_VOCpph u_VOCtpy

## MILL - UNCONTROLLED - EMISSIONS SUMMARY CONT.

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_M_MOLY_FL | *Moly Flotation* | | | | | | | | | | | |
| M_CONC_XF_DRY | | | | | | | *2.0E-4* | *7.1E-4* | *3.0E-5* | *1.1E-4* | | |
| M_CONC_DRY | | | | | | | *1.8E-4* | *6.4E-4* | *2.7E-5* | *9.8E-5* | | |
| M_CONC_XF_DAY | | | | | | | *1.8E-4* | *6.4E-4* | *2.7E-5* | *9.8E-5* | | |
| 2_M_LIME | *Lime System* | | | | | | | | | | | |
| M_LIME1 | | | | | | | *1.9* | *6.4* | *1.9* | *6.4* | | |
| M_VERT1 | | | | | | | *0.01* | *0.04* | *0.01* | *0.04* | | |
| M_LTK1 | | | | | | | *0.01* | *0.04* | *0.01* | *0.04* | | |
| M_LIME2 | | | | | | | *1.9* | *6.4* | *1.9* | *6.4* | | |
| M_VERT2 | | | | | | | *0.01* | *0.04* | *0.01* | *0.04* | | |
| M_LTK2 | | | | | | | *0.01* | *0.04* | *0.01* | *0.04* | | |
| 2_M_EGEN | *Emergency Generators (Calculated using placeholder values - update when known)* | | | | | | | | | | | |
| M_EGEN | *4.8* | *1.2* | *7.6* | *1.9* | *0.01* | *1.9E-3* | *0.28* | *0.07* | *0.28* | *0.07* | *4.1* | *1.0* |
| 2_M_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| M_FUEL1 | | | | | | | | | | | *4.0E-3* | *0.02* |
| 2_M_REAG | *Reagent Storage, Handling, and Use* | | | | | | | | | | | |
| M_SIPX | | | | | | | *4.9E-3* | *0.02* | *4.9E-3* | *0.02* | | |
| M_MIBC | | | | | | | | | | | *0.02* | *0.07* |
| M_NAHS | | | | | | | | | | | | |
| M_CIBA155 | | | | | | | *0.03* | *0.10* | *0.03* | *0.10* | | |
| M_CIBA10 | | | | | | | *0.01* | *0.02* | *0.01* | *0.02* | | |
| M_CYTEC8989 | | | | | | | | | | | *1.1E-5* | *5.0E-5* |
| M_MCO | | | | | | | | | | | *1.1E-3* | *4.8E-3* |
| 2_M_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | | | | | | |
| M_D_C_STAT | *3.7* | *2.0* | *0.42* | *0.23* | *0.01* | *3.3E-3* | *0.02* | *0.01* | *0.02* | *0.01* | *0.20* | *0.11* |
| M_D_C_MOB | *28.9* | *34.8* | *4.6* | *5.2* | *0.05* | *0.05* | *0.17* | *0.22* | *0.17* | *0.22* | *3.0* | *3.3* |
| M_D_DOZ | | | | | | | *1.6* | *5.7* | *0.23* | *0.80* | | |
| M_D_FUG | | | | | | | *143* | *157* | *13.8* | *15.1* | | |
| 2_M_HEAT | *Propane Building Heaters* | | | | | | | | | | | |
| M_HEAT1 | *3.7E-3* | *0.02* | *0.01* | *0.03* | *7.9E-4* | *3.5E-3* | *3.5E-4* | *1.5E-3* | *3.5E-4* | *1.5E-3* | *4.0E-4* | *1.7E-3* |
| M_HEAT2 | *0.01* | *0.02* | *0.01* | *0.04* | *1.1E-3* | *0.01* | *5.0E-4* | *2.2E-3* | *5.0E-4* | *2.2E-3* | *5.7E-4* | *2.5E-3* |
| 2_M_WE | *Miscellaneous Fugitive Dust* | | | | | | | | | | | |
| M_WE_FT | | | | | | | *34.4* | *12.6* | *5.2* | *1.9* | | |
| M_S_EFD | | | | | | | *40.7* | *14.8* | *4.1* | *1.5* | | |
| 3_M_TOTAL | *37.3* | *38.1* | *12.6* | *7.4* | *0.06* | *0.06* | *219* | *306* | *42.4* | *99.5* | *7.4* | *4.5* |

c_COEF c_NOXEF c_SO2EF c_PM10EF c_PM25EF c_VOCEF c_EFunits

## MILL - CONTROLLED - EMISSION FACTORS

| | | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Source ID | | CO | $NO_X$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | VOC | Units & Notes |
| 2_M_MAT | *Material Handling - Stockpile & SAG* | | | | | | | |
| M_TCV | | | | | *7.4E-5* | *1.1E-5* | | *lb/ton* |
| M_STKP_1 | | | | | *7.4E-5* | *1.1E-5* | | *lb/ton* |
| M_STKP_2 | | | | | *6.9E-5* | *1.0E-5* | | *lb/ton* |
| M_RECL1 | | | | | | | | *Emissions accounted for in M_SAG1_CV* |
| M_SAG1_CV | | | | | | | | *Dust Collector (1045398 dscf/hr, 0.002 gr/dscf)* |
| M_RECL2 | | | | | | | | *Emissions accounted for in M_SAG2_CV* |
| M_SAG2_CV | | | | | | | | *Dust Collector (1045398 dscf/hr, 0.002 gr/dscf)* |
| 2_M_SAG1 | *SAG Line 1* | | | | | | | |
| M_SAG1_XF | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_SAG1 | | | | | | | | *wet process* |
| M_TR_SC1 | | | | | | | | *wet process* |
| M_V_SC1 | | | | | | | | *wet process* |
| M_BALL1A | | | | | | | | *wet process* |
| M_BALL1B | | | | | | | | *wet process* |
| 2_M_SAG2 | *SAG Line 2* | | | | | | | |
| M_SAG2_XF | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_SAG2 | | | | | | | | *wet process* |
| M_TR_SC2 | | | | | | | | *wet process* |
| M_V_SC2 | | | | | | | | *wet process* |
| M_BALL2A | | | | | | | | *wet process* |
| M_BALL2B | | | | | | | | *wet process* |
| 2_M_PEBB | *Pebble Recycle* | | | | | | | |
| M_SAG_DIS_SC | | | | | *7.4E-4* | *5.0E-5* | | *lb/ton* |
| M_REC3 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_BIN | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_009 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_109 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_004 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_104 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |

c_COEF c_NOXEF c_SO2EF c_PM10EF c_PM25EF c_VOCEF c_EFunits

## MILL - CONTROLLED - EMISSION FACTORS CONT.

| | | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Source ID | | CO | $NO_X$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | VOC | Units & Notes |
| 2_M_MOLY_FL | *Moly Flotation* | | | | | | | |
| M_CONC_XF_DRY | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_CONC_DRY | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_CONC_XF_DAY | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| 2_M_LIME | *Lime System* | | | | | | | |
| M_LIME1 | | | | | *3.4E-4* | *3.4E-4* | | *lb/ton* |
| M_VERT1 | | | | | *2.8E-3* | *2.8E-3* | | *lb/ton* |
| M_LTK1 | | | | | *2.8E-3* | *2.8E-3* | | *lb/ton* |
| M_LIME2 | | | | | *3.4E-4* | *3.4E-4* | | *lb/ton* |
| M_VERT2 | | | | | *2.8E-3* | *2.8E-3* | | *lb/ton* |
| M_LTK2 | | | | | *2.8E-3* | *2.8E-3* | | *lb/ton* |
| 2_M_EGEN | *Emergency Generators (Calculated using placeholder values - update when known)* | | | | | | | |
| M_EGEN | | | | | | | | *See "E_Gen" Sheet* |
| 2_M_FUEL | *Diesel Storage Tanks* | | | | | | | |
| M_FUEL1 | | | | | | | | *See "Fuel Tanks" Sheet* |
| 2_M_REAG | *Reagent Storage, Handling, and Use* | | | | | | | |
| M_SIPX | | | | | *0.16* | *0.16* | | *lb/ton* |
| M_MIBC | | | | | | | | *See "Reagents" Sheet* |
| M_NAHS | | | | | | | | *See "Reagents" Sheet* |
| M_CIBA155 | | | | | *0.01* | *0.01* | | *lb/ton* |
| M_CIBA10 | | | | | *0.01* | *0.01* | | *lb/ton* |
| M_CYTEC8989 | | | | | | | | *See "Reagents" Sheet* |
| M_MCO | | | | | | | | *See "Reagents" Sheet* |
| 2_M_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | | |
| M_D_C_STAT | | | | | | | | *See "Mill_Fleet" Sheet* |
| M_D_C_MOB | | | | | | | | *See "Mill_Fleet" Sheet* |
| M_D_DOZ | | | | | | | | *See "Mill_Fleet" Sheet* |
| M_D_FUG | | | | | | | | *See "Mill_Fleet" Sheet* |
| 2_M_HEAT | *Propane Building Heaters* | | | | | | | |
| M_HEAT1 | | *7.5* | *13.0* | *1.6* | *0.70* | *0.70* | *0.80* | *lb/k-gal* |
| M_HEAT2 | | *7.5* | *13.0* | *1.6* | *0.70* | *0.70* | *0.80* | *lb/k-gal* |
| 2_M_WE | *Miscellaneous Fugitive Dust* | | | | | | | |
| M_WE_FT | | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| M_S_EFD | | | | | *0.14* | *0.01* | | *lb/VMT* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 7 | OF: 18 | SHEET: Mill_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Mill | DATE: July 25, 2014 | | |

u_COEF u_NOXEF u_SO2EF u_PM10EF u_PM25EF u_VOCEF u_EFunits

## MILL - UNCONTROLLED - EMISSION FACTORS

| | | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Source ID | | CO | $NO_X$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | VOC | Units & Notes |
| 2_M_MAT | *Material Handling - Stockpile & SAG* | | | | | | | |
| M_TCV | | | | | *5.5E-4* | *1.1E-5* | | *lb/ton* |
| M_STKP_1 | | | | | *5.5E-4* | *1.1E-5* | | *lb/ton* |
| M_STKP_2 | | | | | *5.5E-4* | *1.0E-5* | | *lb/ton* |
| M_RECL1 | | | | | *6.9E-5* | *1.0E-5* | | *lb/ton* |
| M_SAG1_CV | | | | | *6.9E-5* | *1.0E-5* | | *lb/ton* |
| M_RECL2 | | | | | *6.9E-5* | *1.0E-5* | | *lb/ton* |
| M_SAG2_CV | | | | | *6.9E-5* | *1.0E-5* | | *lb/ton* |
| 2_M_SAG1 | *SAG Line 1* | | | | | | | |
| M_SAG1_XF | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_SAG1 | | | | | | | | *No emissions - Wet Process* |
| M_TR_SC1 | | | | | | | | *No emissions - Wet Process* |
| M_V_SC1 | | | | | | | | *No emissions - Wet Process* |
| M_BALL1A | | | | | | | | *No emissions - Wet Process* |
| M_BALL1B | | | | | | | | *No emissions - Wet Process* |
| 2_M_SAG2 | *SAG Line 2* | | | | | | | |
| M_SAG2_XF | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_SAG2 | | | | | | | | *No emissions - Wet Process* |
| M_TR_SC2 | | | | | | | | *No emissions - Wet Process* |
| M_V_SC2 | | | | | | | | *No emissions - Wet Process* |
| M_BALL2A | | | | | | | | *No emissions - Wet Process* |
| M_BALL2B | | | | | | | | *No emissions - Wet Process* |
| 2_M_PEBB | *Pebble Recycle* | | | | | | | |
| M_SAG_DIS_SC | | | | | *0.01* | *0.01* | | *lb/ton* |
| M_REC3 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_BIN | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_009 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_109 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_004 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_PEBB_104 | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |

u_COEF u_NOXEF u_SO2EF u_PM10EF u_PM25EF u_VOCEF u_EFunits

## MILL - UNCONTROLLED - EMISSION FACTORS CONT.

| | | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Source ID | | CO | $NO_X$ | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | VOC | Units & Notes |
| 2_M_MOLY_FL | *Moly Flotation* | | | | | | | |
| M_CONC_XF_DRY | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_CONC_DRY | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| M_CONC_XF_DAY | | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| 2_M_LIME | *Lime System* | | | | | | | |
| M_LIME1 | | | | | *0.47* | *0.47* | | *lb/ton* |
| M_VERT1 | | | | | *2.8E-3* | *2.8E-3* | | *lb/ton* |
| M_LTK1 | | | | | *2.8E-3* | *2.8E-3* | | *lb/ton* |
| M_LIME2 | | | | | *0.47* | *0.47* | | *lb/ton* |
| M_VERT2 | | | | | *2.8E-3* | *2.8E-3* | | *lb/ton* |
| M_LTK2 | | | | | *2.8E-3* | *2.8E-3* | | *lb/ton* |
| 2_M_EGEN | *Emergency Generators (Calculated using placeholder values - update when known)* | | | | | | | |
| M_EGEN | | | | | | | | *See "E_Gen" Sheet* |
| 2_M_FUEL | *Diesel Storage Tanks* | | | | | | | |
| M_FUEL1 | | | | | | | | *See "Fuel Tanks" Sheet* |
| 2_M_REAG | *Reagent Storage, Handling, and Use* | | | | | | | |
| M_SIPX | | | | | *0.16* | *0.16* | | *lb/ton* |
| M_MIBC | | | | | | | | *See "Reagents" Sheet* |
| M_NAHS | | | | | | | | *See "Reagents" Sheet* |
| M_CIBA155 | | | | | *0.16* | *0.16* | | *lb/ton* |
| M_CIBA10 | | | | | *0.16* | *0.16* | | *lb/ton* |
| M_CYTEC8989 | | | | | | | | *See "Reagents" Sheet* |
| M_MCO | | | | | | | | *See "Reagents" Sheet* |
| 2_M_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | | |
| M_D_C_STAT | | | | | | | | *See "Mill_Fleet" Sheet* |
| M_D_C_MOB | | | | | | | | *See "Mill_Fleet" Sheet* |
| M_D_DOZ | | | | | | | | *See "Mill_Fleet" Sheet* |
| M_D_FUG | | | | | | | | *See "Mill_Fleet" Sheet* |
| 2_M_HEAT | *Propane Building Heaters* | | | | | | | |
| M_HEAT1 | | *7.5* | *13.0* | *1.6* | *0.70* | *0.70* | *0.80* | *lb/k-gal* |
| M_HEAT2 | | *7.5* | *13.0* | *1.6* | *0.70* | *0.70* | *0.80* | *lb/k-gal* |
| 2_M_WE | *Miscellaneous Fugitive Dust* | | | | | | | |
| M_WE_FT | | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| M_S_EFD | | | | | *0.14* | *0.01* | | *lb/VMT* |

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## MILL - PROCESS RATES

| Source ID | | Process Rates Unit/Hr | Unit/Yr | Units & Notes |
|---|---|---|---|---|
| 2_M_MAT | *Material Handling - Stockpile & SAG* | | | |
| M_TCV | | *9,054* | *48,281,178* | *ton* |
| M_STKP_1 | | *9,054* | *48,281,178* | *ton* |
| M_STKP_2 | | *9,054* | *48,281,178* | *ton* |
| M_RECL1 | | *5,512* | *46,350,897* | *ton* |
| M_SAG1_CV | | *5,512* | *46,350,897* | *ton* |
| M_RECL2 | | *5,512* | *46,350,897* | *ton* |
| M_SAG2_CV | | *5,512* | *46,350,897* | *ton* |
| 2_M_SAG1 | *SAG Line 1* | | | |
| M_SAG1_XF | | *5,512* | *46,350,897* | *ton* |
| M_SAG1 | | *5,512* | *46,350,897* | *ton* |
| M_TR_SC1 | | *5,512* | *46,350,897* | *ton* |
| M_V_SC1 | | *5,512* | *46,350,897* | *ton* |
| M_BALL1A | | *7,507* | *58,873,103* | *ton* |
| M_BALL1B | | *7,507* | *58,873,103* | *ton* |
| 2_M_SAG2 | *SAG Line 2* | | | |
| M_SAG2_XF | | *5,512* | *46,350,897* | *ton* |
| M_SAG2 | | *5,512* | *46,350,897* | *ton* |
| M_TR_SC2 | | *5,512* | *46,350,897* | *ton* |
| M_V_SC2 | | *5,512* | *46,350,897* | *ton* |
| M_BALL2A | | *7,507* | *58,873,103* | *ton* |
| M_BALL2B | | *7,507* | *58,873,103* | *ton* |
| 2_M_PEBB | *Pebble Recycle* | | | |
| M_SAG_DIS_SC | | *2,067* | *15,114,423* | *ton* |
| M_REC3 | | *2,067* | *15,114,423* | *ton* |
| M_PEBB_BIN | | *2,067* | *15,114,423* | *ton* |
| M_PEBB_009 | | *2,067* | *15,114,423* | *ton* |
| M_PEBB_109 | | *2,067* | *15,114,423* | *ton* |
| M_PEBB_004 | | *2,067* | *15,114,423* | *ton* |
| M_PEBB_104 | | *2,067* | *15,114,423* | *ton* |

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## MILL - PROCESS RATES CONT.

| Source ID | | Process Rates Unit/Hr | Unit/Yr | Units & Notes |
|---|---|---|---|---|
| 2_M_MOLY_FL | *Moly Flotation* | | | |
| M_CONC_XF_DRY | | *3.4* | *24,989* | *ton* |
| M_CONC_DRY | | *3.1* | *22,571* | *ton* |
| M_CONC_XF_DAY | | *3.1* | *22,571* | *ton* |
| 2_M_LIME | *Lime System* | | | |
| M_LIME1 | | *4.1* | *27,279* | *ton* |
| M_VERT1 | | *4.1* | *27,279* | *ton* |
| M_LTK1 | | *4.1* | *27,279* | *ton* |
| M_LIME2 | | *4.1* | *27,279* | *ton* |
| M_VERT2 | | *4.1* | *27,279* | *ton* |
| M_LTK2 | | *4.1* | *27,279* | *ton* |
| 2_M_EGEN | *Emergency Generators (Calculated using placeholder values - update when known)* | | | |
| M_EGEN | | | | *See "E_Gen" Sheet* |
| 2_M_FUEL | *Diesel Storage Tanks* | | | |
| M_FUEL1 | | *257* | *557,371* | *gal* |
| 2_M_REAG | *Reagent Storage, Handling, and Use* | | | |
| M_SIPX | | *0.03* | *241* | *ton* |
| M_MIBC | | *1,392* | *441,713* | *gal* |
| M_NAHS | | *8,749* | *2,776,973* | *gal* |
| M_CIBA155 | | *0.17* | *1,296* | *ton* |
| M_CIBA10 | | *0.04* | *314* | *ton* |
| M_CYTEC8989 | | *240* | *76,078* | *gal* |
| M_MCO | | *422* | *133,835* | *gal* |
| 2_M_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | |
| M_D_C_STAT | | | | *See "Mill_Fleet" Sheet* |
| M_D_C_MOB | | | | *See "Mill_Fleet" Sheet* |
| M_D_DOZ | | | | *See "Mill_Fleet" Sheet* |
| M_D_FUG | | | | *See "Mill_Fleet" Sheet* |
| 2_M_HEAT | *Propane Building Heaters* | | | |
| M_HEAT1 | | *5.0E-4* | *4.4* | *k-gal* |
| M_HEAT2 | | *7.2E-4* | *6.3* | *k-gal* |
| 2_M_WE | *Miscellaneous Fugitive Dust* | | | |
| M_WE_FT | | | *70.0* | *acre* |
| M_S_EFD | | | | *See "Employees" Sheet* |

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ContTech ContEff CE_EF

## MILL - CONTROLS

| Source ID | Control Technology | Control Efficiency | Notes |
|---|---|---|---|
| 2_M_MAT | *Material Handling - Stockpile & SAG* | | |
| M_TCV | *moisture, enclosure with filter vents* | *0%* | *Control accounted for in EF* |
| M_STKP_1 | *moisture, enclosure with filter vents* | *99%* | *Moist. & Enc. accounted for in EF* |
| M_STKP_2 | *moisture, enclosure with filter vents* | *99%* | *Moist. & Enc. accounted for in EF* |
| M_RECL1 | | *0%* | *Emissions accounted for in M_SAG1_CV* |
| M_SAG1_CV | *1 dust collector* | *0%* | *Control accounted for in emission calculation* |
| M_RECL2 | | *0%* | *Emissions accounted for in M_SAG2_CV* |
| M_SAG2_CV | *1 dust collector* | *0%* | *Control accounted for in emission calculation* |
| 2_M_SAG1 | *SAG Line 1* | | |
| M_SAG1_XF | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| M_SAG1 | *wet process* | *100%* | |
| M_TR_SC1 | *wet process* | *100%* | |
| M_V_SC1 | *wet process* | *100%* | |
| M_BALL1A | *wet process* | *100%* | |
| M_BALL1B | *wet process* | *100%* | |
| 2_M_SAG2 | *SAG Line 2* | | |
| M_SAG2_XF | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| M_SAG2 | *wet process* | *100%* | |
| M_TR_SC2 | *wet process* | *100%* | |
| M_V_SC2 | *wet process* | *100%* | |
| M_BALL2A | *wet process* | *100%* | |
| M_BALL2B | *wet process* | *100%* | |
| 2_M_PEBB | *Pebble Recycle* | | |
| M_SAG_DIS_SC | *moisture, enclosure* | *50%* | *Control accounted for in EF* |
| M_REC3 | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| M_PEBB_BIN | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| M_PEBB_009 | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| M_PEBB_109 | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| M_PEBB_004 | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| M_PEBB_104 | *moisture, enclosure* | *0%* | *Control accounted for in EF* |

ContTech ContEff CE_EF

## MILL - CONTROLS CONT.

| Source ID | Control Technology | Control Efficiency | Notes |
|---|---|---|---|
| 2_M_MOLY_FL | *Moly Flotation* | | |
| M_CONC_XF_DRY | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| M_CONC_DRY | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| M_CONC_XF_DAY | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| 2_M_LIME | *Lime System* | | |
| M_LIME1 | *bin vent* | *0%* | *Control accounted for in EF* |
| M_VERT1 | | *0%* | |
| M_LTK1 | | *0%* | |
| M_LIME2 | *bin vent* | *0%* | *Control accounted for in EF* |
| M_VERT2 | | *0%* | |
| M_LTK2 | | *0%* | |
| 2_M_EGEN | *Emergency Generators (Calculated using placeholder values - update when known)* | | |
| M_EGEN | | *0%* | |
| 2_M_FUEL | *Diesel Storage Tanks* | | |
| M_FUEL1 | | *0%* | |
| 2_M_REAG | *Reagent Storage, Handling, and Use* | | |
| M_SIPX | | *0%* | |
| M_MIBC | | *0%* | |
| M_NAHS | | *0%* | |
| M_CIBA155 | | *0%* | |
| M_CIBA10 | | *0%* | |
| M_CYTEC8989 | | *0%* | |
| M_MCO | | *0%* | |
| 2_M_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | |
| M_D_C_STAT | | *0%* | |
| M_D_C_MOB | | *0%* | |
| M_D_DOZ | *enclosure with filter vents* | *0%* | |
| M_D_FUG | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |
| 2_M_HEAT | *Propane Building Heaters* | | |
| M_HEAT1 | | *0%* | |
| M_HEAT2 | | *0%* | |
| 2_M_WE | *Miscellaneous Fugitive Dust* | | |
| M_WE_FT | | *0%* | |
| M_S_EFD | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |

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description

## MILL - SOURCE IDENTIFICATION

| Source ID | Source Identification |
|---|---|
| 2_M_MAT | *Material Handling - Stockpile & SAG* |
| M_TCV | *Incline Conveyor to Mine Transfer Conveyor (CV-002)* |
| M_STKP_1 | *Mine Transfer Conveyor (CV-002) to Stockpile Tripper Conveyor (CV-003)* |
| M_STKP_2 | *Stockpile Tripper Conveyor (CV-003) to Covered SAG Mill Stockpile* |
| M_RECL1 | *SAG Mill Stockpile to Reclaim Tunnel Feeders (FE-001 - 004) - SAG 1* |
| M_SAG1_CV | *Reclaim Tunnel Feeders (FE001 - 004) to SAG 1 Conveyor (CV-004)* |
| M_RECL2 | *SAG Mill Stockpile to Reclaim Tunnel Feeders (FE-005 - 008) - SAG 2* |
| M_SAG2_CV | *Reclaim Tunnel Feeders (FE005 - 008) to SAG 1 Conveyor (CV-104)* |
| 2_M_SAG1 | *SAG Line 1* |
| M_SAG1_XF | *SAG 1 Conveyor (CV-004) to SAG Mill 1 (ML-001)* |
| M_SAG1 | *SAG Mill 1 (ML-001)* |
| M_TR_SC1 | *Trommel Screen 1 (SR-001) and associated transfer out (SR-002)* |
| M_V_SC1 | *Vibrating Screen (SR-002) and associated transfer out (oversize to CV-012)* |
| M_BALL1A | *Ball Mill 1A (ML-002) and associated transfers in and out* |
| M_BALL1B | *Ball Mill 1B (ML-003) and associated transfers in and out* |
| 2_M_SAG2 | *SAG Line 2* |
| M_SAG2_XF | *SAG 2 Conveyor (CV-104) to SAG Mill 1 (ML-001)* |
| M_SAG2 | *SAG Mill 1 (ML-101)* |
| M_TR_SC2 | *Trommel Screen 1 (SR-101) and associated transfer out (SR-003)* |
| M_V_SC2 | *Vibrating Screen (SR-003) and associated transfer out (oversize to CV-012)* |
| M_BALL2A | *Ball Mill 1A (ML-102) and associated transfers in and out* |
| M_BALL2B | *Ball Mill 1B (ML-103) and associated transfers in and out* |
| 2_M_PEBB | *Pebble Recycle* |
| M_SAG_DIS_SC | *SAG Mill Discharge Screens (SR-002 - 003) and associated transfers in (CV-012) and out (CV-013)* |
| M_REC3 | *Recycle Conveyor 2 (CV-013) to Recycle Conveyor 3 (CV-014)* |
| M_PEBB_BIN | *Recycle Conveyor 3 (CV-014) to Pebble Bin (BN-002)* |
| M_PEBB_009 | *Pebble Bin (BN-002) to Pebble Feeder 1 (FE-009)* |
| M_PEBB_109 | *Pebble Bin (BN-002) to Pebble Feeder 2 (FE-109)* |
| M_PEBB_004 | *Pebble Feeder 1 (FE-009) to SAG 1 Conveyor (CV-004)* |
| M_PEBB_104 | *Pebble Feeder 2 (FE-109) to SAG 2 Conveyor (CV-104)* |

description

## MILL - SOURCE IDENTIFICATION CONT.

| Source ID | Source Identification |
|---|---|
| 2_M_MOLY_FL | *Moly Flotation* |
| M_CONC_XF_DRY | *Moly Concentrate Filter (FL-001) to Holoflite Dryers (DR001 - 002)* |
| M_CONC_DRY | *Holoflite Dryers (DR-001 - 002) to Moly Concentrate Day Bins (BN001 - 003)* |
| M_CONC_XF_DAY | *Moly Concentrate Day Bins (BN001 - 003) to Moly Bagging System (MS-001)* |
| 2_M_LIME | *Lime System* |
| M_LIME1 | *Lime Bin 1 (BN-801) Loading (Discharge to Enclosed Screw Feeder)* |
| M_VERT1 | *Screw Feeder 1 (CV-801) to Vertimill 1 (ML-801)* |
| M_LTK1 | *Vertimill 1 (ML-801) to Milk of Lime Tank (TK-156)* |
| M_LIME2 | *Lime Bin 2 (BN-802) Loading (Discharge to Enclosed Screw Feeder)* |
| M_VERT2 | *Screw Feeder 2 (CV-802) to Vertimill 2 (ML-802)* |
| M_LTK2 | *Vertimill 2 (ML-802) to Milk of Lime Tank (TK-156)* |
| 2_M_EGEN | *Emergency Generators (Calculated using placeholder values - update when known)* |
| M_EGEN | *Emergency Generators* |
| 2_M_FUEL | *Diesel Storage Tanks* |
| M_FUEL1 | *Mill Usage and Volume Estimated (Estimated Quantity: 5)* |
| 2_M_REAG | *Reagent Storage, Handling, and Use* |
| M_SIPX | *SPIX (Sodium Isopropyl Xanthate)* |
| M_MIBC | *MIBC (Methyl isobutyl carbonal)* |
| M_NAHS | *NaHS (Sodium hydrosulfide solution)* |
| M_CIBA155 | *Flocculant (CIBA Magnafloc 155)* |
| M_CIBA10 | *Flocculant (CIBA Magnafloc 10)* |
| M_CYTEC8989 | *CYTEC 8989* |
| M_MCO | *MCO (Non-polar flotation oil)* |
| 2_M_D | *Non-Emergency Diesel Fleet (mobile and stationary)* |
| M_D_C_STAT | *Mill Combustion (Stationary)* |
| M_D_C_MOB | *Mill Combustion (Mobile)* |
| M_D_DOZ | *Mill Fugitive Dust (Dozing)* |
| M_D_FUG | *Mill Fugitive Dust (Grading, Vehicle Travel)* |
| 2_M_HEAT | *Propane Building Heaters* |
| M_HEAT1 | *Hydro House Propane Heater (0.045 MMBtu/hr)* |
| M_HEAT2 | *Hydro House Propane Heater (0.065 MMBtu/hr)* |
| 2_M_WE | *Miscellaneous Fugitive Dust* |
| M_WE_FT | *Mill Exposed Areas* |
| M_S_EFD | *Mill Employee Fugitive Dust* |
| 3_M_TOTAL | *Mill Subtotal* |

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c_EFref

## MILL - CONTROLLED - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_M_MAT | *Material Handling - Stockpile & SAG* |
| M_TCV | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 1.3 mph)* |
| M_STKP_1 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 1.3 mph)* |
| M_STKP_2 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.2% moist, 1.3 mph)* |
| M_RECL1 | *Emissions accounted for in M_SAG1_CV* |
| M_SAG1_CV | *Manufacturer (Donaldson Torit) Specified Grain Loading* |
| M_RECL2 | *Emissions accounted for in M_SAG2_CV* |
| M_SAG2_CV | *Manufacturer (Donaldson Torit) Specified Grain Loading* |
| 2_M_SAG1 | *SAG Line 1* |
| M_SAG1_XF | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_SAG1 | *No emissions - Wet Process* |
| M_TR_SC1 | *No emissions - Wet Process* |
| M_V_SC1 | *No emissions - Wet Process* |
| M_BALL1A | *No emissions - Wet Process* |
| M_BALL1B | *No emissions - Wet Process* |
| 2_M_SAG2 | *SAG Line 2* |
| M_SAG2_XF | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_SAG2 | *No emissions - Wet Process* |
| M_TR_SC2 | *No emissions - Wet Process* |
| M_V_SC2 | *No emissions - Wet Process* |
| M_BALL2A | *No emissions - Wet Process* |
| M_BALL2B | *No emissions - Wet Process* |
| 2_M_PEBB | *Pebble Recycle* |
| M_SAG_DIS_SC | *AP-42, Table 11.19.2-2, Screening (controlled), Rev. 8/04* |
| M_REC3 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_BIN | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_009 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_109 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_004 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_104 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |

c_EFref

## MILL - CONTROLLED - EF REFRENCE CONT.

| Source ID | Emission Factor Reference |
|---|---|
| 2_M_MOLY_FL | *Moly Flotation* |
| M_CONC_XF_DRY | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_CONC_DRY | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_CONC_XF_DAY | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| 2_M_LIME | *Lime System* |
| M_LIME1 | *AP-42, Table 11.12-2, Cement Unloading to Elevated Storage Silo (pneumatic, controlled), Rev. 6/06* |
| M_VERT1 | *AP-42, Table 11.12-2, Weigh Hopper Loading (uncontrolled), Rev. 6/06* |
| M_LTK1 | *AP-42, Table 11.12-2, Weigh Hopper Loading (uncontrolled), Rev. 6/06* |
| M_LIME2 | *AP-42, Table 11.12-2, Cement Unloading to Elevated Storage Silo (pneumatic, controlled), Rev. 6/06* |
| M_VERT2 | *AP-42, Table 11.12-2, Weigh Hopper Loading (uncontrolled), Rev. 6/06* |
| M_LTK2 | *AP-42, Table 11.12-2, Weigh Hopper Loading (uncontrolled), Rev. 6/06* |
| 2_M_EGEN | *Emergency Generators (Calculated using placeholder values - update when known)* |
| M_EGEN | *See "E_Gen" Sheet* |
| 2_M_FUEL | *Diesel Storage Tanks* |
| M_FUEL1 | *See "Fuel Tanks" Sheet* |
| 2_M_REAG | *Reagent Storage, Handling, and Use* |
| M_SIPX | *AP-42, Table 11.12-2, Mixer Loading (uncontrolled), Rev. 6/06* |
| M_MIBC | *See "Reagents" Sheet* |
| M_NAHS | *See "Reagents" Sheet* |
| M_CIBA155 | *AP-42, Table 11.12-2, Mixer Loading (controlled), Rev. 6/06* |
| M_CIBA10 | *AP-42, Table 11.12-2, Mixer Loading (controlled), Rev. 6/06* |
| M_CYTEC8989 | *See "Reagents" Sheet* |
| M_MCO | *See "Reagents" Sheet* |
| 2_M_D | *Non-Emergency Diesel Fleet (mobile and stationary)* |
| M_D_C_STAT | *See "Mill_Fleet" Sheet* |
| M_D_C_MOB | *See "Mill_Fleet" Sheet* |
| M_D_DOZ | *See "Mill_Fleet" Sheet* |
| M_D_FUG | *See "Mill_Fleet" Sheet* |
| 2_M_HEAT | *Propane Building Heaters* |
| M_HEAT1 | *AP-42, Table 1.5-1 (industrial, propane boilers), Rev. 7/08* |
| M_HEAT2 | *AP-42, Table 1.5-1 (industrial, propane boilers), Rev. 7/08* |
| 2_M_WE | *Miscellaneous Fugitive Dust* |
| M_WE_FT | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| M_S_EFD | *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04* |

u_EFref

## MILL - UNCONTROLLED - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_M_MAT | *Material Handling - Stockpile & SAG* |
| M_TCV | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 6.1 mph)* |
| M_STKP_1 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 6.1 mph)* |
| M_STKP_2 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4% moist, 6.1 mph)* |
| M_RECL1 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.2% moist, 1.3 mph)* |
| M_SAG1_CV | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.2% moist, 1.3 mph)* |
| M_RECL2 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.2% moist, 1.3 mph)* |
| M_SAG2_CV | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.2% moist, 1.3 mph)* |
| 2_M_SAG1 | *SAG Line 1* |
| M_SAG1_XF | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_SAG1 | *No emissions - Wet Process* |
| M_TR_SC1 | *No emissions - Wet Process* |
| M_V_SC1 | *No emissions - Wet Process* |
| M_BALL1A | *No emissions - Wet Process* |
| M_BALL1B | *No emissions - Wet Process* |
| 2_M_SAG2 | *SAG Line 2* |
| M_SAG2_XF | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_SAG2 | *No emissions - Wet Process* |
| M_TR_SC2 | *No emissions - Wet Process* |
| M_V_SC2 | *No emissions - Wet Process* |
| M_BALL2A | *No emissions - Wet Process* |
| M_BALL2B | *No emissions - Wet Process* |
| 2_M_PEBB | *Pebble Recycle* |
| M_SAG_DIS_SC | *AP-42, Table 11.19.2-2, Screening (uncontrolled), Rev. 8/04* |
| M_REC3 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_BIN | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_009 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_109 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_004 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_PEBB_104 | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |

u_EFref

## MILL - UNCONTROLLED - EF REFRENCE CONT.

| Source ID | Emission Factor Reference |
|---|---|
| 2_M_MOLY_FL | *Moly Flotation* |
| M_CONC_XF_DRY | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_CONC_DRY | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| M_CONC_XF_DAY | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| 2_M_LIME | *Lime System* |
| M_LIME1 | *AP-42, Table 11.12-2, Cement Unloading to Elevated Storage Silo (pneumatic, uncontrolled), Rev. 6/06* |
| M_VERT1 | *AP-42, Table 11.12-2, Weigh Hopper Loading (uncontrolled), Rev. 6/06* |
| M_LTK1 | *AP-42, Table 11.12-2, Weigh Hopper Loading (uncontrolled), Rev. 6/06* |
| M_LIME2 | *AP-42, Table 11.12-2, Cement Unloading to Elevated Storage Silo (pneumatic, uncontrolled), Rev. 6/06* |
| M_VERT2 | *AP-42, Table 11.12-2, Weigh Hopper Loading (uncontrolled), Rev. 6/06* |
| M_LTK2 | *AP-42, Table 11.12-2, Weigh Hopper Loading (uncontrolled), Rev. 6/06* |
| 2_M_EGEN | *Emergency Generators (Calculated using placeholder values - update when known)* |
| M_EGEN | *See "E_Gen" Sheet* |
| 2_M_FUEL | *Diesel Storage Tanks* |
| M_FUEL1 | *See "Fuel Tanks" Sheet* |
| 2_M_REAG | *Reagent Storage, Handling, and Use* |
| M_SIPX | *AP-42, Table 11.12-2, Mixer Loading (uncontrolled), Rev. 6/06* |
| M_MIBC | *See "Reagents" Sheet* |
| M_NAHS | *See "Reagents" Sheet* |
| M_CIBA155 | *AP-42, Table 11.12-2, Mixer Loading (uncontrolled), Rev. 6/06* |
| M_CIBA10 | *AP-42, Table 11.12-2, Mixer Loading (uncontrolled), Rev. 6/06* |
| M_CYTEC8989 | *See "Reagents" Sheet* |
| M_MCO | *See "Reagents" Sheet* |
| 2_M_D | *Non-Emergency Diesel Fleet (mobile and stationary)* |
| M_D_C_STAT | *See "Mill_Fleet" Sheet* |
| M_D_C_MOB | *See "Mill_Fleet" Sheet* |
| M_D_DOZ | *See "Mill_Fleet" Sheet* |
| M_D_FUG | *See "Mill_Fleet" Sheet* |
| 2_M_HEAT | *Propane Building Heaters* |
| M_HEAT1 | *AP-42, Table 1.5-1 (industrial, propane boilers), Rev. 7/08* |
| M_HEAT2 | *AP-42, Table 1.5-1 (industrial, propane boilers), Rev. 7/08* |
| 2_M_WE | *Miscellaneous Fugitive Dust* |
| M_WE_FT | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| M_S_EFD | *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04* |

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c_COpph c_COtpy c_NOXpph c_NOXtpy c_SO2pph c_SO2tpy c_PM10pph c_PM10tpy c_PM25pph c_PM25tpy c_VOCpph c_VOCtpy

## LOADOUT - CONTROLLED - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_L_CU_CONC | *Copper Concentrate Loadout* | | | | | | | | | | | |
| L_CU_SHUT_CV | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_FILT | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_COL | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_BLT | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_CONC_HOP | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_CONC_FD | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_CONC_BLT | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_TRIP | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_LO | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_LO_HOP | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_WGH_BLT | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_LO_CV | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_RAIL | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| 2_L_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| L_FUEL1 | | | | | | | | | | | *3.1E-3* | *0.01* |
| 2_L_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | | | | | | |
| L_D_C_STAT | | | | | | | | | | | | |
| L_D_C_MOB | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *0.05* | *0.13* | *0.05* | *0.13* | *0.51* | *1.3* |
| L_D_FUG | | | | | | | | | | | | |
| 2_L_S_WE | *Miscellaneous Fugitive Dust* | | | | | | | | | | | |
| L_S_EFD | | | | | | | *0.05* | *0.02* | *0.01* | *2.0E-3* | | |
| **3_L_TOTAL** | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *0.32* | *0.94* | *0.09* | *0.25* | *0.51* | *1.3* |

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u_COpph u_COtpy u_NOXpph u_NOXtpy u_SO2pph u_SO2tpy u_PM10pph u_PM10tpy u_PM25pph u_PM25tpy u_VOCpph u_VOCtpy

## LOADOUT - UNCONTROLLED - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_L_CU_CONC | *Copper Concentrate Loadout* | | | | | | | | | | | |
| L_CU_SHUT_CV | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_FILT | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_COL | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_BLT | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_CONC_HOP | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_CONC_FD | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_CONC_BLT | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_TRIP | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_LO | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_LO_HOP | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_WGH_BLT | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_LO_CV | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| L_CU_RAIL | | | | | | | *0.02* | *0.06* | *2.5E-3* | *0.01* | | |
| 2_L_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| L_FUEL1 | | | | | | | | | | | *3.1E-3* | *0.01* |
| 2_L_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | | | | | | |
| L_D_C_STAT | | | | | | | | | | | | |
| L_D_C_MOB | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *0.05* | *0.13* | *0.05* | *0.13* | *0.51* | *1.3* |
| L_D_FUG | | | | | | | | | | | | |
| 2_L_S_WE | *Miscellaneous Fugitive Dust* | | | | | | | | | | | |
| L_S_EFD | | | | | | | *1.1* | *0.39* | *0.11* | *0.04* | | |
| **3_L_TOTAL** | *9.6* | *23.4* | *1.1* | *2.7* | *0.02* | *0.04* | *1.3* | *1.3* | *0.19* | *0.29* | *0.51* | *1.3* |

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c_COEF c_NOXEF c_SO2EF c_PM10EF c_PM25EF c_VOCEF c_EFunits

## LOADOUT - CONTROLLED - EMISSION FACTORS

| | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|
| **Source ID** | **CO** | **$NO_X$** | **$SO_2$** | **$PM_{10}$** | **$PM_{2.5}$** | **VOC** | **Units & Notes** |
| 2_L_CU_CONC | *Copper Concentrate Loadout* | | | | | | |
| L_CU_SHUT_CV | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_FILT | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_COL | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_BLT | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_CONC_HOP | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_CONC_FD | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_CONC_BLT | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_TRIP | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_LO | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_LO_HOP | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_WGH_BLT | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_LO_CV | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_RAIL | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| 2_L_FUEL | *Diesel Storage Tanks* | | | | | | |
| L_FUEL1 | | | | | | | *See "Fuel Tanks" Sheet* |
| 2_L_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | |
| L_D_C_STAT | | | | | | | *See "Loadout_Fleet" Sheet* |
| L_D_C_MOB | | | | | | | *See "Loadout_Fleet" Sheet* |
| L_D_FUG | | | | | | | *See "Loadout_Fleet" Sheet* |
| 2_L_S_WE | *Miscellaneous Fugitive Dust* | | | | | | |
| L_S_EFD | | | | *0.14* | *0.01* | | *lb/VMT* |

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u_COEF u_NOXEF u_SO2EF u_PM10EF u_PM25EF u_VOCEF u_EFunits

## LOADOUT - UNCONTROLLED - EMISSION FACTORS

| | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|
| **Source ID** | **CO** | **$NO_X$** | **$SO_2$** | **$PM_{10}$** | **$PM_{2.5}$** | **VOC** | **Units & Notes** |
| 2_L_CU_CONC | *Copper Concentrate Loadout* | | | | | | |
| L_CU_SHUT_CV | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_FILT | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_COL | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_BLT | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_CONC_HOP | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_CONC_FD | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_CONC_BLT | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_TRIP | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_LO | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_LO_HOP | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_WGH_BLT | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_LO_CV | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| L_CU_RAIL | | | | *5.7E-5* | *8.6E-6* | | *lb/ton* |
| 2_L_FUEL | *Diesel Storage Tanks* | | | | | | |
| L_FUEL1 | | | | | | | *See "Fuel Tanks" Sheet* |
| 2_L_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | |
| L_D_C_STAT | | | | | | | *See "Loadout_Fleet" Sheet* |
| L_D_C_MOB | | | | | | | *See "Loadout_Fleet" Sheet* |
| L_D_FUG | | | | | | | *See "Loadout_Fleet" Sheet* |
| 2_L_S_WE | *Miscellaneous Fugitive Dust* | | | | | | |
| L_S_EFD | | | | *0.14* | *0.01* | | *lb/VMT* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
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oretonhr oretonyr procunit

## LOADOUT - PROCESS RATES

| | Process Rates | | |
|---|---|---|---|
| Source ID | Unit/Hr | Unit/Yr | Units & Notes |
| 2_L_CU_CONC | *Copper Concentrate Loadout* | | |
| L_CU_SHUT_CV | *290* | *2,119,244* | *ton* |
| L_CU_FILT | *290* | *2,119,244* | *ton* |
| L_CU_COL | *290* | *2,119,244* | *ton* |
| L_CU_BLT | *290* | *2,119,244* | *ton* |
| L_CU_CONC_HOP | *290* | *2,119,244* | *ton* |
| L_CU_CONC_FD | *290* | *2,119,244* | *ton* |
| L_CU_CONC_BLT | *290* | *2,119,244* | *ton* |
| L_CU_TRIP | *290* | *2,119,244* | *ton* |
| L_CU_LO | *290* | *2,119,244* | *ton* |
| L_CU_LO_HOP | *290* | *2,119,244* | *ton* |
| L_CU_WGH_BLT | *290* | *2,119,244* | *ton* |
| L_CU_LO_CV | *290* | *2,119,244* | *ton* |
| L_CU_RAIL | *290* | *2,119,244* | *ton* |
| 2_L_FUEL | *Diesel Storage Tanks* | | |
| L_FUEL1 | *89.0* | *419,451* | *gal* |
| 2_L_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | |
| L_D_C_STAT | | | *See "Loadout_Fleet" Sheet* |
| L_D_C_MOB | | | *See "Loadout_Fleet" Sheet* |
| L_D_FUG | | | *See "Loadout_Fleet" Sheet* |
| 2_L_S_WE | *Miscellaneous Fugitive Dust* | | |
| L_S_EFD | | | *See "Employees" Sheet* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
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ContTech ContEff CE_EF

## LOADOUT - CONTROLS

| Source ID | Control Technology | Control Efficiency | Notes |
|---|---|---|---|
| 2_L_CU_CONC | *Copper Concentrate Loadout* | | |
| L_CU_SHUT_CV | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_FILT | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_COL | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_BLT | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_CONC_HOP | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_CONC_FD | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_CONC_BLT | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_TRIP | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_LO | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_LO_HOP | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_WGH_BLT | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_LO_CV | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| L_CU_RAIL | *moisture, enclosure* | *0%* | *Control accounted for in EF* |
| 2_L_FUEL | *Diesel Storage Tanks* | | |
| L_FUEL1 | | *0%* | |
| 2_L_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | |
| L_D_C_STAT | | *0%* | |
| L_D_C_MOB | | *0%* | |
| L_D_FUG | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |
| 2_L_S_WE | *Miscellaneous Fugitive Dust* | | |
| L_S_EFD | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |

description

## LOADOUT - SOURCE IDENTIFICATION

| Source ID | Source Identification |
|---|---|
| 2_L_CU_CONC | *Copper Concentrate Loadout* |
| L_CU_SHUT_CV | *Concentrate Filters (FL-001 - 006) to Shuttle Conveyors (CV-001 - CV-006)* |
| L_CU_FILT | *Shuttle Conveyors (CV-001 - CV-006) to Filter Building (BG-011)* |
| L_CU_COL | *Shuttle Conveyors (CV-001 - CV-006) to Collecting Conveyor (CV-010)* |
| L_CU_BLT | *Collecting Conveyor (CV-010) to Belt Conveyor (CV-020)* |
| L_CU_CONC_HOP | *Concentrate Hopper (HP-011) Loading* |
| L_CU_CONC_FD | *Concentrate Hopper (HP-011) to Concentrate Feeder (FE-011)* |
| L_CU_CONC_BLT | *Concentrate Feeder (FE-011) to Belt Conveyor (CV-020)* |
| L_CU_TRIP | *Belt Conveyor (CV-020) to Tripper Conveyor (CV-030)* |
| L_CU_LO | *Tripper Conveyor (CV-030) to Storage and Loadout Shed (BG-012)* |
| L_CU_LO_HOP | *Front End Loader (MS-002) to Load Out Hoppers (HP-012 - 015)* |
| L_CU_WGH_BLT | *Load Out Hoppers (HP-012 - 015) to Weigh Belt Feeders (FE-012 -015)* |
| L_CU_LO_CV | *Weigh Belt Feeders (FE-012 -015) to Load Out Conveyors (CV-031 - 034)* |
| L_CU_RAIL | *Load Out Conveyors (CV-031 - 034) to Rail Cars* |
| 2_L_FUEL | *Diesel Storage Tanks* |
| L_FUEL1 | *Loadout Usage and Volume Estimated (Estimated Quantity: 4)* |
| 2_L_D | *Non-Emergency Diesel Fleet (mobile and stationary)* |
| L_D_C_STAT | *Loadout Combustion (Stationary)* |
| L_D_C_MOB | *Loadout Combustion (Mobile)* |
| L_D_FUG | *Loadout Fugitive Dust (Vehicle Travel)* |
| 2_L_S_WE | *Miscellaneous Fugitive Dust* |
| L_S_EFD | *Loadout Employee Fugitive Dust* |
| 3_L_TOTAL | *Loadout Subtotal* |

c_EFref

## LOADOUT - CONTROLLED - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_L_CU_CONC | *Copper Concentrate Loadout* |
| L_CU_SHUT_CV | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_FILT | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_COL | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_BLT | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_CONC_HOP | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_CONC_FD | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_CONC_BLT | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_TRIP | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_LO | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_LO_HOP | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_WGH_BLT | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_LO_CV | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_RAIL | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| 2_L_FUEL | *Diesel Storage Tanks* |
| L_FUEL1 | *See "Fuel Tanks" Sheet* |
| 2_L_D | *Non-Emergency Diesel Fleet (mobile and stationary)* |
| L_D_C_STAT | *See "Loadout_Fleet" Sheet* |
| L_D_C_MOB | *See "Loadout_Fleet" Sheet* |
| L_D_FUG | *See "Loadout_Fleet" Sheet* |
| 2_L_S_WE | *Miscellaneous Fugitive Dust* |
| L_S_EFD | *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04* |

u_EFref

## LOADOUT - UNCONTROLLED - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_L_CU_CONC | *Copper Concentrate Loadout* |
| L_CU_SHUT_CV | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_FILT | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_COL | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_BLT | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_CONC_HOP | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_CONC_FD | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_CONC_BLT | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_TRIP | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_LO | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_LO_HOP | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_WGH_BLT | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_LO_CV | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| L_CU_RAIL | *AP-42, Equation 13.2.4 (1), Rev. 11/06 (4.8% moist, 1.3 mph)* |
| 2_L_FUEL | *Diesel Storage Tanks* |
| L_FUEL1 | *See "Fuel Tanks" Sheet* |
| 2_L_D | *Non-Emergency Diesel Fleet (mobile and stationary)* |
| L_D_C_STAT | *See "Loadout_Fleet" Sheet* |
| L_D_C_MOB | *See "Loadout_Fleet" Sheet* |
| L_D_FUG | *See "Loadout_Fleet" Sheet* |
| 2_L_S_WE | *Miscellaneous Fugitive Dust* |
| L_S_EFD | *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 9 | SHEET: Tailings_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Tailings | DATE: July 25, 2014 | | |

c_COpph c_COtpy c_NOXpph c_NOXtpy c_SO2pph c_SO2tpy c_PM10pph c_PM10tpy c_PM25pph c_PM25tpy c_VOCpph c_VOCtpy

## TAILINGS - CONTROLLED - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_T_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| T_FUEL1 | | | | | | | | | | | *0.02* | *0.09* |
| 2_T_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | | | | | | |
| T_D_C_STAT | | | | | | | | | | | | |
| T_D_C_MOB | *108* | *159* | *13.1* | *18.2* | *0.20* | *0.25* | *0.62* | *0.89* | *0.62* | *0.89* | *6.9* | *9.0* |
| T_D_DOZ | | | | | | | *24.3* | *27.2* | *3.4* | *3.8* | | |
| T_D_FUG | | | | | | | *32.4* | *53.4* | *3.2* | *5.3* | | |
| 2_T_WE | *Miscellaneous Fugitive Dust* | | | | | | | | | | | |
| T_WE_FT_B | | | | | | | *22.8* | *8.3* | *3.4* | *1.3* | | |
| T_WE_FT_D | | | | | | | *3.0* | *1.1* | *0.45* | *0.17* | | |
| T_S_EFD | | | | | | | *9.7* | *3.5* | *0.97* | *0.35* | | |
| **3_T_TOTAL** | ***108*** | ***159*** | ***13.1*** | ***18.2*** | ***0.20*** | ***0.25*** | ***92.8*** | ***94.5*** | ***12.1*** | ***11.8*** | ***6.9*** | ***9.1*** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 2 | OF: 9 | SHEET: Tailings_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Tailings | DATE: July 25, 2014 | | |

u_COpph u_COtpy u_NOXpph u_NOXtpy u_SO2pph u_SO2tpy u_PM10pph u_PM10tpy u_PM25pph u_PM25tpy u_VOCpph u_VOCtpy

## TAILINGS - UNCONTROLLED - EMISSIONS SUMMARY

| | Potential Emissions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CO | | $NO_X$ | | $SO_2$ | | $PM_{10}$ | | $PM_{2.5}$ | | VOC | |
| **Source ID** | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* | *lb/hr* | *ton/yr* |
| 2_T_FUEL | *Diesel Storage Tanks* | | | | | | | | | | | |
| T_FUEL1 | | | | | | | | | | | *0.02* | *0.09* |
| 2_T_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | | | | | | |
| T_D_C_STAT | | | | | | | | | | | | |
| T_D_C_MOB | *108* | *159* | *13.1* | *18.2* | *0.20* | *0.25* | *0.62* | *0.89* | *0.62* | *0.89* | *6.9* | *9.0* |
| T_D_DOZ | | | | | | | *24.3* | *27.2* | *3.4* | *3.8* | | |
| T_D_FUG | | | | | | | *648* | *1,069* | *63.8* | *106* | | |
| 2_T_WE | *Miscellaneous Fugitive Dust* | | | | | | | | | | | |
| T_WE_FT_B | | | | | | | *455* | *166* | *68.9* | *25.2* | | |
| T_WE_FT_D | | | | | | | *59.7* | *21.8* | *9.0* | *3.3* | | |
| T_S_EFD | | | | | | | *194* | *71.0* | *19.4* | *7.1* | | |
| **3_T_TOTAL** | ***108*** | ***159*** | ***13.1*** | ***18.2*** | ***0.20*** | ***0.25*** | ***1,382*** | ***1,356*** | ***165*** | ***147*** | ***6.9*** | ***9.1*** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 3 | OF: 9 | SHEET: Tailings_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Tailings | DATE: July 25, 2014 | | |

c_COEF c_NOXEF c_SO2EF c_PM10EF c_PM25EF c_VOCEF c_EFunits

## TAILINGS - CONTROLLED - EMISSION FACTORS

| | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|
| **Source ID** | **CO** | **$NO_X$** | **$SO_2$** | **$PM_{10}$** | **$PM_{2.5}$** | **VOC** | **Units & Notes** |
| 2_T_FUEL | *Diesel Storage Tanks* | | | | | | |
| T_FUEL1 | | | | | | | *See "Fuel Tanks" Sheet* |
| 2_T_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | |
| T_D_C_STAT | | | | | | | *See "Tailings_Fleet" Sheet* |
| T_D_C_MOB | | | | | | | *See "Tailings_Fleet" Sheet* |
| T_D_DOZ | | | | | | | *See "Tailings_Fleet" Sheet* |
| T_D_FUG | | | | | | | *See "Tailings_Fleet" Sheet* |
| 2_T_WE | *Miscellaneous Fugitive Dust* | | | | | | |
| T_WE_FT_B | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| T_WE_FT_D | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| T_S_EFD | | | | *0.14* | *0.01* | | *lb/VMT* |

u_COEF u_NOXEF u_SO2EF u_PM10EF u_PM25EF u_VOCEF u_EFunits

## TAILINGS - UNCONTROLLED - EMISSION FACTORS

| | Emission Factors | | | | | | |
|---|---|---|---|---|---|---|---|
| **Source ID** | **CO** | **$NO_X$** | **$SO_2$** | **$PM_{10}$** | **$PM_{2.5}$** | **VOC** | **Units & Notes** |
| 2_T_FUEL | *Diesel Storage Tanks* | | | | | | |
| T_FUEL1 | | | | | | | *See "Fuel Tanks" Sheet* |
| 2_T_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | | | | | |
| T_D_C_STAT | | | | | | | *See "Tailings_Fleet" Sheet* |
| T_D_C_MOB | | | | | | | *See "Tailings_Fleet" Sheet* |
| T_D_DOZ | | | | | | | *See "Tailings_Fleet" Sheet* |
| T_D_FUG | | | | | | | *See "Tailings_Fleet" Sheet* |
| 2_T_WE | *Miscellaneous Fugitive Dust* | | | | | | |
| T_WE_FT_B | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| T_WE_FT_D | | | | *0.18* | *0.03* | | *ton/acre-yr* |
| T_S_EFD | | | | *0.14* | *0.01* | | *lb/VMT* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 5 | OF: 9 | SHEET: Tailings_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Tailings | DATE: July 25, 2014 | | |

oretonhr oretonyr procunit

## TAILINGS - PROCESS RATES

| | Process Rates | | |
|---|---|---|---|
| **Source ID** | **Unit/Hr** | **Unit/Yr** | **Units & Notes** |
| 2_T_FUEL | *Diesel Storage Tanks* | | |
| T_FUEL1 | *929* | *2,726,316* | *gal* |
| 2_T_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | |
| T_D_C_STAT | | | *See "Tailings_Fleet" Sheet* |
| T_D_C_MOB | | | *See "Tailings_Fleet" Sheet* |
| T_D_DOZ | | | *See "Tailings_Fleet" Sheet* |
| T_D_FUG | | | *See "Tailings_Fleet" Sheet* |
| 2_T_WE | *Miscellaneous Fugitive Dust* | | |
| T_WE_FT_B | | *926* | *dry acre* |
| T_WE_FT_D | | *121* | *dry acre* |
| T_S_EFD | | | *See "Employees" Sheet* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 6 | OF: 9 | SHEET: Tailings_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Tailings | DATE: July 25, 2014 | | |

ContTech ContEff CE_EF

## TAILINGS - CONTROLS

| Source ID | Control Technology | Control Efficiency | Notes |
|---|---|---|---|
| 2_T_FUEL | *Diesel Storage Tanks* | | |
| T_FUEL1 | | *0%* | |
| 2_T_D | *Non-Emergency Diesel Fleet (mobile and stationary)* | | |
| T_D_C_STAT | | *0%* | |
| T_D_C_MOB | | *0%* | |
| T_D_DOZ | | *0%* | |
| T_D_FUG | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |
| 2_T_WE | *Miscellaneous Fugitive Dust* | | |
| T_WE_FT_B | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |
| T_WE_FT_D | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |
| T_S_EFD | *water suppression* | *95%* | *AP-42, Figure 13.2.2-2, Rev. 11/06* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 7 | OF: 9 | SHEET: Tailings_DISP |
| AIR EMISSION CALCULATIONS | SUBJECT: Tailings | DATE: July 25, 2014 | | |

description

## TAILINGS - SOURCE IDENTIFICATION

| Source ID | Source Identification |
|---|---|
| 2_T_FUEL | *Diesel Storage Tanks* |
| T_FUEL1 | *Tailings Usage and Volume Estimated (Estimated Quantity: 12)* |
| 2_T_D | *Non-Emergency Diesel Fleet (mobile and stationary)* |
| T_D_C_STAT | *Tailings Combustion (Stationary)* |
| T_D_C_MOB | *Tailings Combustion (Mobile)* |
| T_D_DOZ | *Tailings Fugitive Dust (Dozing)* |
| T_D_FUG | *Tailings Fugitive Dust (Grading, Vehicle Travel)* |
| 2_T_WE | *Miscellaneous Fugitive Dust* |
| T_WE_FT_B | *Tailings Exposed Areas - Beach* |
| T_WE_FT_D | *Tailings Exposed Areas - Dam* |
| T_S_EFD | *Tailings Employee Fugitive Dust* |
| 3_T_TOTAL | *Tailings Subtotal* |

c_EFref

## TAILINGS - CONTROLLED - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_T_FUEL | *Diesel Storage Tanks* |
| T_FUEL1 | *See "Fuel Tanks" Sheet* |
| 2_T_D | *Non-Emergency Diesel Fleet (mobile and stationary)* |
| T_D_C_STAT | *See "Tailings_Fleet" Sheet* |
| T_D_C_MOB | *See "Tailings_Fleet" Sheet* |
| T_D_DOZ | *See "Tailings_Fleet" Sheet* |
| T_D_FUG | *See "Tailings_Fleet" Sheet* |
| 2_T_WE | *Miscellaneous Fugitive Dust* |
| T_WE_FT_B | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| T_WE_FT_D | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| T_S_EFD | *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04* |

u_EFref

## TAILINGS - UNCONTROLLED - EF REFRENCE

| Source ID | Emission Factor Reference |
|---|---|
| 2_T_FUEL | *Diesel Storage Tanks* |
| T_FUEL1 | *See "Fuel Tanks" Sheet* |
| 2_T_D | *Non-Emergency Diesel Fleet (mobile and stationary)* |
| T_D_C_STAT | *See "Tailings_Fleet" Sheet* |
| T_D_C_MOB | *See "Tailings_Fleet" Sheet* |
| T_D_DOZ | *See "Tailings_Fleet" Sheet* |
| T_D_FUG | *See "Tailings_Fleet" Sheet* |
| 2_T_WE | *Miscellaneous Fugitive Dust* |
| T_WE_FT_B | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| T_WE_FT_D | *AP-42, Table 11.9-4, Wind Erosion of Exposed Area, Rev. 7/98 (Ratio AP-42 13.2.4)* |
| T_S_EFD | *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 8 | SHEET: EP_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - East Plant | DATE: August 21, 2014 | | |

**East Plant Diesel Machinery (Non-Emergency)** Year 30

| LOC | Equipment[a] | Rating kW | Rating (hp) | Quantity | EPA Tier[b] | Fuel gal/hr | Ann. Op. Hours[c] | Engine Load | Contingency[d] |
|---|---|---|---|---|---|---|---|---|---|
| UG | Development LHD - Sandvik LH514 | 256 | 343 | 7 | 4 | 12 | 1,835 | 60% | 15% |
| UG | Development Drill - Atlas Copco M2C | 120 | 161 | 5 | 4 | 7 | 651 | 10% | 15% |
| UG | Production Drill - Simba M6C | 112 | 150 | 10 | 4 | 7 | 3,454 | 10% | 15% |
| UG | Blind Bore Machine - Redbore 50 MDUR | 0 | 0 | 1 | X | 0 | 1,498 | 0% | 15% |
| UG | Powder Truck - Normet Charmec MF 605 DA | 110 | 148 | 9 | 4 | 6 | 566 | 90% | 15% |
| UG | Bolter - Atlas Copco Boltec MC | 120 | 161 | 5 | 4 | 7 | 2,457 | 10% | 15% |
| UG | Mechanized Shotcrete Sprayers - Normet Spraymec 6050 WP | 96 | 129 | 5 | 4 | 7 | 740 | 60% | 15% |
| UG | Transmixer Trucks - Normet Utimec LF 600 | 155 | 208 | 3 | 4 | 11 | 2,409 | 90% | 15% |
| UG | UG Haul Trucks (40T) | 375 | 503 | 3 | 4 | 20 | 2,660 | 90% | 15% |
| UG | Scissor Trucks - Getman A64 | 129 | 173 | 4 | 4 | 6 | 1,187 | 90% | 15% |
| UG | Cable Bolters - Atlas Copco Cabletec LC | 120 | 161 | 10 | 4 | 7 | 641 | 10% | 15% |
| UG | Production LHD - Sandvik LH514e | 132 | 177 | 30 | X | 0 | 4,702 | 60% | 15% |
| UG | 2.3 yd LHD - Atlas Copco ST2G | 86 | 115 | 3 | 4 | 2 | 730 | 60% | 15% |
| UG | 3.5 yd LHD - Atlas Copco ST3.5 | 136 | 182 | 4 | 4 | 3 | 730 | 60% | 15% |
| S | Surface Shotcrete Truck - Highway Legal | 128 | 172 | 0 | 4 | 1 | 0 | 60% | 15% |
| UG | Mobile Rock Breaker - Sandvik LH514 | 256 | 343 | 5 | 4 | 12 | 0 | 90% | 15% |
| UG | Medium Reach Rig - MacLean BH-3 Blockholer | 147 | 197 | 2 | 4 | 7 | 388 | 10% | 15% |
| UG | Water Cannon - Getman A64 | 120 | 161 | 3 | 4 | 6 | 776 | 90% | 15% |
| UG | Fuel/Lube Truck - Normet Utimec | 120 | 161 | 4 | 4 | 6 | 776 | 90% | 15% |
| UG | Crane Truck - Getman A64 | 129 | 173 | 4 | 4 | 6 | 1,551 | 50% | 15% |
| UG | Man Haul Vans - Miller Toyota | 128 | 172 | 19 | 4 | 1 | 1,163 | 90% | 15% |
| UG | Flat Deck Truck - Getman A64 | 129 | 173 | 4 | 4 | 6 | 730 | 90% | 15% |
| UG | Crane Truck - Miller Toyota | 128 | 172 | 4 | 4 | 1 | 1,163 | 50% | 15% |
| UG | Generator Truck (LHD) - GETMAN A64 | 120 | 161 | 2 | 4 | 6 | 730 | 60% | 15% |
| UG | UG Grader - CAT 140M2 | 144 | 193 | 3 | 4 | 6 | 1,460 | 60% | 15% |
| UG | Forklift - CAT P36000 | 110 | 148 | 4 | 4 | 3 | 1,460 | 60% | 15% |
| UG | UG Water Trucks - Getman A64 | 129 | 173 | 3 | 4 | 6 | 1,460 | 60% | 15% |
| UG | Conveyor Maint Vehicle - Miller Crane Truck | 128 | 172 | 2 | 4 | 1 | 1,802 | 90% | 15% |
| UG | Scissor Lift - Miller Toyota | 128 | 172 | 9 | 4 | 1 | 1,163 | 50% | 15% |
| S | Surface Loader - CAT 962K | 165 | 221 | 2 | 4 | 6 | 1,939 | 60% | 15% |
| UG | Skid Steer Loader - CAT272D | 71 | 95 | 2 | 4 | 3 | 776 | 60% | 15% |
| UG | Raise Bore - Redbore 60 | 0 | 0 | 5 | 4 | 0 | 0 | 0% | 15% |
| UG | UG Dozer - 2.9m Blade - CAT D6N | 112 | 150 | 2 | 4 | 3 | 776 | 60% | 15% |

[a] *Email from M. Morissette 12/19/12, RCM Mine Data for Air Modeling 2012.xlsx*

[b] *Minimum Tier assumed. X denotes a unit with 0 kW rating, electric assumed*

[c] *Per unit, including availability and utilization factors*

[d] *Per RCM Mine Data for Air Modeling 2012.xlsx, not taken account for in operating hours*

| Conversions | |
|---|---|
| 453.592 | *g/lb* |
| 2,000 | *lb/ton* |
| 0.0015% | *ppm S in ULSD (GPA 2140)* |
| 7.05 | *lb/gal* |
| 1.00E+06 | *Btu/MMBtu* |
| 1.998 | $SO_2/S$ |
| 1.341 | *hp/kw* |

*Blue values are input , black values are calculated or linked*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 2 | OF: 8 | SHEET: EP_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - East Plant | DATE: August 21, 2014 | | |

**East Plant Diesel Machinery (Non-Emergency) - Emission Factors** **Year 30**

| Equipment | Rating kW | Quantity | CO* g/kW-hr | $NO_X$* g/kW-hr | $SO_2$** g/kW-hr | PM* g/kW-hr | VOC* g/kW-hr |
|---|---|---|---|---|---|---|---|
| Development LHD - Sandvik LH514 | 256 | 7 | 3.5 | 0.40 | - | 0.02 | 0.19 |
| Development Drill - Atlas Copco M2C | 120 | 5 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Production Drill - Simba M6C | 112 | 10 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Blind Bore Machine - Redbore 50 MDUR | 0 | 1 | 0.00 | 0.00 | - | 0.00 | 0.00 |
| Powder Truck - Normet Charmec MF 605 DA | 110 | 9 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Bolter - Atlas Copco Boltec MC | 120 | 5 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Mechanized Shotcrete Sprayers - Normet Spraymec 6050 WP | 96 | 5 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Transmixer Trucks - Normet Utimec LF 600 | 155 | 3 | 3.5 | 0.40 | - | 0.02 | 0.19 |
| UG Haul Trucks (40T) | 375 | 3 | 3.5 | 0.40 | - | 0.02 | 0.19 |
| Scissor Trucks - Getman A64 | 129 | 4 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Cable Bolters - Atlas Copco Cabletec LC | 120 | 10 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Production LHD - Sandvik LH514e | 132 | 30 | 0.00 | 0.00 | - | 0.00 | 0.00 |
| 2.3 yd LHD - Atlas Copco ST2G | 86 | 3 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| 3.5 yd LHD - Atlas Copco ST3.5 | 136 | 4 | 3.5 | 0.40 | - | 0.02 | 0.19 |
| Surface Shotcrete Truck - Highway Legal | 128 | 0 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Mobile Rock Breaker - Sandvik LH514 | 256 | 5 | 3.5 | 0.40 | - | 0.02 | 0.19 |
| Medium Reach Rig - MacLean BH-3 Blockholer | 147 | 2 | 3.5 | 0.40 | - | 0.02 | 0.19 |
| Water Cannon - Getman A64 | 120 | 3 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Fuel/Lube Truck - Normet Utimec | 120 | 4 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Crane Truck - Getman A64 | 129 | 4 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Man Haul Vans - Miller Toyota | 128 | 19 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Flat Deck Truck - Getman A64 | 129 | 4 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Crane Truck - Miller Toyota | 128 | 4 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Generator Truck (LHD) - GETMAN A64 | 120 | 2 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| UG Grader - CAT 140M2 | 144 | 3 | 3.5 | 0.40 | - | 0.02 | 0.19 |
| Forklift - CAT P36000 | 110 | 4 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| UG Water Trucks - Getman A64 | 129 | 3 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Conveyor Maint Vehicle - Miller Crane Truck | 128 | 2 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Scissor Lift - Miller Toyota | 128 | 9 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Surface Loader - CAT 962K | 165 | 2 | 3.5 | 0.40 | - | 0.02 | 0.19 |
| Skid Steer Loader - CAT272D | 71 | 2 | 5.0 | 0.40 | - | 0.02 | 0.19 |
| Raise Bore - Redbore 60 | 0 | 5 | 6.6 | 7.5 | - | 0.40 | 7.5 |
| UG Dozer - 2.9m Blade - CAT D6N | 112 | 2 | 5.0 | 0.40 | - | 0.02 | 0.19 |

* *40 CFR § 89.112 , Table 1*

** *$SO_2$ emissions - mass balance based on 15 ppm S content (ULSD)*

**East Plant Diesel Machinery (Non-Emergency) - Short Term Emission** **Year 30**

| SUM | Equipment | CO *lb/hr* | $NO_X$ *lb/hr* | $SO_2$ *lb/hr* | PM *lb/hr* | VOC *lb/hr* | LOC |
|---|---|---|---|---|---|---|---|
| 1 | Development LHD - Sandvik LH514 | 9.5 | 1.1 | 0.01 | 0.05 | 0.52 | UG |
| 1 | Development Drill - Atlas Copco M2C | 0.76 | 0.06 | 8.7E-4 | 3.0E-3 | 0.03 | UG |
| 1 | Production Drill - Simba M6C | 1.4 | 0.11 | 1.7E-3 | 0.01 | 0.05 | UG |
| 0 | Blind Bore Machine - Redbore 50 MDUR | | | | | | UG |
| 1 | Powder Truck - Normet Charmec MF 605 DA | 11.3 | 0.90 | 0.01 | 0.05 | 0.43 | UG |
| 1 | Bolter - Atlas Copco Boltec MC | 0.76 | 0.06 | 8.7E-4 | 3.0E-3 | 0.03 | UG |
| 1 | Mechanized Shotcrete Sprayers - Normet Spraymec 6050 WP | 3.7 | 0.29 | 0.01 | 0.01 | 0.14 | UG |
| 1 | Transmixer Trucks - Normet Utimec LF 600 | 3.7 | 0.42 | 0.01 | 0.02 | 0.20 | UG |
| 1 | UG Haul Trucks (40T) | 9.0 | 1.0 | 0.01 | 0.05 | 0.49 | UG |
| 1 | Scissor Trucks - Getman A64 | 5.9 | 0.47 | 0.01 | 0.02 | 0.22 | UG |
| 1 | Cable Bolters - Atlas Copco Cabletec LC | 1.5 | 0.12 | 1.7E-3 | 0.01 | 0.06 | UG |
| 1 | Production LHD - Sandvik LH514e | | | | | | UG |
| 1 | 2.3 yd LHD - Atlas Copco ST2G | 2.0 | 0.16 | 9.2E-4 | 0.01 | 0.07 | UG |
| 1 | 3.5 yd LHD - Atlas Copco ST3.5 | 2.9 | 0.33 | 1.8E-3 | 0.02 | 0.16 | UG |
| 1 | Surface Shotcrete Truck - Highway Legal | | | | | | S |
| 1 | Mobile Rock Breaker - Sandvik LH514 | 10.2 | 1.2 | 0.01 | 0.06 | 0.55 | UG |
| 0 | Medium Reach Rig - MacLean BH-3 Blockholer | 0.26 | 0.03 | 3.5E-4 | 1.5E-3 | 0.01 | UG |
| 1 | Water Cannon - Getman A64 | 4.1 | 0.33 | 4.0E-3 | 0.02 | 0.16 | UG |
| 1 | Fuel/Lube Truck - Normet Utimec | 5.5 | 0.44 | 0.01 | 0.02 | 0.21 | UG |
| 1 | Crane Truck - Getman A64 | 3.3 | 0.26 | 3.0E-3 | 0.01 | 0.12 | UG |
| 1 | Man Haul Vans - Miller Toyota | 27.7 | 2.2 | 4.4E-3 | 0.11 | 1.1 | UG |
| 1 | Flat Deck Truck - Getman A64 | 5.9 | 0.47 | 0.01 | 0.02 | 0.22 | UG |
| 1 | Crane Truck - Miller Toyota | 3.2 | 0.26 | 5.1E-4 | 0.01 | 0.12 | UG |
| 1 | Generator Truck (LHD) - GETMAN A64 | 1.8 | 0.15 | 1.8E-3 | 0.01 | 0.07 | UG |
| 1 | UG Grader - CAT 140M2 | 2.3 | 0.26 | 2.7E-3 | 0.01 | 0.12 | UG |
| 1 | Forklift - CAT P36000 | 3.3 | 0.27 | 1.5E-3 | 0.01 | 0.13 | UG |
| 1 | UG Water Trucks - Getman A64 | 2.9 | 0.24 | 2.7E-3 | 0.01 | 0.11 | UG |
| 1 | Conveyor Maint Vehicle - Miller Crane Truck | 2.9 | 0.23 | 4.6E-4 | 0.01 | 0.11 | UG |
| 1 | Scissor Lift - Miller Toyota | 7.3 | 0.58 | 1.2E-3 | 0.03 | 0.28 | UG |
| 1 | Surface Loader - CAT 962K | 1.8 | 0.20 | 1.8E-3 | 0.01 | 0.10 | S |
| 1 | Skid Steer Loader - CAT272D | 1.1 | 0.09 | 8.5E-4 | 4.3E-3 | 0.04 | UG |
| 0 | Raise Bore - Redbore 60 | | | | | | UG |
| 1 | UG Dozer - 2.9m Blade - CAT D6N | 1.7 | 0.14 | 7.7E-4 | 0.01 | 0.06 | UG |
| | **East Plant Underground** | **136** | **12.2** | **0.11** | **0.61** | **5.8** | |
| | **East Plant Surface** | **1.8** | **0.20** | **1.8E-3** | **0.01** | **0.10** | |
| | **East Plant Total** | **138** | **12.4** | **0.11** | **0.62** | **5.9** | |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 4 | OF: 8 | SHEET: EP_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - East Plant | DATE: August 21, 2014 | | |

**East Plant Diesel Machinery (Non-Emergency) - Long Term Emission** **Year 30**

| SUM | Equipment | CO ton/yr | $NO_X$ ton/yr | $SO_2$ ton/yr | PM ton/yr | VOC ton/yr | LOC |
|---|---|---|---|---|---|---|---|
| 1 | Development LHD - Sandvik LH514 | 8.8 | 1.0 | 0.01 | 0.05 | 0.48 | UG |
| 1 | Development Drill - Atlas Copco M2C | 0.25 | 0.02 | 2.8E-4 | 9.9E-4 | 0.01 | UG |
| 1 | Production Drill - Simba M6C | 2.5 | 0.20 | 3.0E-3 | 0.01 | 0.09 | UG |
| 0 | Blind Bore Machine - Redbore 50 MDUR | | | | | | UG |
| 1 | Powder Truck - Normet Charmec MF 605 DA | 3.2 | 0.26 | 3.4E-3 | 0.01 | 0.12 | UG |
| 1 | Bolter - Atlas Copco Boltec MC | 0.93 | 0.07 | 1.1E-3 | 3.7E-3 | 0.04 | UG |
| 1 | Mechanized Shotcrete Sprayers - Normet Spraymec 6050 WP | 1.4 | 0.11 | 1.9E-3 | 0.01 | 0.05 | UG |
| 1 | Transmixer Trucks - Normet Utimec LF 600 | 4.5 | 0.51 | 0.01 | 0.03 | 0.24 | UG |
| 1 | UG Haul Trucks (40T) | 11.9 | 1.4 | 0.02 | 0.07 | 0.65 | UG |
| 1 | Scissor Trucks - Getman A64 | 3.5 | 0.28 | 3.2E-3 | 0.01 | 0.13 | UG |
| 1 | Cable Bolters - Atlas Copco Cabletec LC | 0.49 | 0.04 | 5.6E-4 | 1.9E-3 | 0.02 | UG |
| 1 | Production LHD - Sandvik LH514e | | | | | | UG |
| 1 | 2.3 yd LHD - Atlas Copco ST2G | 0.72 | 0.06 | 3.4E-4 | 2.9E-3 | 0.03 | UG |
| 1 | 3.5 yd LHD - Atlas Copco ST3.5 | 1.1 | 0.12 | 6.7E-4 | 0.01 | 0.06 | UG |
| 1 | Surface Shotcrete Truck - Highway Legal | | | | | | S |
| 1 | Mobile Rock Breaker - Sandvik LH514 | | | | | | UG |
| 0 | Medium Reach Rig - MacLean BH-3 Blockholer | 0.05 | 0.01 | 6.7E-5 | 2.9E-4 | 2.7E-3 | UG |
| 1 | Water Cannon - Getman A64 | 1.6 | 0.13 | 1.5E-3 | 0.01 | 0.06 | UG |
| 1 | Fuel/Lube Truck - Normet Utimec | 2.1 | 0.17 | 2.1E-3 | 0.01 | 0.08 | UG |
| 1 | Crane Truck - Getman A64 | 2.5 | 0.20 | 2.3E-3 | 0.01 | 0.10 | UG |
| 1 | Man Haul Vans - Miller Toyota | 16.1 | 1.3 | 2.6E-3 | 0.06 | 0.61 | UG |
| 1 | Flat Deck Truck - Getman A64 | 2.1 | 0.17 | 1.9E-3 | 0.01 | 0.08 | UG |
| 1 | Crane Truck - Miller Toyota | 1.9 | 0.15 | 3.0E-4 | 0.01 | 0.07 | UG |
| 1 | Generator Truck (LHD) - GETMAN A64 | 0.67 | 0.05 | 6.5E-4 | 2.7E-3 | 0.03 | UG |
| 1 | UG Grader - CAT 140M2 | 1.7 | 0.19 | 1.9E-3 | 0.01 | 0.09 | UG |
| 1 | Forklift - CAT P36000 | 2.4 | 0.20 | 1.1E-3 | 0.01 | 0.09 | UG |
| 1 | UG Water Trucks - Getman A64 | 2.1 | 0.17 | 1.9E-3 | 0.01 | 0.08 | UG |
| 1 | Conveyor Maint Vehicle - Miller Crane Truck | 2.6 | 0.21 | 4.2E-4 | 0.01 | 0.10 | UG |
| 1 | Scissor Lift - Miller Toyota | 4.2 | 0.34 | 6.7E-4 | 0.02 | 0.16 | UG |
| 1 | Surface Loader - CAT 962K | 1.7 | 0.19 | 1.7E-3 | 0.01 | 0.09 | S |
| 1 | Skid Steer Loader - CAT272D | 0.42 | 0.03 | 3.3E-4 | 1.7E-3 | 0.02 | UG |
| 0 | Raise Bore - Redbore 60 | | | | | | UG |
| 1 | UG Dozer - 2.9m Blade - CAT D6N | 0.66 | 0.05 | 3.0E-4 | 2.6E-3 | 0.03 | UG |
| | **East Plant Underground** | **80.4** | **7.4** | **0.07** | **0.37** | **3.5** | |
| | **East Plant Surface** | **1.7** | **0.19** | **1.7E-3** | **0.01** | **0.09** | |
| | **East Plant Total** | **82.1** | **7.6** | **0.07** | **0.38** | **3.6** | |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 5 | OF: 8 | SHEET: EP_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - East Plant | DATE: August 21, 2014 | | |

**East Plant Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Vehicle Specifications** **Year 30**

| Equipment | Quantity | Ann. Op. Hours[a] | Speed[b] *mph* | Silt[c] *%* | Weight[d] *ton* |
|---|---|---|---|---|---|
| Development LHD - Sandvik LH514 | 7 | 1,835 | 12.0 | 2.0 | 50 |
| Development Drill - Atlas Copco M2C | 5 | 651 | 5.0 | 2.0 | 30 |
| Production Drill - Simba M6C | 10 | 3,454 | 5.0 | 2.0 | 23 |
| Blind Bore Machine - Redbore 50 MDUR | 1 | 1,498 | 0.0 | 2.0 | 16 |
| Powder Truck - Normet Charmec MF 605 DA | 9 | 566 | 5.0 | 2.0 | 20 |
| Bolter - Atlas Copco Boltec MC | 5 | 2,457 | 5.0 | 2.0 | 24 |
| Mechanized Shotcrete Sprayers - Normet Spraymec 6050 WP | 5 | 740 | 5.0 | 2.0 | 15 |
| Transmixer Trucks - Normet Utimec LF 600 | 3 | 2,409 | 15.0 | 2.0 | 23 |
| UG Haul Trucks (40T) | 3 | 2,660 | 15.0 | 2.0 | 44 |
| Scissor Trucks - Getman A64 | 4 | 1,187 | 12.0 | 2.0 | 12 |
| Cable Bolters - Atlas Copco Cabletec LC | 10 | 641 | 5.0 | 2.0 | 33 |
| Production LHD - Sandvik LH514e | 30 | 4,702 | 15.0 | 2.0 | 50 |
| 2.3 yd LHD - Atlas Copco ST2G | 3 | 730 | 12.0 | 2.0 | 17 |
| 3.5 yd LHD - Atlas Copco ST3.5 | 4 | 730 | 12.0 | 2.0 | 22 |
| Surface Shotcrete Truck - Highway Legal | 0 | 0 | 5.0 | 2.0 | 4 |
| Mobile Rock Breaker - Sandvik LH514 | 5 | 0 | 12.0 | 2.0 | 16 |
| Medium Reach Rig - MacLean BH-3 Blockholer | 2 | 388 | 5.0 | 2.0 | 14 |
| Water Cannon - Getman A64 | 3 | 776 | 10.0 | 2.0 | 17 |
| Fuel/Lube Truck - Normet Utimec | 4 | 776 | 15.0 | 2.0 | 12 |
| Crane Truck - Getman A64 | 4 | 1,551 | 15.0 | 2.0 | 17 |
| Man Haul Vans - Miller Toyota | 19 | 1,163 | 15.0 | 2.0 | 4 |
| Flat Deck Truck - Getman A64 | 4 | 730 | 15.0 | 2.0 | 12 |
| Crane Truck - Miller Toyota | 4 | 1,163 | 15.0 | 2.0 | 17 |
| Generator Truck (LHD) - GETMAN A64 | 2 | 730 | 5.0 | 2.0 | 17 |
| UG Grader - CAT 140M2 | 3 | 1,460 | 8.0 | 2.0 | 22 |
| Forklift - CAT P36000 | 4 | 1,460 | 5.0 | 2.0 | 30 |
| UG Water Trucks - Getman A64 | 3 | 1,460 | 15.0 | 2.0 | 17 |
| Conveyor Maint Vehicle - Miller Crane Truck | 2 | 1,802 | 15.0 | 2.0 | 17 |
| Scissor Lift - Miller Toyota | 9 | 1,163 | 15.0 | 2.0 | 6 |
| Surface Loader - CAT 962K | 2 | 1,939 | 5.0 | 2.0 | 26 |
| Skid Steer Loader - CAT272D | 2 | 776 | 5.0 | 2.0 | 5 |
| Raise Bore - Redbore 60 | 5 | 0 | 0.0 | 2.0 | 28 |
| UG Dozer - 2.9m Blade - CAT D6N | 2 | 776 | 5.0 | 2.0 | 20 |

[a] *Per unit, including availability and utilization factors*

[b] *Meeting with C. Pascoe 5/7/14, Phone Meeting K. Ballard 5/14/14*

[c] *Email from K. Ballard, 6/5/14, based on grindability studies*

[d] *Manufacturer specifications (vehicle wt + half of rated payload, if applicable), estimated based on type of equipment if not available*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 6 | OF: 8 | SHEET: EP_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - East Plant | DATE: August 21, 2014 | | |

**East Plant Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Emission Factors** **Year 30**

| Equipment | PM* lb/VMT | $PM_{10}$* lb/VMT | $PM_{2.5}$* lb/VMT | LOC |
|---|---|---|---|---|
| Development LHD - Sandvik LH514 | 4.9 | 1.1 | 0.11 | UG |
| Development Drill - Atlas Copco M2C | 3.9 | 0.84 | 0.08 | UG |
| Production Drill - Simba M6C | 3.5 | 0.75 | 0.07 | UG |
| Blind Bore Machine - Redbore 50 MDUR | 3.0 | 0.64 | 0.06 | UG |
| Powder Truck - Normet Charmec MF 605 DA | 3.3 | 0.70 | 0.07 | UG |
| Bolter - Atlas Copco Boltec MC | 3.6 | 0.76 | 0.08 | UG |
| Mechanized Shotcrete Sprayers - Normet Spraymec 6050 WP | 2.9 | 0.62 | 0.06 | UG |
| Transmixer Trucks - Normet Utimec LF 600 | 3.5 | 0.75 | 0.07 | UG |
| UG Haul Trucks (40T) | 4.7 | 1.0 | 0.10 | UG |
| Scissor Trucks - Getman A64 | 2.6 | 0.56 | 0.06 | UG |
| Cable Bolters - Atlas Copco Cabletec LC | 4.1 | 0.88 | 0.09 | UG |
| Production LHD - Sandvik LH514e | 5.0 | 1.1 | 0.11 | UG |
| 2.3 yd LHD - Atlas Copco ST2G | 3.1 | 0.65 | 0.07 | UG |
| 3.5 yd LHD - Atlas Copco ST3.5 | 3.4 | 0.73 | 0.07 | UG |
| Surface Shotcrete Truck - Highway Legal | 1.4 | 0.30 | 0.03 | S |
| Mobile Rock Breaker - Sandvik LH514 | 3.0 | 0.64 | 0.06 | UG |
| Medium Reach Rig - MacLean BH-3 Blockholer | 2.8 | 0.60 | 0.06 | UG |
| Water Cannon - Getman A64 | 3.1 | 0.65 | 0.07 | UG |
| Fuel/Lube Truck - Normet Utimec | 2.7 | 0.57 | 0.06 | UG |
| Crane Truck - Getman A64 | 3.1 | 0.65 | 0.07 | UG |
| Man Haul Vans - Miller Toyota | 1.6 | 0.34 | 0.03 | UG |
| Flat Deck Truck - Getman A64 | 2.6 | 0.56 | 0.06 | UG |
| Crane Truck - Miller Toyota | 3.1 | 0.65 | 0.07 | UG |
| Generator Truck (LHD) - GETMAN A64 | 3.1 | 0.65 | 0.07 | UG |
| UG Grader - CAT 140M2 | 3.4 | 0.73 | 0.07 | UG |
| Forklift - CAT P36000 | 3.9 | 0.84 | 0.08 | UG |
| UG Water Trucks - Getman A64 | 3.1 | 0.65 | 0.07 | UG |
| Conveyor Maint Vehicle - Miller Crane Truck | 3.1 | 0.65 | 0.07 | UG |
| Scissor Lift - Miller Toyota | 2.0 | 0.42 | 0.04 | UG |
| Surface Loader - CAT 962K | 3.3 | 0.70 | 0.07 | S |
| Skid Steer Loader - CAT272D | 1.8 | 0.38 | 0.04 | UG |
| Raise Bore - Redbore 60 | 3.8 | 0.82 | 0.08 | UG |
| UG Dozer - 2.9m Blade - CAT D6N | 3.3 | 0.70 | 0.07 | UG |

* *Control from precip and water & chemical dust suppressant applied to emission factors*

**Unpaved Road Controls**

| | Surface | UG | Reference |
|---|---|---|---|
| Days of >0.01" Precip | 41 | 0 | *East Plant Precip data* |
| Water & Chemical Suppression* | 95% | 95% | *AP-42, Figure 13.2.2-2, Rev. 11/06* |

* *Control efficiency is based on AP-42 Chapter 13.2.2, Unpaved Roads. Figure 13.2.2-2 provides the control efficiencies achievable with watering*

**Unpaved Roads - Predictive Emission Factor Equation & Constants***

$E = k \times (s / 12)^a \times (W / 3)^b \times (365 - P) / 365$

k, a, b - empirical constants

s - surface material silt content %

W - mean vehicle wt ton

P - Days of >0.01" Precip

| | Empirical Constants for Industrial Roads | | | |
|---|---|---|---|---|
| Constant | PM | $PM_{10}$ | $PM_{2.5}$ |
| k | 4.9 | 1.5 | 0.15 |
| a | 0.7 | 0.9 | 0.9 |
| b | 0.45 | 0.45 | 0.45 |

* *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04*

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - East Plant | DATE: August 21, 2014 | | |

**East Plant Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Emissions (Short Term & Long Term)** **Year 30**

| Equipment | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* | LOC |
|---|---|---|---|---|---|---|---|
| Development LHD - Sandvik LH514 | 415 | 88.7 | 8.9 | 380 | 81.4 | 8.1 | UG |
| Development Drill - Atlas Copco M2C | 98.5 | 21.1 | 2.1 | 32.0 | 6.9 | 0.69 | UG |
| Production Drill - Simba M6C | 175 | 37.4 | 3.7 | 302 | 64.6 | 6.5 | UG |
| Blind Bore Machine - Redbore 50 MDUR | | | | | | | UG |
| Powder Truck - Normet Charmec MF 605 DA | 148 | 31.6 | 3.2 | 41.8 | 8.9 | 0.89 | UG |
| Bolter - Atlas Copco Boltec MC | 89.1 | 19.1 | 1.9 | 109 | 23.4 | 2.3 | UG |
| Mechanized Shotcrete Sprayers - Normet Spraymec 6050 WP | 72.1 | 15.4 | 1.5 | 26.7 | 5.7 | 0.57 | UG |
| Transmixer Trucks - Normet Utimec LF 600 | 157 | 33.7 | 3.4 | 190 | 40.5 | 4.1 | UG |
| UG Haul Trucks (40T) | 211 | 45.1 | 4.5 | 280 | 60.0 | 6.0 | UG |
| Scissor Trucks - Getman A64 | 125 | 26.8 | 2.7 | 74.3 | 15.9 | 1.6 | UG |
| Cable Bolters - Atlas Copco Cabletec LC | 206 | 44.0 | 4.4 | 65.9 | 14.1 | 1.4 | UG |
| Production LHD - Sandvik LH514e | 2,231 | 477 | 47.7 | 5,246 | 1,122 | 112 | UG |
| 2.3 yd LHD - Atlas Copco ST2G | 110 | 23.5 | 2.3 | 40.1 | 8.6 | 0.86 | UG |
| 3.5 yd LHD - Atlas Copco ST3.5 | 164 | 35.2 | 3.5 | 60.0 | 12.8 | 1.3 | UG |
| Surface Shotcrete Truck - Highway Legal | | | | | | | S |
| Mobile Rock Breaker - Sandvik LH514 | 178 | 38.1 | 3.8 | | | | UG |
| Medium Reach Rig - MacLean BH-3 Blockholer | 28.0 | 6.0 | 0.60 | 5.4 | 1.2 | 0.12 | UG |
| Water Cannon - Getman A64 | 91.5 | 19.6 | 2.0 | 35.5 | 7.6 | 0.76 | UG |
| Fuel/Lube Truck - Normet Utimec | 159 | 34.1 | 3.4 | 61.7 | 13.2 | 1.3 | UG |
| Crane Truck - Getman A64 | 183 | 39.2 | 3.9 | 142 | 30.4 | 3.0 | UG |
| Man Haul Vans - Miller Toyota | 453 | 97.0 | 9.7 | 264 | 56.4 | 5.6 | UG |
| Flat Deck Truck - Getman A64 | 157 | 33.5 | 3.3 | 57.1 | 12.2 | 1.2 | UG |
| Crane Truck - Miller Toyota | 183 | 39.2 | 3.9 | 107 | 22.8 | 2.3 | UG |
| Generator Truck (LHD) - GETMAN A64 | 30.5 | 6.5 | 0.65 | 11.1 | 2.4 | 0.24 | UG |
| UG Grader - CAT 140M2 | 82.2 | 17.6 | 1.8 | 60.0 | 12.8 | 1.3 | UG |
| Forklift - CAT P36000 | 78.8 | 16.9 | 1.7 | 57.5 | 12.3 | 1.2 | UG |
| UG Water Trucks - Getman A64 | 137 | 29.4 | 2.9 | 100 | 21.4 | 2.1 | UG |
| Conveyor Maint Vehicle - Miller Crane Truck | 91.5 | 19.6 | 2.0 | 82.5 | 17.6 | 1.8 | UG |
| Scissor Lift - Miller Toyota | 266 | 57.0 | 5.7 | 155 | 33.1 | 3.3 | UG |
| Surface Loader - CAT 962K | 32.8 | 7.0 | 0.70 | 31.8 | 6.8 | 0.68 | S |
| Skid Steer Loader - CAT272D | 17.6 | 3.8 | 0.38 | 6.8 | 1.5 | 0.15 | UG |
| Raise Bore - Redbore 60 | | | | | | | UG |
| UG Dozer - 2.9m Blade - CAT D6N | 32.8 | 7.0 | 0.70 | 12.7 | 2.7 | 0.27 | UG |
| **Vehicle Travel - East Plant Underground** | **6,372** | **1,363** | **136** | **8,006** | **1,713** | **171** | |
| **Vehicle Travel - East Plant Surface** | **32.8** | **7.0** | **0.70** | **31.8** | **6.8** | **0.68** | |
| **Vehicle Travel - East Plant Total** | **6,404** | **1,370** | **137** | **8,038** | **1,720** | **172** | |

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - East Plant | DATE: August 21, 2014 | | |

**East Plant Diesel Machinery (Non-Emergency) - Fugitive Emissions from Grading/Dozing - Emissions (Short Term & Long Term)** **Year 30**

**Emission Factors**

| Grading | PM | $PM_{10}$ | $PM_{2.5}$ | EF Unit | |
|---|---|---|---|---|---|
| UG Grader - CAT 140M2 | 3.0 | 1.8 | 0.1 | *lb/VMT* | UG |
| **Dozing** | | | | | |
| UG Dozer - 2.9m Blade - CAT D6N | 2.2 | 1.6 | 0.2 | *lb/hr* | UG |

LOC

**Emissions**

| | Quantity | Operation *hr/yr* | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* | |
|---|---|---|---|---|---|---|---|---|---|
| **Grading** | | | | | | | | | |
| UG Grader - CAT 140M2 | 3 | 1,679 | 49.6 | 29.8 | 1.5 | 41.7 | 25.0 | 1.3 | UG |
| **Dozing** | | | | | | | | | |
| UG Dozer - 2.9m Blade - CAT D6N | 2 | 892 | 4.3 | 3.2 | 0.45 | 1.9 | 1.4 | 0.20 | UG |
| **Grading - East Plant Underground** | | | **49.6** | **29.8** | **1.5** | **41.7** | **25.0** | **1.3** | |
| **Grading - East Plant Surface** | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| **Dozing - East Plant Underground** | | | **4.3** | **3.2** | **0.45** | **1.9** | **1.4** | **0.20** | |
| **Dozing - East Plant Surface** | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| **Grading/Dozing - East Plant Total** | | | **54.0** | **33.0** | **2.0** | **43.6** | **26.4** | **1.5** | |

**East Plant Underground Fleet - Uncontrolled Fugitive Dust Emissions**

| | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* |
|---|---|---|---|---|---|---|
| **Vehicle Travel & Grading - East Plant Underground** | **6,421** | **1,393** | **138** | **8,048** | **1,738** | **173** |
| **Dozing - East Plant Underground** | **4.3** | **3.2** | **0.45** | **1.9** | **1.4** | **0.20** |
| **Fugitive Dust - East Plant Underground Total** | **6,426** | **1,396** | **138** | **8,050** | **1,739** | **173** |

**East Plant Surface Fleet - Uncontrolled Fugitive Dust Emissions**

| | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* |
|---|---|---|---|---|---|---|
| **Vehicle Travel & Grading - East Plant Surface** | **32.8** | **7.0** | **0.70** | **31.8** | **6.8** | **0.68** |
| **Dozing - East Plant Surface** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Fugitive Dust - East Plant Surface Total** | **32.8** | **7.0** | **0.70** | **31.8** | **6.8** | **0.68** |

**Dozing and Grading Emission Factor Equations** *AP-42, 11.9, Table 11.9-1 (overburden), Rev. 7/98*

| | | Scaling Factor $PM_{10}$ | Scaling Factor $PM_{2.5}$ | |
|---|---|---|---|---|
| | PM | | | |
| Dozing | $E = (5.7 * s^{1.2}) / (M^{1.3})$ | 0.75 | 0.105 | |
| Grading | $E = 0.040 * S^{2.5}$ | 0.6 | 0.031 | |
| s = material silt content % | | | 2.0 | *Email from K. Ballard, 6/5/14, based on grindability studies* |
| M = material moisture content % | | | 4.0 | *Average from Design Criteria* |
| S = mean vehicle speed mph | | | 5.59 | *Phone Meeting with C. Pascoe 10/11/12 (9 km/hr)* |
| Fuel Contingency | | | 15% | *RCM Mine Data for Ari Modelling 2012.xlsx* |

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Mill | DATE: July 28, 2014 | | |

**Mill Diesel Machinery (Non-Emergency)**

| Stat./Mob. | Mobile Equipment | References & Notes | Rating kW | Rating (hp) | Quantity | EPA Tier | Fuel gal/hr | Ann. Op. Hours | Engine Load | Contin-gency* |
|---|---|---|---|---|---|---|---|---|---|---|
| M | Dozer (Coarse Ore Stockpile) | a, b | 219 | 294 | 1 | U | 15 | 6,132 | 60% | 15% |
| M | Boom Truck (Pebble Crusher) | a, b | 219 | 294 | 1 | U | 15 | 2,190 | 60% | 15% |
| M | Wheel Loader (2yrs) - 992 class | a, b | 189 | 254 | 2 | U | 13 | 6,130 | 60% | 15% |
| M | Forklift (Maintenance) | a, b | 58 | 78 | 1 | U | 4 | 2,190 | 60% | 15% |
| M | Bobcat | a, b | 58 | 78 | 2 | U | 4 | 2,920 | 60% | 15% |
| M | Flatbed Truck | b, c | 146 | 196 | 1 | U | 10** | 2,190 | 90% | 15% |
| M | Forklift (Moly Plant-Lg) | b, c | 146 | 196 | 1 | U | 10** | 2,920 | 60% | 15% |
| S | Stormwater Mgmt. Pump | a, d | 153 | 205 | 3 | U | 10 | 1,095 | 90% | 15% |
| S | Stormwater Mgmt. Pump | a, d | 388 | 520 | 0 | U | 27 | 1,095 | 90% | 15% |
| M | Flatbed Truck (1 ton, nonroad) | c, d | 287 | 385 | 2 | U | 20 | 1,095 | 90% | 15% |
| M | Grader | b, d | 117 | 157 | 1 | U | 8 | 2,190 | 60% | 15% |
| M | Backhoe | b, d | 112 | 150 | 1 | U | 4 | 2,190 | 60% | 15% |
| M | Water Truck | b, d | 219 | 294 | 2 | U | 15 | 2,190 | 60% | 15% |
| M | Boom Truck | b, d | 117 | 157 | 1 | U | 8 | 2,190 | 60% | 15% |
| M | Fuel Lube Truck | b, d, e | 224 | 300 | 1 | U | 3 | 4,380 | 90% | 15% |
| M | 20T Crane | b, d | 75 | 100 | 1 | U | 8 | 1,752 | 50% | 15% |
| M | 60T Crane | b, d | 117 | 157 | 1 | U | 8 | 876 | 50% | 15% |
| M | Mobile Air Compressor | b, d | 44 | 59 | 2 | U | 3 | 1,095 | 90% | 15% |
| M | Light Tower | b, d | 7 | 10 | 2 | U | 1 | 4,380 | 90% | 15% |
| M | Fusion Machine | b, d | 44 | 59 | 1 | U | 3 | 2,190 | 90% | 15% |
| M | Lg Forklift (Warehouse) | d, e | 146 | 196 | 1 | U | 10** | 2,190 | 60% | 15% |
| M | Sm Forklift (Warehouse) | d, e | 146 | 196 | 1 | U | 10** | 2,190 | 60% | 15% |
| M | Highrail Maintenance Vehicle | d, e | 146 | 196 | 1 | U | 10** | 876 | 80% | 15% |
| M | Bucket Truck (Electrical) | d, e | 146 | 196 | 1 | U | 10** | 876 | 90% | 15% |
| M | Vacuum Truck | d, e | 146 | 196 | 1 | U | 10** | 876 | 90% | 15% |
| M | Man/Boom Lifts | d, e | 146 | 196 | 2 | U | 10** | 2,190 | 50% | 15% |
| M | Loader (Clean-up)-972 Class | d, e | 146 | 196 | 1 | U | 10** | 2,190 | 60% | 15% |

* *Per RCM Mine Data for Air Modeling 2012.xlsx. Taken account for in emissions, not operating hours*

** Conservative Assumption

| Conversions | | |
|---|---|---|
| 453.592 | *g/lb* | |
| 2,000 | *lb/ton* | |
| 0.0015% | *ppm S in ULSD (GPA 2140)* | |
| 7.05 | *lb/gal* | |
| 1.00E+06 | *Btu/MMBtu* | |
| 1.998 | *$SO_2$/S* | |
| 1.341 | *hp/kw* | |
| 7,000 | *Btu/hp-hr* | *AP-42, Table 3.4-1, Footnote e, Diesel, Rev. 10/96* |
| 137,000 | *Btu/gal* | *AP-42, Appendix A, Diesel, Rev. 9/85* |
| 8,760 | *hr/yr* | |

| References & Notes | | |
|---|---|---|
| a | *West Plant & Filter Plant Mobile Eq.xlsx (R. Heig 2/16/13)* | |
| b | *Unknown, assuming EPA Tier* | 4 |
| c | *Email from K. Ballard, 4/16/2014* | |

*Blue values are input , black values are calculated or linked*

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Mill | DATE: July 28, 2014 | | |

**Mill Diesel Machinery (Non-Emergency) - Emission Factors**

| Stat./Mob. | Equipment | Rating kW | Quantity | CO CO* g/kW-hr | NOX $NO_x$* g/kW-hr | SO2 $SO_2$** g/kW-hr | PM PM* g/kW-hr | VOC VOC* g/kW-hr | |
|---|---|---|---|---|---|---|---|---|---|
| M | Dozer (Coarse Ore Stockpile) | 219 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Boom Truck (Pebble Crusher) | 219 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Wheel Loader (2yrs) - 992 class | 189 | 2 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Forklift (Maintenance) | 58 | 1 | 5.0 | 0.40 | - | 0.02 | 0.19 | 3T4 |
| M | Bobcat | 58 | 2 | 5.0 | 0.40 | - | 0.02 | 0.19 | 3T4 |
| M | Flatbed Truck | 146 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Forklift (Moly Plant-Lg) | 146 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| S | Stormwater Mgmt. Pump | 153 | 3 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| S | Stormwater Mgmt. Pump | 388 | 0 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Flatbed Truck (1 ton, nonroad) | 287 | 2 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Grader | 117 | 1 | 5.0 | 0.40 | - | 0.02 | 0.19 | 3T4 |
| M | Backhoe | 112 | 1 | 5.0 | 0.40 | - | 0.02 | 0.19 | 3T4 |
| M | Water Truck | 219 | 2 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Boom Truck | 117 | 1 | 5.0 | 0.40 | - | 0.02 | 0.19 | 3T4 |
| M | Fuel Lube Truck | 224 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | 20T Crane | 75 | 1 | 5.0 | 0.40 | - | 0.02 | 0.19 | 3T4 |
| M | 60T Crane | 117 | 1 | 5.0 | 0.40 | - | 0.02 | 0.19 | 3T4 |
| M | Mobile Air Compressor | 44 | 2 | 5.0 | 4.7 | - | 0.03 | 4.7 | 2T4 |
| M | Light Tower | 7 | 2 | 6.6 | 7.5 | - | 0.40 | 7.5 | 1T4 |
| M | Fusion Machine | 44 | 1 | 5.0 | 4.7 | - | 0.03 | 4.7 | 2T4 |
| M | Lg Forklift (Warehouse) | 146 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Sm Forklift (Warehouse) | 146 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Highrail Maintenance Vehicle | 146 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Bucket Truck (Electrical) | 146 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Vacuum Truck | 146 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Man/Boom Lifts | 146 | 2 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Loader (Clean-up)-972 Class | 146 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |

* *40 CFR § 89.112 , Table 1*

** *$SO_2$ emissions - mass balance based on 15 ppm S content (ULSD)*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Mill | DATE: July 28, 2014 | | |

**Mill Diesel Machinery (Non-Emergency) - Short Term Emission**

| Stat./Mob. | Equipment | CO *lb/hr* | $NO_X$ *lb/hr* | $SO_2$ *lb/hr* | PM *lb/hr* | VOC *lb/hr* |
|---|---|---|---|---|---|---|
| M | Dozer (Coarse Ore Stockpile) | 1.2 | 0.13 | 2.2E-3 | 0.01 | 0.06 |
| M | Boom Truck (Pebble Crusher) | 1.2 | 0.13 | 2.2E-3 | 0.01 | 0.06 |
| M | Wheel Loader (2yrs) - 992 class | 2.0 | 0.23 | 3.8E-3 | 0.01 | 0.11 |
| M | Forklift (Maintenance) | 0.44 | 0.04 | 5.8E-4 | 1.8E-3 | 0.02 |
| M | Bobcat | 0.89 | 0.07 | 1.2E-3 | 3.6E-3 | 0.03 |
| M | Flatbed Truck | 1.2 | 0.13 | 2.2E-3 | 0.01 | 0.06 |
| M | Forklift (Moly Plant-Lg) | 0.78 | 0.09 | 1.5E-3 | 4.4E-3 | 0.04 |
| S | Stormwater Mgmt. Pump | 3.7 | 0.42 | 0.01 | 0.02 | 0.20 |
| S | Stormwater Mgmt. Pump | | | | | |
| M | Flatbed Truck (1 ton, nonroad) | 4.6 | 0.52 | 0.01 | 0.03 | 0.25 |
| M | Grader | 0.89 | 0.07 | 1.2E-3 | 3.6E-3 | 0.03 |
| M | Backhoe | 0.85 | 0.07 | 5.8E-4 | 3.4E-3 | 0.03 |
| M | Water Truck | 2.3 | 0.27 | 4.4E-3 | 0.01 | 0.13 |
| M | Boom Truck | 0.89 | 0.07 | 1.2E-3 | 3.6E-3 | 0.03 |
| M | Fuel Lube Truck | 1.8 | 0.20 | 6.6E-4 | 0.01 | 0.10 |
| M | 20T Crane | 0.47 | 0.04 | 9.7E-4 | 1.9E-3 | 0.02 |
| M | 60T Crane | 0.74 | 0.06 | 9.7E-4 | 3.0E-3 | 0.03 |
| M | Mobile Air Compressor | 1.00 | 0.94 | 1.3E-3 | 0.01 | 0.94 |
| M | Light Tower | 0.22 | 0.25 | 2.2E-4 | 0.01 | 0.25 |
| M | Fusion Machine | 0.50 | 0.47 | 6.6E-4 | 3.0E-3 | 0.47 |
| M | Lg Forklift (Warehouse) | 0.78 | 0.09 | 1.5E-3 | 4.4E-3 | 0.04 |
| M | Sm Forklift (Warehouse) | 0.78 | 0.09 | 1.5E-3 | 4.4E-3 | 0.04 |
| M | Highrail Maintenance Vehicle | 1.0 | 0.12 | 1.9E-3 | 0.01 | 0.06 |
| M | Bucket Truck (Electrical) | 1.2 | 0.13 | 2.2E-3 | 0.01 | 0.06 |
| M | Vacuum Truck | 1.2 | 0.13 | 2.2E-3 | 0.01 | 0.06 |
| M | Man/Boom Lifts | 1.3 | 0.15 | 2.4E-3 | 0.01 | 0.07 |
| M | Loader (Clean-up)-972 Class | 0.78 | 0.09 | 1.5E-3 | 4.4E-3 | 0.04 |
| | **Mill Stationary** | **3.7** | **0.42** | **0.01** | **0.02** | **0.20** |
| | **Mill Mobile** | **28.9** | **4.6** | **0.05** | **0.17** | **3.0** |
| | **Mill Total** | **32.5** | **5.0** | **0.05** | **0.19** | **3.2** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 4 | OF: 8 | SHEET: Mill_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Mill | DATE: July 28, 2014 | | |

**Mill Diesel Machinery (Non-Emergency) - Long Term Emission**

| Stat./Mob. | Equipment | CO *ton/yr* | $NO_X$ *ton/yr* | $SO_2$ *ton/yr* | PM *ton/yr* | VOC *ton/yr* |
|---|---|---|---|---|---|---|
| M | Dozer (Coarse Ore Stockpile) | 3.6 | 0.41 | 0.01 | 0.02 | 0.19 |
| M | Boom Truck (Pebble Crusher) | 1.3 | 0.15 | 2.1E-3 | 0.01 | 0.07 |
| M | Wheel Loader (2yrs) - 992 class | 6.2 | 0.71 | 0.01 | 0.04 | 0.34 |
| M | Forklift (Maintenance) | 0.49 | 0.04 | 5.6E-4 | 1.9E-3 | 0.02 |
| M | Bobcat | 1.3 | 0.10 | 1.5E-3 | 0.01 | 0.05 |
| M | Flatbed Truck | 1.3 | 0.15 | 2.1E-3 | 0.01 | 0.07 |
| M | Forklift (Moly Plant-Lg) | 1.1 | 0.13 | 1.9E-3 | 0.01 | 0.06 |
| S | Stormwater Mgmt. Pump | 2.0 | 0.23 | 3.3E-3 | 0.01 | 0.11 |
| S | Stormwater Mgmt. Pump | | | | | |
| M | Flatbed Truck (1 ton, nonroad) | 2.5 | 0.29 | 4.1E-3 | 0.01 | 0.14 |
| M | Grader | 0.97 | 0.08 | 1.1E-3 | 3.9E-3 | 0.04 |
| M | Backhoe | 0.93 | 0.07 | 5.6E-4 | 3.7E-3 | 0.04 |
| M | Water Truck | 2.6 | 0.29 | 4.2E-3 | 0.01 | 0.14 |
| M | Boom Truck | 0.97 | 0.08 | 1.1E-3 | 3.9E-3 | 0.04 |
| M | Fuel Lube Truck | 3.9 | 0.45 | 1.2E-3 | 0.02 | 0.21 |
| M | 20T Crane | 0.41 | 0.03 | 7.4E-4 | 1.7E-3 | 0.02 |
| M | 60T Crane | 0.32 | 0.03 | 3.7E-4 | 1.3E-3 | 0.01 |
| M | Mobile Air Compressor | 0.55 | 0.51 | 6.2E-4 | 3.3E-3 | 0.51 |
| M | Light Tower | 0.48 | 0.55 | 4.2E-4 | 0.03 | 0.55 |
| M | Fusion Machine | 0.55 | 0.51 | 6.2E-4 | 3.3E-3 | 0.51 |
| M | Lg Forklift (Warehouse) | 0.85 | 0.10 | 1.4E-3 | 4.9E-3 | 0.05 |
| M | Sm Forklift (Warehouse) | 0.85 | 0.10 | 1.4E-3 | 4.9E-3 | 0.05 |
| M | Highrail Maintenance Vehicle | 0.45 | 0.05 | 7.4E-4 | 2.6E-3 | 0.02 |
| M | Bucket Truck (Electrical) | 0.51 | 0.06 | 8.3E-4 | 2.9E-3 | 0.03 |
| M | Vacuum Truck | 0.51 | 0.06 | 8.3E-4 | 2.9E-3 | 0.03 |
| M | Man/Boom Lifts | 1.4 | 0.16 | 2.3E-3 | 0.01 | 0.08 |
| M | Loader (Clean-up)-972 Class | 0.85 | 0.10 | 1.4E-3 | 4.9E-3 | 0.05 |
| | **Mill Stationary** | **2.0** | **0.23** | **3.3E-3** | **0.01** | **0.11** |
| | **Mill Mobile** | **34.8** | **5.2** | **0.05** | **0.22** | **3.3** |
| | **Mill Total** | **36.8** | **5.4** | **0.05** | **0.23** | **3.4** |

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Mill | DATE: July 28, 2014 | | |

**Mill Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Vehicle Specifications**

| Stat./Mob. | Equipment | Quantity | Ann. Op. Hours[a] | Speed[b] *mph* | Silt[c] *%* | Weight[d] *ton* |
|---|---|---|---|---|---|---|
| M | Dozer (Coarse Ore Stockpile) | 1 | 6,132 | 2 | 2.0 | 18 |
| M | Boom Truck (Pebble Crusher) | 1 | 2,190 | 15 | 2.0 | 27 |
| M | Wheel Loader (2yrs) - 992 class | | | *paved surface* | | |
| M | Forklift (Maintenance) | | | *paved surface* | | |
| M | Bobcat | | | *paved surface* | | |
| M | Flatbed Truck | 1 | 2,190 | 25 | 2.0 | 27 |
| M | Forklift (Moly Plant-Lg) | | | *paved surface* | | |
| S | Stormwater Mgmt. Pump | | | *stationary* | | |
| S | Stormwater Mgmt. Pump | | | *stationary* | | |
| M | Flatbed Truck (1 ton, nonroad) | 2 | 1,095 | 15 | 2.0 | 2 |
| M | Grader | 1 | 2,190 | 25 | 2.0 | 23 |
| M | Backhoe | 1 | 2,190 | 5 | 2.0 | 12 |
| M | Water Truck | 2 | 2,190 | 15 | 2.0 | 10 |
| M | Boom Truck | 1 | 2,190 | 15 | 2.0 | 17 |
| M | Fuel Lube Truck | 1 | 4,380 | 15 | 2.0 | 50 |
| M | 20T Crane | 1 | 1,752 | 10 | 2.0 | 27 |
| M | 60T Crane | 1 | 876 | 10 | 2.0 | 45 |
| M | Mobile Air Compressor | 2 | 1,095 | 5 | 2.0 | 4 |
| M | Light Tower | 2 | 4,380 | 5 | 2.0 | 1 |
| M | Fusion Machine | 1 | 2,190 | 1 | 2.0 | 2 |
| M | Lg Forklift (Warehouse) | | | *paved surface* | | |
| M | Sm Forklift (Warehouse) | | | *paved surface* | | |
| M | Highrail Maintenance Vehicle | 1 | 876 | 5 | 2.0 | 2 |
| M | Bucket Truck (Electrical) | 1 | 876 | 15 | 2.0 | 12 |
| M | Vacuum Truck | 1 | 876 | 15 | 2.0 | 2 |
| M | Man/Boom Lifts | 2 | 2,190 | 5 | 2.0 | 12 |
| M | Loader (Clean-up)-972 Class | 1 | 2,190 | 5 | 2.0 | 23 |

[a] *Per unit, including availability and utilization factors*

[b] *Assumption based on similar equipment, phone conversation with K. Ballard*

[c] *Email from K. Ballard, 6/5/14, based on grindability studies*

[d] *Manufacturer specifications (vehicle wt + half of rated payload, if applicable), estimated based on type of equipment if not available*

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Mill | DATE: July 28, 2014 | | |

**Mill Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Emission Factors**

| Stat./Mob. | Equipment | PM *lb/VMT* | $PM_{10}$ *lb/VMT* | $PM_{2.5}$ *lb/VMT* |
|---|---|---|---|---|
| M | Dozer (Coarse Ore Stockpile) | 2.8 | 0.60 | 0.06 |
| M | Boom Truck (Pebble Crusher) | 3.3 | 0.71 | 0.07 |
| M | Wheel Loader (2yrs) - 992 class | | | |
| M | Forklift (Maintenance) | | | |
| M | Bobcat | | | |
| M | Flatbed Truck | 3.3 | 0.71 | 0.07 |
| M | Forklift (Moly Plant-Lg) | | | |
| S | Stormwater Mgmt. Pump | | | |
| S | Stormwater Mgmt. Pump | | | |
| M | Flatbed Truck (1 ton, nonroad) | 1.0 | 0.22 | 0.02 |
| M | Grader | 3.1 | 0.67 | 0.07 |
| M | Backhoe | 2.3 | 0.50 | 0.05 |
| M | Water Truck | 2.1 | 0.46 | 0.05 |
| M | Boom Truck | 2.7 | 0.57 | 0.06 |
| M | Fuel Lube Truck | 4.4 | 0.94 | 0.09 |
| M | 20T Crane | 3.4 | 0.72 | 0.07 |
| M | 60T Crane | 4.2 | 0.90 | 0.09 |
| M | Mobile Air Compressor | 1.4 | 0.30 | 0.03 |
| M | Light Tower | 0.73 | 0.16 | 0.02 |
| M | Fusion Machine | 1.0 | 0.22 | 0.02 |
| M | Lg Forklift (Warehouse) | | | |
| M | Sm Forklift (Warehouse) | | | |
| M | Highrail Maintenance Vehicle | 1.0 | 0.22 | 0.02 |
| M | Bucket Truck (Electrical) | 2.3 | 0.50 | 0.05 |
| M | Vacuum Truck | 1.0 | 0.22 | 0.02 |
| M | Man/Boom Lifts | 2.3 | 0.50 | 0.05 |
| M | Loader (Clean-up)-972 Class | 3.1 | 0.66 | 0.07 |

**Unpaved Road Controls**

| | Surface | Reference |
|---|---|---|
| Days of >0.01" Precip | 40 | *West Plant Precip data* |
| Water & Chemical Suppression* | 95% | *AP-42, Figure 13.2.2-2, Rev. 11/06* |

* *Control efficiency is based on AP-42 Chapter 13.2.2, Unpaved Roads. Figure 13.2.2-2 provides the control efficiencies achievable with watering*

**Unpaved Roads - Predictive Emission Factor Equation & Constants***

$E = k \times (s / 12)^a \times (W / 3)^b \times (365 - P) / 365$

k, a, b - empirical constants

s - surface material silt content %

W - mean vehicle wt ton

P - Days of >0.01" Precip

| | | Empirical Constants for Industrial Roads | | |
|---|---|---|---|---|
| Constant | | PM | $PM_{10}$ | $PM_{2.5}$ |
| k | | 4.9 | 1.5 | 0.15 |
| a | | 0.7 | 0.9 | 0.9 |
| b | | 0.45 | 0.45 | 0.45 |

* *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04*

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Mill | DATE: July 28, 2014 | | |

**Mill Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Emissions (Short Term & Long Term)**

| Stat./Mob. | Equipment | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* |
|---|---|---|---|---|---|---|---|
| M | Dozer (Coarse Ore Stockpile) | 5.6 | 1.2 | 0.12 | 17.2 | 3.7 | 0.37 |
| M | Boom Truck (Pebble Crusher) | 49.9 | 10.7 | 1.1 | 54.6 | 11.7 | 1.2 |
| M | Wheel Loader (2yrs) - 992 class | | | | | | |
| M | Forklift (Maintenance) | | | | | | |
| M | Bobcat | | | | | | |
| M | Flatbed Truck | 83.2 | 17.8 | 1.8 | 91.1 | 19.5 | 1.9 |
| M | Forklift (Moly Plant-Lg) | | | | | | |
| S | Stormwater Mgmt. Pump | | | | | | |
| S | Stormwater Mgmt. Pump | | | | | | |
| M | Flatbed Truck (1 ton, nonroad) | 31.1 | 6.7 | 0.67 | 17.0 | 3.6 | 0.36 |
| M | Grader | 77.8 | 16.6 | 1.7 | 85.1 | 18.2 | 1.8 |
| M | Backhoe | 11.7 | 2.5 | 0.25 | 12.8 | 2.7 | 0.27 |
| M | Water Truck | 64.0 | 13.7 | 1.4 | 70.1 | 15.0 | 1.5 |
| M | Boom Truck | 40.2 | 8.6 | 0.86 | 44.0 | 9.4 | 0.94 |
| M | Fuel Lube Truck | 66.0 | 14.1 | 1.4 | 145 | 30.9 | 3.1 |
| M | 20T Crane | 33.7 | 7.2 | 0.72 | 29.5 | 6.3 | 0.63 |
| M | 60T Crane | 42.3 | 9.0 | 0.90 | 18.5 | 4.0 | 0.40 |
| M | Mobile Air Compressor | 14.0 | 3.0 | 0.30 | 7.7 | 1.6 | 0.16 |
| M | Light Tower | 7.3 | 1.6 | 0.16 | 16.1 | 3.4 | 0.34 |
| M | Fusion Machine | 1.0 | 0.22 | 0.02 | 1.1 | 0.24 | 0.02 |
| M | Lg Forklift (Warehouse) | | | | | | |
| M | Sm Forklift (Warehouse) | | | | | | |
| M | Highrail Maintenance Vehicle | 5.2 | 1.1 | 0.11 | 2.3 | 0.49 | 0.05 |
| M | Bucket Truck (Electrical) | 34.8 | 7.5 | 0.75 | 15.3 | 3.3 | 0.33 |
| M | Vacuum Truck | 15.6 | 3.3 | 0.33 | 6.8 | 1.5 | 0.15 |
| M | Man/Boom Lifts | 23.2 | 5.0 | 0.50 | 25.4 | 5.4 | 0.54 |
| M | Loader (Clean-up)-972 Class | 15.5 | 3.3 | 0.33 | 17.0 | 3.6 | 0.36 |
| | **Vehicle Travel - Mill Total** | **622** | **133** | **13.3** | **676** | **145** | **14.5** |

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Mill | DATE: July 28, 2014 | | |

**Mill Diesel Machinery (Non-Emergency) - Fugitive Emissions from Grading/Dozing - Emissions (Short Term & Long Term)**

**Emission Factors**

| Grading | PM | $PM_{10}$ | $PM_{2.5}$ | EF Unit |
|---|---|---|---|---|
| Grader | 3.0 | 1.8 | 0.1 | *lb/VMT* |
| **Dozing** | | | | |
| Dozer (Coarse Ore Stockpile) | 2.2 | 1.6 | 0.2 | *lb/hr* |

**Emissions**

| | Quantity | Operation *hr/yr* | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* |
|---|---|---|---|---|---|---|---|---|
| **Grading** | | | | | | | | |
| Grader | 1 | 2,519 | 16.5 | 9.9 | 0.51 | 20.8 | 12.5 | 0.65 |
| **Dozing** | | | | | | | | |
| Dozer (Coarse Ore Stockpile)* | 1 | 7,052 | 2.2 | 1.6 | 0.23 | 7.6 | 5.7 | 0.80 |
| **Grading - Mill** | | | **16.5** | **9.9** | **0.51** | **20.8** | **12.5** | **0.65** |
| **Dozing - Mill** | | | **2.2** | **1.6** | **0.23** | **7.6** | **5.7** | **0.80** |
| **Grading/Dozing - Tailings Total** | | | **18.7** | **11.5** | **0.74** | **28.4** | **18.2** | **1.4** |

**Mill Fleet - Uncontrolled Fugitive Dust Emissions**

| | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* |
|---|---|---|---|---|---|---|
| **Vehicle Travel & Grading - Mill** | **639** | **143** | **13.8** | **697** | **157** | **15.1** |
| **Dozing - Mill** | **2.2** | **1.6** | **0.23** | **7.6** | **5.7** | **0.80** |
| **Fugitive Dust - Mill Total** | **641** | **145** | **14.0** | **705** | **163** | **15.9** |

**Dozing and Grading Emission Factor Equations** *AP-42, 11.9, Table 11.9-1 (overburden), Rev. 7/98*

| | | Scaling Factor $PM_{10}$ | Scaling Factor $PM_{2.5}$ | |
|---|---|---|---|---|
| | PM | | | |
| Dozing | $E = (5.7 * s^{1.2}) / (M^{1.3})$ | 0.75 | 0.105 | |
| Grading | $E = 0.040 * S^{2.5}$ | 0.6 | 0.031 | |
| s = material silt content % | | | 2.0 | *Email from K. Ballard, 6/5/14, based on grindability studies* |
| M = material moisture content % | | | 4.0 | *Average from Design Criteria* |
| S = mean vehicle speed mph | | | 5.59 | *Phone Meeting with C. Pascoe 10/11/12 (9 km/hr)* |
| Fuel Contingency | | | 15% | *RCM Mine Data for Ari Modelling 2012.xlsx* |

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Loadout | DATE: July 28, 2014 | | |

**Loadout Diesel Machinery (Non-Emergency)**

| Stat./Mob. | Mobile Equipment | References & Notes | Rating kW | Rating (hp) | Quantity | EPA Tier | Fuel gal/hr | Ann. Op. Hours | Engine Load | Contin-gency* |
|---|---|---|---|---|---|---|---|---|---|---|
| M | Loader | a, b | 248 | 333 | 3 | U | 17 | 5,913 | 60% | 15% |
| M | Switch Engine | a, b | 438 | 587 | 1 | U | 30 | 5,203 | 80% | 15% |
| M | Track Mobile | a, b | 219 | 294 | 1 | U | 15 | 5,203 | 60% | 15% |
| M | Wheel Loader | a, b | 75 | 100 | 1 | U | 13 | 876 | 60% | 15% |
| M | Sweeper | b, c | 146 | 196 | 1 | U | 10** | 876 | 60% | 15% |

* *Per RCM Mine Data for Air Modeling 2012.xlsx. Taken account for in emissions, not operating hours*

** Conservative Assumption

| Conversions | | |
|---|---|---|
| 453.592 | *g/lb* | |
| 2,000 | *lb/ton* | |
| 0.0015% | *ppm S in ULSD (GPA 2140)* | |
| 7.05 | *lb/gal* | |
| 1.00E+06 | *Btu/MMBtu* | |
| 1.998 | *$SO_2$/S* | |
| 1.341 | *hp/kw* | |
| 7,000 | *Btu/hp-hr* | *AP-42, Table 3.4-1, Footnote e, Diesel, Rev. 10/96* |
| 137,000 | *Btu/gal* | *AP-42, Appendix A, Diesel, Rev. 9/85* |

| References & Notes | | |
|---|---|---|
| a | *West Plant & Filter Plant Mobile Eq.xlsx (R. Heig 2/16/13)* | |
| b | *Unknown, assuming EPA Tier* | *4* |
| c | *Email from K. Ballard, 4/16/2014* | |

*Blue values are input , black values are calculated or linked*

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Loadout | DATE: July 28, 2014 | | |

**Loadout Diesel Machinery (Non-Emergency) - Emission Factors**

| Stat./Mob. | Equipment | Rating kW | Quantity | CO CO* g/kW-hr | NOX $NO_x$* g/kW-hr | SO2 $SO_2$** g/kW-hr | PM PM* g/kW-hr | VOC VOC* g/kW-hr | |
|---|---|---|---|---|---|---|---|---|---|
| M | Loader | 248 | 3 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Switch Engine | 438 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Track Mobile | 219 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Wheel Loader | 75 | 1 | 5.0 | 0.40 | - | 0.02 | 0.19 | 3T4 |
| M | Sweeper | 146 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |

* *40 CFR § 89.112 , Table 1*

** *$SO_2$ emissions - mass balance based on 15 ppm S content (ULSD)*

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**Loadout Diesel Machinery (Non-Emergency) - Short Term Emission**

| Stat./Mob. | Equipment | CO *lb/hr* | $NO_x$ *lb/hr* | $SO_2$ *lb/hr* | PM *lb/hr* | VOC *lb/hr* |
|---|---|---|---|---|---|---|
| M | Loader | 4.0 | 0.45 | 0.01 | 0.02 | 0.22 |
| M | Switch Engine | 3.1 | 0.36 | 0.01 | 0.02 | 0.17 |
| M | Track Mobile | 1.2 | 0.13 | 2.2E-3 | 0.01 | 0.06 |
| M | Wheel Loader | 0.57 | 0.05 | 1.9E-3 | 2.3E-3 | 0.02 |
| M | Sweeper | 0.78 | 0.09 | 1.5E-3 | 4.4E-3 | 0.04 |
| | **Loadout Stationary** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **Loadout Mobile** | **9.6** | **1.1** | **0.02** | **0.05** | **0.51** |
| | **Loadout Total** | **9.6** | **1.1** | **0.02** | **0.05** | **0.51** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
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**Loadout Diesel Machinery (Non-Emergency) - Long Term Emission**

| Stat./Mob. | Equipment | CO *ton/yr* | $NO_x$ *ton/yr* | $SO_2$ *ton/yr* | PM *ton/yr* | VOC *ton/yr* |
|---|---|---|---|---|---|---|
| M | Loader | 11.7 | 1.3 | 0.02 | 0.07 | 0.64 |
| M | Switch Engine | 8.1 | 0.92 | 0.01 | 0.05 | 0.44 |
| M | Track Mobile | 3.0 | 0.35 | 4.9E-3 | 0.02 | 0.16 |
| M | Wheel Loader | 0.25 | 0.02 | 7.2E-4 | 9.9E-4 | 0.01 |
| M | Sweeper | 0.34 | 0.04 | 5.6E-4 | 1.9E-3 | 0.02 |
| | **Loadout Stationary** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **Loadout Mobile** | **23.4** | **2.7** | **0.04** | **0.13** | **1.3** |
| | **Loadout Total** | **23.4** | **2.7** | **0.04** | **0.13** | **1.3** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
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**Loadout Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Vehicle Specifications**

| Stat./Mob. | Equipment | Quantity | Ann. Op. Hours | Speed *mph* | Silt *%* | Weight *ton* |
|---|---|---|---|---|---|---|
| M | Loader | | | *paved surface* | | |
| M | Switch Engine | | | *rail* | | |
| M | Track Mobile | | | *paved surface & rail* | | |
| M | Wheel Loader | | | *paved surface* | | |
| M | Sweeper | | | *paved surface* | | |

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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Loadout | DATE: July 28, 2014 | | |

**Loadout Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Emission Factors**

| Stat./Mob. | Equipment | PM *lb/VMT* | $PM_{10}$ *lb/VMT* | $PM_{2.5}$ *lb/VMT* |
|---|---|---|---|---|
| M | Loader | | | |
| M | Switch Engine | | | |
| M | Track Mobile | | | |
| M | Wheel Loader | | | |
| M | Sweeper | | | |
| | P - Days of >0.01" Precip | | | |

* *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04*

**Unpaved Road Controls**

| | Surface | Reference |
|---|---|---|
| Days of >0.01" Precip | 40 | *West Plant Precip data* |
| Water & Chemical Suppression* | 95% | *AP-42, Figure 13.2.2-2, Rev. 11/06* |

* *Control efficiency is based on AP-42 Chapter 13.2.2, Unpaved Roads. Figure 13.2.2-2 provides the control efficiencies achievable with watering*

**Unpaved Roads - Predictive Emission Factor Equation & Constants***

$E = k \times (s / 12)^a \times (W / 3)^b \times (365 - P) / 365$

k, a, b - empirical constants

s - surface material silt content %

W - mean vehicle wt ton

| | Empirical Constants for Industrial Roads | | | |
|---|---|---|---|---|
| Constant | | PM | $PM_{10}$ | $PM_{2.5}$ |
| k | | 4.9 | 1.5 | 0.15 |
| a | | 0.7 | 0.9 | 0.9 |
| b | | 0.45 | 0.45 | 0.45 |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
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**Loadout Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Emissions (Short Term & Long Term)**

| Stat./Mob. | Equipment | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* |
|---|---|---|---|---|---|---|---|
| M | Loader | | | | | | |
| M | Switch Engine | | | | | | |
| M | Track Mobile | | | | | | |
| M | Wheel Loader | | | | | | |
| M | Sweeper | | | | | | |
| | **Vehicle Travel - Loadout Total** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
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| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Tailings | DATE: July 28, 2014 | | |

**Tailings Diesel Machinery (Non-Emergency)**

| Stat./Mob. | Mobile Equipment | References & Notes | Rating kW | Rating (hp) | Quantity | EPA Tier | Fuel gal/hr | Ann. Op. Hours | Engine Load | Contin-gency* |
|---|---|---|---|---|---|---|---|---|---|---|
| M | Flat Bed Truck (1 Ton, Tailings) | a, b | 287 | 385 | 1 | U | 20 | 1095** | 90% | 15% |
| M | Boom Truck (Tailings) | a, b | 179 | 240 | 1 | U | 12 | 2,190 | 60% | 15% |
| M | Excavator (Tailings)-345 Class | a, b | 295 | 396 | 7 | U | 20 | 1,950 | 60% | 15% |
| M | Bulldozer (Tailings) | a, b | 236 | 317 | 15 | U | 16 | 1,950 | 60% | 15% |
| M | Loader-980 Class | b, c | 295 | 396 | 8 | U | 20 | 1,950 | 60% | 15% |
| M | Grader | b, c | 193 | 259 | 2 | U | 13 | 1095** | 60% | 15% |
| M | Water Truck | b, c | 130 | 174 | 1 | U | 9 | 1095** | 60% | 15% |
| M | Compactor - 10 ton | b, c | 75 | 100 | 15 | U | 5 | 3,900 | 60% | 15% |
| M | Skid Steer (Bobcat) | b, c | 54 | 73 | 2 | U | 4 | 1,095 | 60% | 15% |
| M | Pipe Fusion Machine | b, c | 15 | 20 | 2 | U | 1 | 1,095 | 90% | 15% |
| M | 40 Ton Class Haul Truck | b, c | 441 | 592 | 21 | U | 30 | 3,900 | 60% | 15% |

* *Per RCM Mine Data for Air Modeling 2012.xlsx. Taken account for in emissions, not operating hours.*

** Conservative Assumption

| Conversions | | |
|---|---|---|
| 453.592 | *g/lb* | |
| 2,000 | *lb/ton* | |
| 0.0015% | *ppm S in ULSD (GPA 2140)* | |
| 7.05 | *lb/gal* | |
| 1.00E+06 | *Btu/MMBtu* | |
| 1.998 | *$SO_2$/S* | |
| 1.341 | *hp/kw* | |
| 7,000 | *Btu/hp-hr* | *AP-42, Table 3.4-1, Footnote e, Diesel, Rev. 10/96* |
| 137,000 | *Btu/gal* | *AP-42, Appendix A, Diesel, Rev. 9/85* |
| 8,760 | *hr/yr* | |

| References & Notes | | |
|---|---|---|
| a | *Mill Equipment List* | |
| b | *Unknown, assuming EPA Tier* | *4* |
| c | *Email from K. Ballard, 4/16/2014* | |

*Blue values are input , black values are calculated or linked*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 2 | OF: 8 | SHEET: Tailings_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Tailings | DATE: July 28, 2014 | | |

**Tailings Diesel Machinery (Non-Emergency) - Emission Factors**

| Stat./Mob. | Equipment | Rating kW | Quantity | CO* g/kW-hr | NOX $NO_x$* g/kW-hr | SO2 $SO_2$** g/kW-hr | PM* g/kW-hr | VOC* g/kW-hr | |
|---|---|---|---|---|---|---|---|---|---|
| M | Flat Bed Truck (1 Ton, Tailings) | 287 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Boom Truck (Tailings) | 179 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Excavator (Tailings)-345 Class | 295 | 7 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Bulldozer (Tailings) | 236 | 15 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Loader-980 Class | 295 | 8 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Grader | 193 | 2 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Water Truck | 130 | 1 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |
| M | Compactor - 10 ton | 75 | 15 | 5.0 | 0.40 | - | 0.02 | 0.19 | 3T4 |
| M | Skid Steer (Bobcat) | 54 | 2 | 5.0 | 4.7 | - | 0.03 | 4.7 | 2T4 |
| M | Pipe Fusion Machine | 15 | 2 | 6.6 | 7.5 | - | 0.40 | 7.5 | 1T4 |
| M | 40 Ton Class Haul Truck | 441 | 21 | 3.5 | 0.40 | - | 0.02 | 0.19 | 4T4 |

* *40 CFR § 89.112 , Table 1*

** *$SO_2$ emissions - mass balance based on 15 ppm S content (ULSD)*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 3 | OF: 8 | SHEET: Tailings_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Tailings | DATE: July 28, 2014 | | |

**Tailings Diesel Machinery (Non-Emergency) - Short Term Emission**

| Stat./Mob. | Equipment | CO *lb/hr* | $NO_X$ *lb/hr* | $SO_2$ *lb/hr* | PM *lb/hr* | VOC *lb/hr* |
|---|---|---|---|---|---|---|
| M | Flat Bed Truck (1 Ton, Tailings) | 2.3 | 0.26 | 4.3E-3 | 0.01 | 0.12 |
| M | Boom Truck (Tailings) | 0.95 | 0.11 | 1.8E-3 | 0.01 | 0.05 |
| M | Excavator (Tailings)-345 Class | 11.0 | 1.3 | 0.02 | 0.06 | 0.60 |
| M | Bulldozer (Tailings) | 18.9 | 2.2 | 0.04 | 0.11 | 1.0 |
| M | Loader-980 Class | 12.6 | 1.4 | 0.02 | 0.07 | 0.68 |
| M | Grader | 2.1 | 0.24 | 3.9E-3 | 0.01 | 0.11 |
| M | Water Truck | 0.69 | 0.08 | 1.3E-3 | 4.0E-3 | 0.04 |
| M | Compactor - 10 ton | 8.5 | 0.68 | 0.01 | 0.03 | 0.32 |
| M | Skid Steer (Bobcat) | 0.83 | 0.78 | 1.1E-3 | 5.0E-3 | 0.78 |
| M | Pipe Fusion Machine | 0.44 | 0.50 | 4.4E-4 | 0.03 | 0.50 |
| M | 40 Ton Class Haul Truck | 49.4 | 5.6 | 0.09 | 0.28 | 2.7 |
| | **Tailings Stationary** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **Tailings Mobile** | **108** | **13.1** | **0.20** | **0.62** | **6.9** |
| | **Tailings Total** | **108** | **13.1** | **0.20** | **0.62** | **6.9** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 4 | OF: 8 | SHEET: Tailings_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Tailings | DATE: July 28, 2014 | | |

**Tailings Diesel Machinery (Non-Emergency) - Long Term Emission**

| Stat./Mob. | Equipment | CO *ton/yr* | $NO_X$ *ton/yr* | $SO_2$ *ton/yr* | PM *ton/yr* | VOC *ton/yr* |
|---|---|---|---|---|---|---|
| M | Flat Bed Truck (1 Ton, Tailings) | 1.3 | 0.14 | 2.0E-3 | 0.01 | 0.07 |
| M | Boom Truck (Tailings) | 1.0 | 0.12 | 1.7E-3 | 0.01 | 0.06 |
| M | Excavator (Tailings)-345 Class | 10.7 | 1.2 | 0.02 | 0.06 | 0.58 |
| M | Bulldozer (Tailings) | 18.4 | 2.1 | 0.03 | 0.11 | 1.00 |
| M | Loader-980 Class | 12.3 | 1.4 | 0.02 | 0.07 | 0.67 |
| M | Grader | 1.1 | 0.13 | 1.8E-3 | 0.01 | 0.06 |
| M | Water Truck | 0.38 | 0.04 | 6.2E-4 | 2.2E-3 | 0.02 |
| M | Compactor - 10 ton | 16.6 | 1.3 | 0.02 | 0.07 | 0.63 |
| M | Skid Steer (Bobcat) | 0.45 | 0.43 | 5.2E-4 | 2.7E-3 | 0.43 |
| M | Pipe Fusion Machine | 0.24 | 0.27 | 2.1E-4 | 0.01 | 0.27 |
| M | 40 Ton Class Haul Truck | 96.2 | 11.0 | 0.16 | 0.55 | 5.2 |
| | **Tailings Stationary** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | **Tailings Mobile** | **159** | **18.2** | **0.25** | **0.89** | **9.0** |
| | **Tailings Total** | **159** | **18.2** | **0.25** | **0.89** | **9.0** |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 5 | OF: 8 | SHEET: Tailings_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Tailings | DATE: April 25, 2014 | | |

**Tailings Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Vehicle Specifications**

| Stat./Mob. | Equipment | Quantity | Ann. Op. Hours[a] | Speed[b] *mph* | Silt[c] *%* | Weight[d] *ton* |
|---|---|---|---|---|---|---|
| M | Flat Bed Truck (1 Ton, Tailings) | 1.0 | 1,095 | 25 | 2.0 | 3 |
| M | Boom Truck (Tailings) | 1.0 | 2,190 | 15 | 2.0 | 12 |
| M | Excavator (Tailings)-345 Class | 7.0 | 1,950 | 10 | 2.0 | 23 |
| M | Bulldozer (Tailings) | 15.0 | 1,950 | 2 | 2.0 | 15 |
| M | Loader-980 Class | 8.0 | 1,950 | 5 | 2.0 | 23 |
| M | Grader | 2.0 | 1,095 | 25 | 2.0 | 23 |
| M | Water Truck | 1.0 | 1,095 | 15 | 2.0 | 27 |
| M | Compactor - 10 ton | 15.0 | 3,900 | 2 | 2.0 | 36 |
| M | Skid Steer (Bobcat) | 2.0 | 1,095 | 5 | 2.0 | 1 |
| M | Pipe Fusion Machine | 2.0 | 1,095 | 1 | 2.0 | 2 |
| M | 40 Ton Class Haul Truck | 21.0 | 3,900 | 25 | 2.0 | 41 |

[a] *Per unit, including availability and utilization factors*

[b] *Based on EquipmentHREst1252013.xlsx and phone call with K. Ballard 4/25/14.*

[c] *Email from K. Ballard, 6/5/14, based on grindability studies*

[d] *Manufacturer specifications (vehicle wt + half of rated payload, if applicable), estimated based on type of equipment if not available*

**Tailings Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Emission Factors**

| Stat./Mob. | Equipment | PM *lb/VMT* | $PM_{10}$ *lb/VMT* | $PM_{2.5}$ *lb/VMT* |
|---|---|---|---|---|
| M | Flat Bed Truck (1 Ton, Tailings) | 1.2 | 0.27 | 0.03 |
| M | Boom Truck (Tailings) | 2.3 | 0.50 | 0.05 |
| M | Excavator (Tailings)-345 Class | 3.1 | 0.67 | 0.07 |
| M | Bulldozer (Tailings) | 2.6 | 0.55 | 0.05 |
| M | Loader-980 Class | 3.1 | 0.66 | 0.07 |
| M | Grader | 3.1 | 0.66 | 0.07 |
| M | Water Truck | 3.3 | 0.72 | 0.07 |
| M | Compactor - 10 ton | 3.8 | 0.82 | 0.08 |
| M | Skid Steer (Bobcat) | 0.76 | 0.16 | 0.02 |
| M | Pipe Fusion Machine | 1.0 | 0.22 | 0.02 |
| M | 40 Ton Class Haul Truck | 4.0 | 0.86 | 0.09 |

**Unpaved Road Controls**

| | Surface | Reference |
|---|---|---|
| Days of >0.01" Precip | 40 | *West Plant Precip data* |
| Water & Chemical Suppression* | 95% | *AP-42, Figure 13.2.2-2, Rev. 11/06* |

* *Control efficiency is based on AP-42 Chapter 13.2.2, Unpaved Roads. Figure 13.2.2-2 provides the control efficiencies achievable with watering*

**Unpaved Roads - Predictive Emission Factor Equation & Constants***

$E = k \times (s / 12)^a \times (W / 3)^b \times (365 - P) / 365$

| | Empirical Constants for Industrial Roads | | | |
|---|---|---|---|---|
| | Constant | PM | $PM_{10}$ | $PM_{2.5}$ |
| k, a, b - empirical constants | k | 4.9 | 1.5 | 0.15 |
| s - surface material silt content % | a | 0.7 | 0.9 | 0.9 |
| W - mean vehicle wt ton | b | 0.45 | 0.45 | 0.45 |
| P - Days of >0.01" Precip | | | | |

* *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Industrial Roads, Rev. 8/04*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | | BY: N. Tipple | | |
|---|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | | PAGE: 7 | OF: 8 | SHEET: Tailings_Fleet |
| AIR EMISSION CALCULATIONS | SUBJECT: Diesel Fleet Calculations - Tailings | | DATE: April 3, 2014 | | |

**Tailings Diesel Machinery (Non-Emergency) - Fugitive Emissions from Vehicle Travel - Emissions (Short Term & Long Term)**

| Stat./Mob. | Equipment | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* |
|---|---|---|---|---|---|---|---|
| M | Flat Bed Truck (1 Ton, Tailings) | 31.1 | 6.7 | 0.67 | 17.0 | 3.6 | 0.36 |
| M | Boom Truck (Tailings) | 34.8 | 7.5 | 0.75 | 38.2 | 8.2 | 0.82 |
| M | Excavator (Tailings)-345 Class | 219 | 47.0 | 4.7 | 214 | 45.8 | 4.6 |
| M | Bulldozer (Tailings) | 77.0 | 16.5 | 1.6 | 75.1 | 16.1 | 1.6 |
| M | Loader-980 Class | 124 | 26.5 | 2.7 | 121 | 25.9 | 2.6 |
| M | Grader | 155 | 33.2 | 3.3 | 84.9 | 18.2 | 1.8 |
| M | Water Truck | 50.2 | 10.7 | 1.1 | 27.5 | 5.9 | 0.59 |
| M | Compactor - 10 ton | 114 | 24.5 | 2.4 | 223 | 47.7 | 4.8 |
| M | Skid Steer (Bobcat) | 7.6 | 1.6 | 0.16 | 4.2 | 0.89 | 0.09 |
| M | Pipe Fusion Machine | 2.1 | 0.44 | 0.04 | 1.1 | 0.24 | 0.02 |
| M | 40 Ton Class Haul Truck | 2,119 | 453 | 45.3 | 4,131 | 884 | 88.4 |
| | **Vehicle Travel - Tailings Total** | **2,934** | **628** | **62.8** | **4,937** | **1,056** | **106** |

**Tailings Diesel Machinery (Non-Emergency) - Fugitive Emissions from Grading/Dozing - Emissions (Short Term & Long Term)**

**Emission Factors**

| Grading | PM | $PM_{10}$ | $PM_{2.5}$ | EF Unit |
|---|---|---|---|---|
| Grader | 3.0 | 1.8 | 0.1 | *lb/VMT* |
| **Dozing** | | | | |
| Bulldozer (Tailings) | 2.2 | 1.6 | 0.2 | *lb/hr* |

**Emissions**

| | Quantity | Operation *hr/yr* | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* |
|---|---|---|---|---|---|---|---|---|
| **Grading** | | | | | | | | |
| Grader | 2 | 1,259 | 33.1 | 19.9 | 1.0 | 20.8 | 12.5 | 0.65 |
| **Dozing** | | | | | | | | |
| Bulldozer (Tailings) | 15 | 2,243 | 32.4 | 24.3 | 3.4 | 36.3 | 27.2 | 3.8 |
| **Grading - Mill** | | | **33.1** | **19.9** | **1.0** | **20.8** | **12.5** | **0.65** |
| **Dozing - Mill** | | | **32.4** | **24.3** | **3.4** | **36.3** | **27.2** | **3.8** |
| **Grading/Dozing - Tailings Total** | | | **65.5** | **44.2** | **4.4** | **57.2** | **39.7** | **4.5** |

**Tailings Fleet - Uncontrolled Fugitive Dust Emissions**

| | PM *lb/hr* | $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *ton/yr* | $PM_{10}$ *ton/yr* | $PM_{2.5}$ *ton/yr* |
|---|---|---|---|---|---|---|
| **Vehicle Travel & Grading - Tailings** | **2,967** | **648** | **63.8** | **4,958** | **1,069** | **106** |
| **Dozing - Tailings** | **32.4** | **24.3** | **3.4** | **36.3** | **27.2** | **3.8** |
| **Fugitive Dust - Tailings Total** | **3,000** | **672** | **67.2** | **4,994** | **1,096** | **110** |

**Dozing and Grading Emission Factor Equations** *AP-42, 11.9, Table 11.9-1 (overburden), Rev. 7/98.*

| | | Scaling Factor PM | Scaling Factor $PM_{10}$ | Scaling Factor $PM_{2.5}$ | |
|---|---|---|---|---|---|
| Dozing | $E = (5.7 * s^{1.2}) / (M^{1.3})$ | | 0.75 | 0.105 | |
| Grading | $E = 0.040 * S^{2.5}$ | | 0.6 | 0.031 | |
| s = material silt content % | | | | 2.0 | *Email from K. Ballard, 6/5/14, based on grindability studies* |
| M = material moisture content % | | | | 4.0 | *Average from Design Criteria* |
| S = mean vehicle speed mph | | | | 5.59 | *Phone Meeting with C. Pascoe 10/11/12 (9 km/hr)* |
| Fuel Contingency | | | | 15% | *RCM Mine Data for Ari Modelling 2012.xlsx* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 1 | SHEET: Employees |
| AIR EMISSION CALCULATIONS | SUBJECT: Fugitive Dust - Employees & Contractors | DATE: July 28, 2014 | | |

| Location | Number of Employees[a] | Average Distance Travelled: one way VMT, ea[b] | one way VMT/hr | RT VMT/yr |
|---|---|---|---|---|
| East Plant | 800 | 0.28 | 224 | 163,520 |
| Mill | 285 | 1 | 285 | 208,050 |
| Loadout | 30 | 0.25 | 8 | 5,475 |
| Tailings | 285 | 4.78 | 1,362 | 994,479 |

[a] *Email from K. Ballard, "Employees/contractors", 7/21/2014*

[b] *Google Earth estimation with K. Ballard*

**Unpaved Roads - Equation & Constants[a]**

$E = k \times (s / 12)^a \times (W / 3)^b \times (365 - P) / 365$

| | Empirical Constants for Industrial Roads | | | |
|---|---|---|---|---|
| | Constant | PM | $PM_{10}$ | $PM_{2.5}$ |
| k, a, b - empirical constants | k | 4.9 | 1.5 | 0.15 |
| s - surface material silt content % | a | 0.7 | 0.9 | 0.9 |
| W - mean vehicle wt ton | b | 0.45 | 0.45 | 0.45 |

[a] *AP-42, 13.2.2, Equation 1a & 2, Table 13.2.2-2, Unpaved Roads, Rev. 11/06*

**EMISSION FACTORS**

| Location | Paved/Unpaved | Silt % [a] | Vehicle Weight ton [a] | Annual Days of Precip (>0.01")[c] | c_PM10EF PM lb/VMT | c_PM25EF $PM_{10}$ lb/VMT | c_PMEF $PM_{2.5}$ lb/VMT |
|---|---|---|---|---|---|---|---|
| East Plant | Paved & Unpaved[c] | 2.0 | 0.75 | 40 | 0.67 | 0.14 | 0.01 |
| Mill | Unpaved | 2.0 | 0.75 | 40 | 0.67 | 0.14 | 0.01 |
| Loadout | Unpaved | 2.0 | 0.75 | 40 | 0.67 | 0.14 | 0.01 |
| Tailings | Unpaved | 2.0 | 0.75 | 40 | 0.67 | 0.14 | 0.01 |

[a] *Email with K. Ballard, 6/5/14, Based on grindability studies*

[b] Assumption based on phone conversation with K. Ballard

[c] *Onsite Precip Data*

[d] Emissions calculated for worst case (all unpaved)

**CONTROLLED EMISSIONS**

| Location | c_PMpph PM lb/hr | c_PM10pph $PM_{10}$ lb/hr | c_PM25pph $PM_{2.5}$ lb/hr | c_PMtpy PM ton/yr | c_PM10tpy $PM_{10}$ ton/yr | c_PM25tpy $PM_{2.5}$ ton/yr |
|---|---|---|---|---|---|---|
| East Plant | 7.5 | 1.6 | 0.16 | 2.7 | 0.58 | 0.06 |
| Mill | 9.5 | 2.0 | 0.20 | 3.5 | 0.74 | 0.07 |
| Loadout | 0.25 | 0.05 | 0.01 | 0.09 | 0.02 | 2.0E-3 |
| Tailings | 45.4 | 9.7 | 0.97 | 16.6 | 3.5 | 0.35 |

**UNCONTROLLED EMISSIONS**

| Location | u_PMpph PM lb/hr | u_PM10pph $PM_{10}$ lb/hr | u_PM25pph $PM_{2.5}$ lb/hr | u_PMtpy PM ton/yr | u_PM10tpy $PM_{10}$ ton/yr | u_PM25tpy $PM_{2.5}$ ton/yr |
|---|---|---|---|---|---|---|
| East Plant | 149 | 32.0 | 3.2 | 54.5 | 11.7 | 1.2 |
| Mill | 190 | 40.7 | 4.1 | 69.4 | 14.8 | 1.5 |
| Loadout | 5.0 | 1.1 | 0.11 | 1.8 | 0.39 | 0.04 |
| Tailings | 909 | 194 | 19.4 | 332 | 71.0 | 7.1 |

**Conversions & Assumptions**

| | |
|---|---|
| 365 | *days of operation/yr* |
| 2,000 | *lb/ton* |
| 95% | *Control (Watering)* [a] |

[a] *AP-42, Figure 13.2.2-2, Rev. 11/06*

*Blue values are input , black values are calculated or linked*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 4 | SHEET: E_Gen |
| AIR EMISSION CALCULATIONS | SUBJECT: Emergency Power Generation Emissions | DATE: April 1, 2014 | | |

**Emergency Generator - Emissions Summary**

**Emergency Power Generation Emissions Summary - Short Term**

| Source | CO | $NO_X$ | PM | $SO_2$ | VOC |
|---|---|---|---|---|---|
| | *lb/hr* | *lb/hr* | *lb/hr* | *lb/hr* | *lb/hr* |
| East Plant - Existing Generators | 17.70 | 32.52 | 1.01 | 0.03 | 6.58 |
| East Plant - New Generators | 14.86 | 101.30 | 3.52 | 0.66 | 6.75 |
| Mill - ESTIMATED/ASSUMED Generators | 4.77 | 7.60 | 0.28 | 0.01 | 4.11 |
| **Emergency Power Generation Total** | **37.33** | **141.42** | **4.82** | **0.70** | **17.44** |

**Emergency Power Generation Emissions Summary - Long Term**

| Source | CO | $NO_X$ | PM | $SO_2$ | VOC |
|---|---|---|---|---|---|
| | *ton/yr* | *ton/yr* | *ton/yr* | *ton/yr* | *ton/yr* |
| East Plant - Existing Generators | 4.43 | 8.13 | 0.25 | 0.008 | 1.64 |
| East Plant - New Generators | 3.71 | 25.32 | 0.88 | 0.17 | 1.69 |
| Mill - ESTIMATED/ASSUMED Generators | 1.19 | 1.90 | 0.07 | 0.0019 | 1.03 |
| **Emergency Power Generation Total** | **9.33** | **35.35** | **1.20** | **0.18** | **4.36** |

**Conversions**

| | | |
|---|---|---|
| 1.341 | *hp/kW* | |
| 453.592 | *g/lb* | |
| 2,000 | *lb/ton* | |
| 15 | *ppm S in ULSD (GPA 2140)* | |
| 7.05 | *lb/gal* | *AP-42, Appendix A (Distillate Oil), Rev. 9/85* |
| 1.00E+06 | *Btu/MMBtu* | |

*Blue values are input , black values are calculated or linked*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 2 | OF: 4 | SHEET: E_Gen |
| AIR EMISSION CALCULATIONS | SUBJECT: Emergency Power Generation Emissions | DATE: April 1, 2014 | | |

**Emergency Power Generation**

**East Plant - Existing Generators**

| | | |
|---|---|---|
| Cat 516B - Diesel | 2,628 *hp* | *Pinal County Air Quality, Permit Number B30993.0000* |
| | 1,960 *kW* | |
| Model Year | 2006 | *Assuming Tier II* |
| Cat 3046C - Diesel | 449 *hp* | *Pinal County Air Quality, Permit Number B30993.0000* |
| | 335 *kW* | |
| Model Year | 2001 | *Assuming Tier II* |
| Break-Specific Fuel Consumption | 7,000 *Btu/hp-hr* | *AP-42, Table 3.4-1, Footnote e, Rev. 10/96* |
| Diesel Heat Value | 137,000 *Btu/gal* | *AP-42, Appendix A, Rev. 9/85* |
| Operation | 500 *hr/yr* | *Email from K. Walch, 4/14/2014* |
| Power (All Engines) | 21.5 *MMBtu/hr* | |

| **Total Diesel Fuel Consumption** | *gal/hr* | *(gal/yr)* |
|---|---|---|
| Cat 516B - Diesel | 134 | 67,139 |
| Cat 3046C - Diesel | 23 | 11,471 |

| **Emission Factors** | **Cat 516B - Diesel** | **Cat 516B - Diesel** | **Reference** |
|---|---|---|---|
| CO | 3.50 *g/kW-h* | 3.50 *g/kW-h* | *40 CFR § 89.112, Table 1, Tier II* |
| $NO_X$ | 6.40 *g/kW-h* | 6.60 *g/kW-h* | *40 CFR § 89.112, Table 1, Tier II* |
| PM | 0.20 *g/kW-h* | 0.20 *g/kW-h* | *40 CFR § 89.112, Table 1, Tier II* |
| VOC | 1.30 *g/kW-h* | 1.30 *g/kW-h* | *40 CFR § 89.112, Table 1, Tier II* |
| $SO_2$ | - | - | *Mass balance based on 15 ppm S content (below)* |

| **Emissions** | **Cat 516B - Diesel** | | **Cat 3046C - Diesel** | | **Total** | |
|---|---|---|---|---|---|---|
| | ***lb/hr*** | ***ton/yr*** | ***lb/hr*** | ***ton/yr*** | ***lb/hr*** | ***ton/yr*** |
| CO | *15.12* | *3.78* | *2.58* | *0.65* | 17.70 | 4.43 |
| $NO_X$ | *27.65* | *6.91* | *4.87* | *1.22* | 32.52 | 8.13 |
| PM | *0.86* | *0.22* | *0.15* | *0.04* | 1.01 | 0.25 |
| VOC | *5.62* | *1.40* | *0.96* | *0.24* | 6.58 | 1.64 |
| $SO_2$ | *0.03* | *0.007* | *0.005* | *0.0012* | 0.03 | 0.008 |

**SO2 Mass Balance (Single Cat 516B - Diesel)**

$$\frac{134\ \cancel{gal}}{hr} \times \frac{7.05\ \cancel{lb}}{\cancel{gal}} \times 0.0015\%\ \cancel{S} \times \frac{64.06\ lb\ SO_2}{32.07\ \cancel{lb\ S}} = \frac{0.03\ lb\ SO_2}{hr}$$

$$\frac{0.03\ \cancel{lb}\ SO_2}{\cancel{hr}} \times \frac{500\ \cancel{hr}}{yr} \times \frac{ton}{2{,}000\ \cancel{lb}} = \frac{0.007\ ton\ SO_2}{yr}$$

**SO2 Mass Balance (Single Cat 3046C - Diesel)**

$$\frac{23\ \cancel{gal}}{hr} \times \frac{7.05\ \cancel{lb}}{\cancel{gal}} \times 0.0015\%\ \cancel{S} \times \frac{64.06\ lb\ SO_2}{32.07\ \cancel{lb\ S}} = \frac{0.005\ lb\ SO_2}{hr}$$

$$\frac{0.00\ \cancel{lb}\ SO_2}{\cancel{hr}} \times \frac{500\ \cancel{hr}}{yr} \times \frac{ton}{2{,}000\ \cancel{lb}} = \frac{0.0012\ ton\ SO_2}{yr}$$

**Emergency Power Generation - Continued**

**East Plant - New Generators**

| | | |
|---|---|---|
| Engine Make and Model | Caterpillar C175-16 | *Caterpillar Standby 3100 kW Tier 4i Performance Data* |
| Engine Output | 3,263 *kW* | |
| | 4,376 *hp* | *Caterpillar Standby 3100 kW Tier 4i Performance Data* |
| Model Year | 2012 | *Caterpillar Standby 3100 kW Tier 4i Performance Data* |
| Break-Specific Fuel Consumption | 7,000 *Btu/hp-hr* | *AP-42, Table 3.4-1, Footnote e, Rev. 10/96* |
| Diesel Heat Value | 137,000 *Btu/gal* | *AP-42, Appendix A, Rev. 9/85* |
| Quantity | 14 | *Email from M. Woloch, 3/10/2014* |
| Operation | 500 *hr/yr* | *Email from K. Walch, 4/14/2014* |
| Power (All Engines) | 428.8 *MMBtu/hr* | |

| **Total Diesel Fuel Consumption** | *gal/hr* | *(gal/yr)* |
|---|---|---|
| Single Generator | 224 | 111,796 |
| 14 Generators | 3,130 | 1,565,139 |

| **Emission Factors** | **Performance Data*** | **Reference** |
|---|---|---|
| CO | 0.11 *g/hp-h* | *Caterpillar Standby 3100 kW Tier 4i Performance Data (worst case)* |
| $NO_X$ | 0.75 *g/hp-h* | *Caterpillar Standby 3100 kW Tier 4i Performance Data (worst case)* |
| PM** | 0.05 *g/hp-h* | *Caterpillar Standby 3100 kW Tier 4i Performance Data (worst case)* |
| VOC | 0.05 *g/hp-h* | *Caterpillar Standby 3100 kW Tier 4i Performance Data (worst case)* |
| $SO_2$ | - | *Mass balance based on 15 ppm S content (below)* |

**Performance data: Rated Speed Potential Site Variation: 1800 RPM*

***Worst case emissions at 50% power (2,284 hp)*

| **Emissions** | **Single Generator** | | **14 Generators** | |
|---|---|---|---|---|
| | ***lb/hr*** | ***ton/yr*** | ***lb/hr*** | ***ton/yr*** |
| CO | *1.06* | *0.27* | 14.86 | 3.71 |
| $NO_X$ | *7.24* | *1.81* | 101.30 | 25.32 |
| PM | *0.25* | *0.06* | 3.52 | 0.88 |
| VOC | *0.48* | *0.12* | 6.75 | 1.69 |
| $SO_2$ | *0.05* | *0.012* | 0.66 | 0.17 |

**SO2 Mass Balance (Single Caterpillar C175-16)**

$$\frac{224\ \cancel{gal}}{hr} \times \frac{7.05\ \cancel{lb}}{\cancel{gal}} \times 0.0015\%\ \cancel{S} \times \frac{64.06\ lb\ SO_2}{32.07\ \cancel{lb\ S}} = \frac{0.05\ lb\ SO_2}{hr}$$

$$\frac{0.05\ \cancel{lb}\ SO_2}{\cancel{hr}} \times \frac{500\ \cancel{hr}}{yr} \times \frac{ton}{2{,}000\ \cancel{lb}} = \frac{0.012\ ton\ SO_2}{yr}$$

**Emergency Power Generation - Continued**

**Mill - ESTIMATED/ASSUMED Generators**

| | | | |
|---|---|---|---|
| Diesel Generator A | 200 | *hp* | ***PLACEHOLDER ONLY, TO BE UPDATED*** |
| | 149 | *kW* | ***PLACEHOLDER ONLY, TO BE UPDATED*** |
| Model Year | 2003 | | ***PLACEHOLDER ONLY, TO BE UPDATED*** |
| Quantity | 2 | | ***PLACEHOLDER ONLY, TO BE UPDATED*** |
| Diesel Generator B | 100 | *hp* | ***PLACEHOLDER ONLY, TO BE UPDATED*** |
| | 75 | *kW* | ***PLACEHOLDER ONLY, TO BE UPDATED*** |
| Model Year | 2003 | | ***PLACEHOLDER ONLY, TO BE UPDATED*** |
| Quantity | 3 | | ***PLACEHOLDER ONLY, TO BE UPDATED*** |
| Break-Specific Fuel Consumption | 7,000 | *Btu/hp-hr* | *AP-42, Table 3.4-1, Footnote e, Rev. 10/96* |
| Diesel Heat Value | 137,000 | *Btu/gal* | *AP-42, Appendix A, Rev. 9/85* |
| Operation | 500 | *hr/yr* | *Email from K. Walch, 4/14/2014* |
| Power (All Engines) | 4.9 | *MMBtu/hr* | |

| **Total Diesel Fuel Consumption** | *gal/hr* | *(gal/yr)* |
|---|---|---|
| Single Diesel Generator A | 10 | 5,109 |
| 2x Diesel Generator A | 20 | 10,219 |
| Single Diesel Generator B | 5 | 2,555 |
| 3x Diesel Generator B | 15 | 7,664 |

| **Emission Factors** | **Diesel Generator A** | **Diesel Generator B** | **Reference** |
|---|---|---|---|
| CO | 3.5 *g/kW-h* | 5.0 *g/kW-h* | *40 CFR § 89.112, Table 1, Tier II* |
| $NO_X$[a] | 6.6 *g/kW-h* | 6.6 *g/kW-h* | *40 CFR § 89.112, Table 1, Tier II* |
| PM | 0.20 *g/kW-h* | 0.30 *g/kW-h* | *40 CFR § 89.112, Table 1, Tier II* |
| VOC[b] | 1.3 *g/kW-h* | 6.6 *g/kW-h* | *40 CFR § 89.112, Table 1, Tier II* |
| $SO_2$ | - | - | *Mass balance based on 15 ppm S content (below)* |

| **Emissions** | **Diesel Generator A** | | **Diesel Generator B** | | **Total** | |
|---|---|---|---|---|---|---|
| | ***lb/hr*** | ***ton/yr*** | ***lb/hr*** | ***ton/yr*** | ***lb/hr*** | ***ton/yr*** |
| CO | *2.30* | *0.58* | *2.47* | *0.62* | *4.77* | 1.19 |
| $NO_X$ | *4.34* | *1.09* | *3.26* | *0.81* | 7.60 | 1.90 |
| PM | *0.13* | *0.03* | *0.15* | *0.037* | 0.28 | 0.07 |
| VOC | *0.85* | *0.21* | *3.26* | *0.81* | 4.11 | 1.03 |
| $SO_2$ | *0.004* | *0.0011* | *0.003* | *0.0008* | 0.01 | 0.0019 |

**SO2 Mass Balance (Single Diesel Generator A)**

$$\frac{10\ \cancel{gal}}{hr} \times \frac{7.05\ \cancel{lb}}{\cancel{gal}} \times 0.0015\%\ \cancel{S} \times \frac{64.06\ lb\ SO_2}{32.07\ \cancel{lb\ S}} = \frac{0.002\ lb\ SO_2}{hr}$$

$$\frac{0.002\ \cancel{lb}\ SO_2}{\cancel{hr}} \times \frac{500\ \cancel{hr}}{yr} \times \frac{ton}{2{,}000\ \cancel{lb}} = \frac{0.0005\ ton\ SO_2}{yr}$$

**SO2 Mass Balance (Single Diesel Generator B)**

$$\frac{5\ \cancel{gal}}{hr} \times \frac{7.05\ \cancel{lb}}{\cancel{gal}} \times 0.0015\%\ \cancel{S} \times \frac{64.06\ lb\ SO_2}{32.07\ \cancel{lb\ S}} = \frac{0.001\ lb\ SO_2}{hr}$$

$$\frac{0.001\ \cancel{lb}\ SO_2}{\cancel{hr}} \times \frac{500\ \cancel{hr}}{yr} \times \frac{ton}{2{,}000\ \cancel{lb}} = \frac{0.0003\ ton\ SO_2}{yr}$$

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 1 | SHEET: Fuel Tanks |
| AIR EMISSION CALCULATIONS | SUBJECT: Emergency Power Generation Emissions | DATE: May 5, 2014 | | |

**Diesel Storage Tanks**

| | | EP_S_FUEL1 | EP_UG_FUEL1 | M_FUEL1 | L_FUEL1 | T_FUEL1 | | |
|---|---|---|---|---|---|---|---|---|
| | | EP Surface | EP UG[a] | Mill | Loadout | Tailings | | 2 |
| Per Tank Fuel Usage[b] | *gal/hr* | 8 | 87 | 51 | 22 | 77 | | 3 |
| Per Tank Fuel Usage[b] | *gal/mo* | 1,355 | 9,106 | 9,290 | 8,739 | 18,933 | | 4 |
| Per Tank Fuel Usage[b] | *gal/yr* | 16,259 | 109,268 | 111,474 | 104,863 | 227,193 | | 5 |
| Total Fuel Usage[b] | *gal/hr* | 8 | 521 | 257 | 89 | 929 | | 6 |
| Total Fuel Usage[b] | *gal/mo* | 1,355 | 54,634 | 46,448 | 34,954 | 227,193 | | 7 |
| Total Fuel Usage[b] | *gal/yr* | 16,259 | 655,607 | 557,371 | 419,451 | 2,726,316 | | 8 |
| Fuel Tank Quantity | | 1 | 6 | 5 | 4 | 12 | estimate | 9 |
| Fuel Tank Volume | *gal* | 5,000 | 20,000 | 10,000 | 10,000 | 20,000 | estimate | 10 |
| Fills Per Tank, Per Year | | 4 | 6 | 12 | 11 | 12 | | 11 |
| Diameter | *ft* | 8 | 13 | 8 | 12 | 12 | estimate | 12 |
| Length | *ft* | 13 | 20 | 27 | 12 | 24 | | 13 |
| Orientation | | Horizontal | Horizontal | Horizontal | Horizontal | Horizontal | | 14 |
| Tank Contents | | Diesel | Diesel | Diesel | Diesel | Diesel | | 15 |
| Location | | Superior, Arizona | | | | | | 16 |
| Per Tank VOC Emissions | *lb/hr* | 3.3E-4 | 8.0E-4 | 7.9E-4 | 7.7E-4 | 1.7E-3 | | 17 |
| Per Tank VOC Emissions[c] | *lb/yr* | 2.87 | 7.03 | 6.94 | 6.72 | 14.57 | | 18 |
| Per Tank VOC Emissions | *ton/yr* | 1.4E-3 | 3.5E-3 | 3.5E-3 | 3.4E-3 | 7.3E-3 | | 19 |
| Total VOC Emissions | *lb/hr* | 3.3E-4 | 4.8E-3 | 4.0E-3 | 3.1E-3 | 2.0E-2 | | 20 |
| Total VOC Emissions | *ton/yr* | 0.001 | 0.021 | 0.017 | 0.013 | 0.087 | | 21 |

[a] *6,562 (2,000 m) ft below surface, RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf, p. 9*

[b] *Including 15% contingency*

[c] *Calculated using EPA Tanks 4.0.9d, 05/02/2014*

| Conversions | |
|---|---|
| 7.48052 | $ft^3/gal$ |
| 2,000 | *lb/ton* |
| 8,760 | *hr/yr* |
| 12 | *mo/yr* |

*Blue values are input , black values are calculated or linked*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 2 | SHEET: EP Cooling |
| AIR EMISSION CALCULATIONS | SUBJECT: Cooling Tower Emissions | DATE: April 25, 2014 | | |

## COOLING TOWERS - PM/$PM_{10}$/$PM_{2.5}$ EMISSION RATES

| Operation | | | Reference |
|---|---|---|---|
| Surface Cooling Circulation | 4,200 *l/s* | 1,110 *gal/s* | *Refrigeration and Ventilation Strategy, Section 8.3, Rev. 11/12* |
| Surface Drift Loss | 0.002% | | *Email from V. Peacey (assumption from KUC), 03/07/2012* |
| Underground Cooling Circulation | 1,250 *l/s* | 330 *gal/s* | *Refrigeration and Ventilation Strategy, Section 9.3, Rev. 11/12* |
| Underground Drift Loss | 0.002% | | *Email from V. Peacey (assumption from KUC), 03/07/2012* |

| Cooling Tower Water Quality | | Reference |
|---|---|---|
| Total Dissolved Solids (TDS) | 3,000 *ppm* | *Refrigeration and Ventilation Strategy, Section 11.2, Rev. 11/12* |

| Drift | | Reference |
|---|---|---|
| Drift Mass Governed by Atmospheric Dispersion | 31.3% | *EPA Document: Effects of Pathogenic and Toxic Material Transport Via Cooling Device Drift - Vol. 1 Technical Report EPA 600 7-79-251a, 11/1979* |

*Surface Towers*

1,110 ~~*gal*~~/~~*sec*~~ × 8.33 *lb water*/~~*gal*~~ *water* × 3,600 ~~*sec*~~/*hr* × 0.002% *(drift)* = 665.45 *lb water*/*hr*

*Underground Towers*

330 ~~*gal*~~/~~*sec*~~ × 8.33 *lb water*/~~*gal*~~ *water* × 3,600 ~~*sec*~~/*hr* × 0.002% *(drift)* = 198.05 *lb water*/*hr*

### *PM Emissions*

*Surface Towers*

665.45 ~~*lb water*~~/*hr* × 31.3% *(dispersion factor)** × 3,000 *lb PM*/1.0E+06 ~~*lb water*~~ = 0.63 *lb PM*/*hr* = 2.74 *ton PM*/*yr*

*Underground Towers*

198.05 ~~*lb water*~~/*hr* × 31.3% *(dispersion factor)** × 3,000 *lb PM*/1.0E+06 ~~*lb water*~~ = 0.19 *lb PM*/*hr* = 0.81 *ton PM*/*yr*

**TOTAL = 0.81 *lb PM*/*hr* = 3.55 *ton PM*/*yr***

### *$PM_{10}$ Emissions*

*Surface Towers*

0.63 ~~*lb PM*~~/*hr* × 0.403 *lb $PM_{10}$*/~~*lb PM*~~ * = 0.25 *lb $PM_{10}$*/*hr* = 1.10 *ton $PM_{10}$*/*yr*

*Underground Towers*

0.19 ~~*lb PM*~~/*hr* × 0.403 *lb $PM_{10}$*/~~*lb PM*~~ * = 0.07 *lb $PM_{10}$*/*hr* = 0.33 *ton $PM_{10}$*/*yr*

**TOTAL = 0.33 *lb $PM_{10}$*/*hr* = 1.43 *ton $PM_{10}$*/*yr***

### *$PM_{2.5}$ Emissions*

*Surface Towers*

0.63 ~~*lb PM*~~/*hr* × 0.061 *lb $PM_{2.5}$*/~~*lb PM*~~ * = 0.038 *lb $PM_{2.5}$*/*hr* = 0.168 *ton $PM_{2.5}$*/*yr*

*Underground Towers*

0.19 ~~*lb PM*~~/*hr* × 0.061 *lb $PM_{2.5}$*/~~*lb PM*~~ * = 0.011 *lb $PM_{2.5}$*/*hr* = 0.050 *ton $PM_{2.5}$*/*yr*

**TOTAL = 0.050 *lb $PM_{2.5}$*/*hr* = 0.218 *ton $PM_{2.5}$*/*yr***

* *See size fraction calculation on the following page.*

*Blue values are input , black values are calculated or linked*

**COOLING TOWERS - PM/$PM_{10}$/$PM_{2.5}$ EMISSION RATES - Continued**

***$PM_{10}$, $PM_{2.5}$ Multiplier Calculation***

| Operation | | Reference |
|---|---|---|
| Water TDS | 3,000 *ppm* | *Refrigeration and Ventilation Strategy, Section 11.2, Rev. 11/12* |
| Calcium Carbonate Density | 2.7 *g/cc* | *Perry's Chemical Engineer's Handbook, Sixth Edition, p. 3-10.* |
| Volume of a Sphere | $V = 4 / 3 * \pi * r^3$ | |

**Water Drop Size and Mass Distribution***

| Droplet Dia. (micron) | (% mass) | Water Droplet Vol. (cc) | Water Droplet Mass (g) | Solids Mass (g) | Solids Vol. (cc) | Solids Dia. (micron) | % mass <10, <2.5 (microns) |
|---|---|---|---|---|---|---|---|
| 22 | 0.4 | 5.6E-09 | 5.6E-09 | 1.7E-11 | 6.2E-12 | 2.3 | |
| 29 | 1.5 | 1.3E-08 | 1.3E-08 | 3.8E-11 | 1.4E-11 | 3.0 | 1.9 |
| 44 | 3.8 | 4.5E-08 | 4.5E-08 | 1.3E-10 | 5.0E-11 | 4.6 | |
| 58 | 2.1 | 1.0E-07 | 1.0E-07 | 3.1E-10 | 1.1E-10 | 6.0 | |
| 65 | 1.9 | 1.4E-07 | 1.4E-07 | 4.3E-10 | 1.6E-10 | 6.7 | |
| 87 | 1.6 | 3.4E-07 | 3.4E-07 | 1.0E-09 | 3.8E-10 | 9.0 | |
| 108 | 1.4 | 6.6E-07 | 6.6E-07 | 2.0E-09 | 7.3E-10 | 11.2 | 12.6 |
| 120 | 1.3 | 9.0E-07 | 9.0E-07 | 2.7E-09 | 1.0E-09 | 12.4 | |
| 132 | 1.1 | 1.2E-06 | 1.2E-06 | 3.6E-09 | 1.3E-09 | 13.7 | |
| 144 | 1.3 | 1.6E-06 | 1.6E-06 | 4.7E-09 | 1.7E-09 | 14.9 | |
| 174 | 5.8 | 2.8E-06 | 2.8E-06 | 8.3E-09 | 3.1E-09 | 18.0 | |
| 300 | 5.0 | 1.4E-05 | 1.4E-05 | 4.2E-08 | 1.6E-08 | 31.1 | |
| 450** | 4.2 | 4.8E-05 | 4.8E-05 | 1.4E-07 | 5.3E-08 | 46.6 | |
| Total | 31.3 | | | | | | |

* *Effects of Pathogenic and Toxic Material Transport Via Cooling Device Drift - Vol. 1 Technical Report. EPA 600 7-79-251a, Nov. 1979.*

** *Maximum droplet size governed by atmospheric dispersion.*

**$PM_{10}$/PM multiplier = 0.40**
**$PM_{2.5}$/PM multiplier = 0.06**

| Conversions | |
|---|---|
| 8,760 | *hr/yr* |
| 2,000 | *lb/ton* |
| 3.78541 | *l/gal* |
| 8.33 | *lb/gal water* |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 1 | SHEET: Reagents |
| AIR EMISSION CALCULATIONS | SUBJECT: Liquid Reagent Tanks & Solid Reagent Usage | DATE: March 28, 2014 | | |

## LIQUID REAGENT STORAGE TANK CHARACTERISTICS AND EMISSIONS

VOCpph VOCtpy

| TANK EMISSIONS | VOC* (lb/yr) | VOC lb/hr | VOC ton/yr |
|---|---|---|---|
| MIBC (Methyl isobutyl carbonal) | 135 | 0.02 | 0.07 |
| MCO (Non-polar flotation oil) | 9.5 | 1.1E-3 | 4.8E-3 |
| CYTEC 8989 | 0.10 | 1.1E-5 | 5.0E-5 |
| NaHS (Sodium hydrosulfide solution) | | | |

* *Calculated using EPA Tanks 4.0.9d*

| MIBC (Methyl isobutyl carbonal) | | | Notes |
|---|---|---|---|
| Design Throughput | 5,268 | *l/day* | 2 |
| | 1,392 | *gal/day* | |
| Average Throughput | 4,581 | *l/day* | 2 |
| | 441,713 | *gal/yr* | |
| Tank Diameter | 4.4 | *m* | 2 |
| | 14.4 | *ft* | |
| Tank Height | 5.4 | *m* | 2 |
| | 17.7 | *ft* | |
| Tank Volume | 67.3 | $m^3$ | 2 |
| | 17,779 | *gal* | |

1 *Assuming 100% $(CH_3)_2CHCH_2CH(OH)CH_3$*
2 *Design Criteria 2013 08 6.pdf*

| MCO (Non-polar flotation oil) | | | Notes |
|---|---|---|---|
| Design Throughput | 1,597 | *l/day* | 2 |
| | 422 | *gal/day* | |
| Average Throughput | 1,388 | *l/day* | 2 |
| | 133,835 | *gal/yr* | |
| Tank Diameter | 3.9 | *m* | 2 |
| | 12.8 | *ft* | |
| Tank Height | 4.9 | *m* | 2 |
| | 16.1 | *ft* | |
| Tank Volume | 45.6 | $m^3$ | 2 |
| | 12,046 | *gal* | |

1 *Emissions calculated based on 100% Distillate fuel oil no. 2*
2 *Design Criteria 2013 08 6.pdf*

**Solid Reagent Use** *(Design Criteria 2013 08 6.pdf)*

| | (tonne/day) (design) | (tonne/day) (average) | (ton/hr) | ton/yr |
|---|---|---|---|---|
| Lime | 89.7 | 67.8 | 4.1 | 27,279 |
| SIPX* | 690* | 600* | 0.03 | 241 |
| CIBA 155 | 3.70 | 3.22 | 0.17 | 1,296 |
| CIBA 10 | 0.96 | 0.78 | 0.04 | 314 |

* *Units: kg/day*

| Conversions | | | |
|---|---|---|---|
| 3.78541 | *l/gal* | 24 | *hr/day* |
| 264.172 | $gal/m^3$ | 365 | *days/yr* |
| 8.34540445 | *lb/gal water* | 2,204.62 | *lb/tonne* |
| 3.28084 | *ft/m* | 907.185 | *kg/ton* |
| 1.10231 | *ton/tonne* | 2,000 | *lb/ton* |
| 8,760 | *hr/yr* | | |

*Blue values are input , black values are calculated or linked*

| CYTEC 8989 | | | Notes |
|---|---|---|---|
| Design Throughput | 908 | *l/day* | 2 |
| | 240 | *gal/day* | |
| Average Throughput | 789 | *l/day* | 2 |
| | 76,078 | *gal/yr* | |
| Tank Diameter | 3.7 | *m* | 2 |
| | 12.1 | *ft* | |
| Tank Height | 4.7 | *m* | 2 |
| | 15.4 | *ft* | |
| Tank Volume | 39.8 | $m^3$ | 2 |
| | 10,514 | *gal* | |

1 *Dithiophosphate, Cresol -p, & Non-Organic Components*
2 *Design Criteria 2013 08 6.pdf*

| NaHS (Sodium hydrosulfide solution) | | | Notes |
|---|---|---|---|
| Design Throughput | 41.4 | *tonnes/day* | 2, 3 |
| | 8,749 | *gal/day* | |
| Average Throughput | 36.0 | *tonnes/day* | 2, 3 |
| | 2,776,973 | *gal/yr* | |
| Tank Diameter | 7.5 | *m* | 1, 2 |
| | 24.6 | *ft* | |
| Tank Height | 8.5 | *m* | 1, 2 |
| | 27.9 | *ft* | |
| Tank Volume | 334.4 | $m^3$ | 1, 2 |
| | 88,339 | *gal* | |
| Specific Gravity | 1.25 | | 2 |
| Storage Solution Conc. | 30 | *% NaHS* | 2 |

1 *Stainless Steel Heated and Insulated Tank*
2 *Design Criteria 2013 08 6.pdf*
3 *As shipped concentration 40% - 45% NaHS*
4 *Phone conversation with manufacturer (3/28/14) 28% conversion to $H_2S$*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 2 | SHEET: Drill & Blast |
| AIR EMISSION CALCULATIONS | SUBJECT: Drilling and Blasting | DATE: August 21, 2014 | | |

**Production Drilling**

| Emission Factors | | Reference |
|---|---|---|
| $PM_{10}$ | 8.0E-5 *lb/ton* | *AP-42, Table 11.19.2-2 (wet drilling), Rev. 8/04* |
| **PM Scaling Factors** | | |
| PM | 2.1 | *Ratio calculated based on particle size multiplier from AP-42, 13.2.4* |
| $PM_{10}$ | 1 | |
| $PM_{2.5}$ | 1 | |

| Production Drilling - Activity Information | | |
|---|---|---|
| Ore Quantity | 48,281,178 | *ton/yr* |
| Drill Hole Depth | 6,889 | *ton/hr* |

| Production Drilling - Emissions | *lb/hr* | *ton/yr* |
|---|---|---|
| PM | 1.2 | 4.1 |
| $PM_{10}$ | 0.55 | 1.9 |
| $PM_{2.5}$ | 0.55 | 1.9 |

| Conversions | |
|---|---|
| 1.10231 | *ton/tonne* |
| 907.185 | *kg/ton* |
| 3.28084 | *ft/m* |
| 10.7639 | $ft^2/m^2$ |
| 2,000 | *lb/ton* |

*Blue values are input , black values are calculated or linked*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 2 | OF: 2 | SHEET: Drill & Blast |
| AIR EMISSION CALCULATIONS | SUBJECT: Drilling and Blasting | DATE: August 21, 2014 | | |

| Blasting | | | | Reference |
|---|---|---|---|---|
| **Activity Information** | | | | |
| Material Mined | 47,787,079 | *ton/yr* | 30 | *RCM Mine Data for Ari Modelling 2012.xlsx* |
| Material Density | 2.1 | *tonne/m$^3$* | | *Design Criteria 2013 08 6.pdf* |
| Material Mined | 20,643,695 | *m$^3$/yr* | | |
| Blasting Agent Use | 1,682,432 | *kg/yr* | -4 | *Explosives.xlsx* |
| | 1,855 | *ton/yr* | | |
| No. of Blasts | 444 | *blasts/yr* | | *D. Randall's December 2013 meeting notes* |
| | 2 | *max blasts/day* | | *D. Randall's December 2013 meeting notes* |
| Operation | 365 | *days/yr* | | |
| | 24 | *hr/day* | | |

| Emission Factors | | | Reference |
|---|---|---|---|
| Emission Factor Equation | TSP = 0.000014 x A$^{1.5}$ | *lb/blast* | *AP-42, Table 11.9-1 (blasting, overburden), Rev. 7/98* |
| Where, A = Area per Blast | 226 | *m$^2$ (max daily)* | *D. Randall's December 2013 meeting notes* |
| | 2,430 | *ft$^2$ (max daily)* | *Based on maximum blasts per day* |
| TSP | 1.68 | *lb/blast* | |
| Where, A = Area per Blast | 57,600 | *m$^2$ (annual)* | *D. Randall's December 2013 meeting notes* |
| | 620,001 | *ft$^2$ (annual)* | |
| TSP | 6,835 | *lb/yr* | |
| CO | 32.53 | *lb/ton* | *NIOSH - Fumes Studies - Richard Mainiero, Emulsion* |
| $NO_X$ | 6.20 | *lb/ton* | *NIOSH - Fumes Studies - Richard Mainiero, Emulsion* |
| $SO_2$ | 2 | *lb/ton* | *AP-42, Table 13.3-1 (ANFO), Rev. 2/80* |

| PM Scaling Factors | | Reference |
|---|---|---|
| PM | 1 | *AP-42, Table 11.9-1 (blasting, overburden), Rev. 7/98* |
| $PM_{10}$ | 0.52 | *AP-42, Table 11.9-1 (blasting, overburden), Rev. 7/98* |
| $PM_{2.5}$ | 0.03 | *AP-42, Table 11.9-1 (blasting, overburden), Rev. 7/99* |

| Emissions | *(lb/blast)** | *lb/hr** | *(lb/day)** | *ton/yr* |
|---|---|---|---|---|
| PM | 1.7 | 1.7 | 1.7 | 3.4 |
| $PM_{10}$ | 0.87 | 0.87 | 0.87 | 1.8 |
| $PM_{2.5}$ | 0.05 | 0.05 | 0.05 | 0.10 |
| CO | 136 | 136 | 136 | 30.2 |
| $NO_X$ | 25.9 | 25.9 | 25.9 | 5.7 |
| $SO_2$ | 8.4 | 8.4 | 8.4 | 1.9 |

* *Based on maximum of 2 blasts per day*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 1 | SHEET: Flow |
| AIR EMISSION CALCULATIONS | SUBJECT: Flow Calculations (EPA Method 19) | DATE: April 16, 2014 | | |

**Stockpile Reclaim Dust Collectors** *(Donaldson Torit DFO 4-32)*

**Linear Interpolation (Pressure Based on Elevation)**

| Elevation | Pressure | Pressure | |
|---|---|---|---|
| *ft* | *kPa* | *atm* | |
| 2,500* | 92.5* | 0.91 | |
| 2,888** | 91.2 | 0.90 | *West Plant Elevation/Pressure* |
| 3,000* | 90.8* | 0.90 | |

* *www.engineeringtoolbox.com/air-altitude-pressure-d_462.html*
** *Google Earth*

| | |
|---|---|
| 56.8 | F (WP Met Data) |
| 0.90 | atm |
| 68.0 | F, standard temp. |
| 18,950 | acfm* |
| 17,423 | dscfm |
| 1,045,398 | dscfh |

* *Email from Eric Pedersen, M3, 3/27/14*

**Underground Reclaim Dust Collectors**

**Linear Interpolation (Pressure Based on Elevation)**

| Elevation | Pressure | Pressure | |
|---|---|---|---|
| *ft* | *kPa* | *atm* | |
| -2,000* | 109* | 1.08 | |
| -2,386 | 110.5 | 1.09 | *Mine Elevation/Pressure* |
| -2,500* | 111* | 1.10 | |

* *www.engineeringtoolbox.com/air-altitude-pressure-d_462.html*

**Elevation Calculation**

| | |
|---|---|
| 4,176 | EP Elevation* |
| 6,562 | Mine Depth** |
| -2,386 | Mine Elevation |

* *Google Earth*
** *RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf, p. 9*

| | | |
|---|---|---|
| 40.0* | °C | |
| 1.09 | atm | |
| 68.0 | F, standard temp. | |
| 22,500 | a m³/hr | *for crushers (UG Flowsheet 0000)* |
| 794,581 | acfh | |
| 915,420 | dscfh | |
| 5,100 | a m³/hr | *for conveyor transfer (UG Flowsheet 0000)* |
| 180,105 | acfh | |
| 207,495 | dscfh | |
| 22,500 | a m³/hr | *for silos (UG Flowsheet 0000)* |
| 794,581 | acfh | |
| 915,420 | dscfh | |
| 17,000 | a m³/hr | *for skip loading (UG Flowsheet 0000)* |
| 600,350 | acfh | |
| 691,651 | dscfh | |
| 17,000 | a m³/hr | *for bin unloading (UG Flowsheet 0001)* |
| 600,350 | acfh | |
| 691,651 | dscfh | |

* *RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf, p. 12*

**Conversions**

| | |
|---|---|
| 101.325 | kPa/atm |
| 60 | min/hr |
| 35.3147 | ft3/m3 |

*Blue values are input , black values are calculated or linked*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper | BY: N. Tipple |
|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 OF: 3 SHEET: UG Control |
| AIR EMISSION CALCULATIONS | SUBJECT: Underground Scrubbing | DATE: August 21, 2014 |

**Underground Control Summary - Control Efficiencies**

**Combined Underground Scrubbing Efficiency for Particulate and Gaseous Pollutants**

| | PM | $PM_{10}$ | $PM_{2.5}$ | $NO_X$ | CO | $SO_2$ |
|---|---|---|---|---|---|---|
| Water Droplets in Shafts | 30.4% | 30.4% | 4.7% | | | |
| Heat Rejection Sprays | 30.0% | 30.0% | 2.5% | 8.8% | 3.5% | 25.0% |
| Gravitational Settlement | 45.8% | 5.1% | 0.3% | | | |
| Effective Control | 73.6% | 53.7% | 7.4% | 8.8% | 3.5% | 25.0% |

**Underground Control Summary - Emissions**

3_EP_UG_TOTAL c_PMpph c_PM10pph c_PM25pph c_NOXpph c_COpph c_SO2pph

**Emissions for Particulate and Gaseous Pollutants (*lb/hr*)**

| | PM | $PM_{10}$ | $PM_{2.5}$ | $NO_X$ | CO | $SO_2$ |
|---|---|---|---|---|---|---|
| Controlled UG Emissions | 361 | 90.2 | 13.6 | 38.0 | 272 | 8.5 |
| Vented to Atmosphere | 95.4 | 41.7 | 12.6 | 34.7 | 262 | 6.3 |

3_EP_UG_TOTAL c_PMtpy c_PM10tpy c_PM25tpy c_NOXtpy c_COtpy c_SO2tpy

**Emissions for Particulate and Gaseous Pollutants (*ton/yr*)**

| | PM | $PM_{10}$ | $PM_{2.5}$ | $NO_X$ | CO | $SO_2$ |
|---|---|---|---|---|---|---|
| Controlled UG Emissions | 530 | 149 | 32.4 | 13.1 | 111 | 1.9 |
| Vented to Atmosphere | 140 | 69.1 | 30.0 | 12.0 | 107 | 1.4 |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper | BY: N. Tipple |
|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 2 OF: 3 SHEET: UG Control |
| AIR EMISSION CALCULATIONS | SUBJECT: Underground Scrubbing | DATE: August 21, 2014 |

**Exhaust Shaft Dust Scrubbing Efficiency for $PM_{10}$ and $PM_{2.5}$**

Water droplets in the shaft will remove at least:

90% Particulate matter greater than 10 µm*
40% Particulate matter between 4 and 10 µm*
10% Particulate matter less than 4 µm*

** Resolution project Exhaust Shaft Emissions Report, 5/08, p. 20*

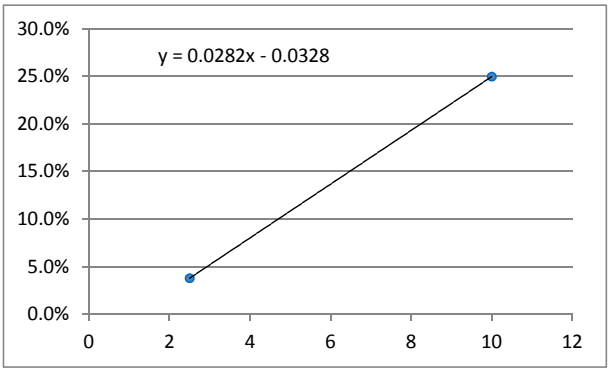
$PM_4$ Scrubbing Efficiency: 10%
$PM_{10}$ Scrubbing Efficiency: Between 10% and 40%

To find $PM_{10}$ scrubbing efficiency, solve for particulate distribution:

| $PM_{10}$ *lb/hr* | $PM_{2.5}$ *lb/hr* | PM *lb/hr* |
|---|---|---|
| 90 | 13.6 | 361 |

** RESO EI 20140404.xlsx*

| | Maximum particle size (µm) | | | |
|---|---|---|---|---|
| | 2.5 | 10 | 30 | 4 |
| Distribution: | 3.8% | 25.0% | 100.0% | |




Fraction of particles with max size of 4 µm (x = 4) is 8.0%

$PM_4/PM_{10}$ Ratio 32.1%
$PM_{2.5}/PM_4$ Ratio 47.1%

| Exhaust Shaft Dust Scrubbing Efficiency | |
|---|---|
| $PM_{10}$ | 30.4% |
| $PM_{2.5}$ | 4.7% |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper | BY: N. Tipple |
|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 3 OF: 3 SHEET: UG Control |
| AIR EMISSION CALCULATIONS | SUBJECT: Underground Scrubbing | DATE: August 21, 2014 |

**Heat Rejection Sprays Scrubbing Efficiency for Particulate and Gaseous Pollutants**

| Pollutant | Scrubbing Efficiency* | ** |
|---|---|---|
| $PM_{2.5}$** | 2.5% | 5.0% |
| $PM_7$ | 22.5% | |
| $PM_{10}$** | 30.0% | 60.0% |
| $NO_X$ | 8.75% | |
| CO | 3.5% | |
| $SO_2$ | 25.0% | |

* *R08-006(Resolution - Exhaust Shaft Emissions)(R2).doc, p. 24*

** *Efficiency assuming 100% of air passes through heat rejection sprays*

*** 50% *applicable to exhaust air*

**Gravitational Settlement**

Terminal Settling Velocity

$$u_t = \frac{g d_p^2 (\rho_p - \rho)}{18\mu}$$ *Perry's Chemical Engineers' Handbook Seventh Edition, Equation 6-232*

$$\eta = \frac{W_n L u_t}{Q_n}$$ *Air Pollution Control Theory, p. 240*

$$u_{t\,avg} = \frac{\int \frac{g d_p^2 (\rho_p - \rho)}{18\mu} dd}{d_p} = \frac{g d_p^3 (\rho_p - \rho)}{54\mu d_p}$$

| Where | Value | Unit | Reference |
|---|---|---|---|
| g = gravitational constant | 9.81 | $m/s^2$ | *Perry's Chemical Engineers' Handbook, Table 1-14* |
| $\rho_p$ = particle density (ore) | 1.8E+06 | $g/m^3$ | *RCM Combined Ore Flow System Description, p. 23, lowest density* |
| ρ = air density | 1,200 | $g/m^3$ | *Perry's Chemical Engineers' Handbook, Page 6-27* |
| μ = air viscosity | 0.017 | g/m-s | *Perry's Chemical Engineers' Handbook, Interpolated from Page 2-208* |
| $W_9$ = width of shaft 9 | 7 | m | *Refrigeration and Ventilation Study, p. 9* |
| $W_{10}$ = width of shaft 10 | 8.5 | m | *Refrigeration and Ventilation Study, p. 9* |
| $W_{14}$ = width of shaft 14 | 10 | m | *Refrigeration and Ventilation Study, p. 9* |
| L = length of chamber | > 2,000 | m | *Refrigeration and Ventilation Study, p. 9* |
| $Q_n$ = chamber air flow rate | 622 | $m^3/s$ | *Refrigeration and Ventilation Study, p. 49* |

| Particle Size ($d_p$) | | | $u_{t\,avg}$ | Efficiency, η (Settlement in Shafts) | | | |
|---|---|---|---|---|---|---|---|
| | μm | m | m/s | Shaft 9 | Shaft 10 | Shaft 14 | Avg |
| $PM_{2.5}$ | ≤ 2.5 | 2.5E-6 | 1.2E-4 | 0.3% | 0.3% | 0.4% | 0.3% |
| $PM_{10}$ | ≤ 10 | 1.0E-5 | 1.9E-3 | 4.1% | 5.2% | 6.1% | 5.1% |
| PM | ≤ 30 | 3.0E-5 | 0.02 | 36.6% | 46.4% | 54.6% | 45.8% |

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 1 | OF: 4 | SHEET: HAPs |
| AIR EMISSION CALCULATIONS | SUBJECT: Hazardous Air Pollutants | DATE: August 20, 2014 | | |

**Hazardous Air Pollutants Emissions Summary**

| CAS No. | Pollutant | ULSD Engines *ton/yr* | Process & Fug. Dust *ton/yr* | Reagents *ton/yr* | Diesel Tanks *ton/yr* | Propane Combustion *ton/yr* | Total *ton/yr* | POM |
|---|---|---|---|---|---|---|---|---|
| 106990 | 1,3-Butadiene | 1.18E-02 | | | | | **1.18E-02** | |
| 83329 | Acenaphthene | 1.84E-03 | | | | | **1.84E-03** | POM |
| 208968 | Acenaphthylene | 4.31E-03 | | | | | **4.31E-03** | POM |
| 75070 | Acetaldehyde | 2.39E-01 | | | | | **2.39E-01** | |
| 107028 | Acrolein | 3.03E-02 | | | | | **3.03E-02** | |
| 120127 | Anthracene | 9.35E-04 | | | | | **9.35E-04** | POM |
| 7440382 | Arsenic | 1.94E-03 | 2.24E-02 | | | 9.45E-08 | **2.43E-02** | |
| 56553 | Benzo(a)anthracene | 6.95E-04 | | | | | **6.95E-04** | POM |
| 71432 | Benzene | 5.16E-01 | | | 1.13E-06 | 9.92E-07 | **5.16E-01** | |
| 50328 | Benzo(a)pyrene | 1.34E-04 | | | | | **1.34E-04** | POM |
| 205992 | Benzo(b)fluoranthene | 3.65E-04 | | | | | **3.65E-04** | POM |
| 191242 | Benzo(g,h,l)perylene | 3.15E-04 | | | | | **3.15E-04** | POM |
| 207089 | Benzo(k)fluoranthene | 1.13E-04 | | | | | **1.13E-04** | POM |
| 7440417 | Beryllium | 3.82E-03 | 1.57E-03 | | | 5.67E-09 | **5.38E-03** | |
| 92524 | Biphenyl | | | | 1.41E-04 | | **1.41E-04** | POM |
| 7440439 | Cadmium | 1.04E-02 | 7.71E-04 | | | 5.20E-07 | **1.12E-02** | |
| 7440473 | Chromium | 3.26E-03 | 1.24E-01 | | | 6.61E-07 | **1.28E-01** | |
| 218019 | Chrysene | 5.68E-04 | | | | | **5.68E-04** | POM |
| 7440484 | Cobalt | | 1.66E-02 | | | 3.97E-08 | **1.66E-02** | |
| 53703 | Dibenzo(a,h)anthracene | 2.80E-04 | | | | | **2.80E-04** | POM |
| 100414 | Ethylbenzene | | | | 1.83E-05 | | **1.83E-05** | |
| 206440 | Fluoranthene | 3.51E-03 | | | | | **3.51E-03** | POM |
| 86737 | Fluorene | 1.27E-02 | | | | | **1.27E-02** | POM |
| 50000 | Formaldehyde | 3.80E-01 | | | | 3.54E-05 | **3.80E-01** | |
| 110543 | Hexane | | | | 1.41E-03 | 8.50E-04 | **2.26E-03** | |
| 193395 | Indeno(1,2,3-c,d)pyrene | 2.38E-04 | | | | | **2.38E-04** | POM |
| 7439921 | Lead | 2.57E-04 | 4.95E-02 | | | | **4.97E-02** | |
| 7439965 | Manganese | 1.06E-04 | 1.39E-01 | | | 1.79E-07 | **1.39E-01** | |
| 7439976 | Mercury | 3.21E-01 | 2.65E-01 | | | 1.23E-07 | **5.86E-01** | |
| 91203 | Naphthalene | 6.48E-02 | | | 7.74E-04 | 2.88E-07 | **6.56E-02** | POM |
| 7440020 | Nickel | 4.59E-04 | 2.14E-02 | | | 9.92E-07 | **2.19E-02** | |
| 85018 | Phenanthrene | 2.12E-02 | | | 1.76E-04 | | **2.14E-02** | POM |
| 108952 | Phenol | | | | 9.01E-05 | | **9.01E-05** | |
| 129000 | Pyrene | 2.56E-03 | | | | | **2.56E-03** | POM |
| 7782492 | Selenium | 2.30E-04 | 5.58E-03 | | | 1.13E-08 | **5.81E-03** | |
| 100425 | Styrene | | | | 4.50E-05 | | **4.50E-05** | |
| 108883 | Toluene | 2.08E-01 | | | 4.50E-05 | 1.61E-06 | **2.08E-01** | |
| 1330207 | Xylene | 1.44E-01 | | | 4.08E-04 | | **1.45E-01** | |
| 95636 | 1,2,4-trimethylbenzene | | | | 1.41E-03 | | **1.41E-03** | |
| 7783064 | Hydrogen sulfide | | | 2.57E-02 | | | **2.57E-02** | |
| 106445 | p-Cresol | | | 2.50E-05 | | | **2.50E-05** | |
| 79061 | Acrylamide | | | 1.48E-02 | | | **1.48E-02** | |
| 106467 | Dichlorobenzene | | | | | 5.67E-07 | **5.67E-07** | |
| 7440360 | Antimony | | 1.72E-03 | | | | **1.72E-03** | |
| POM | POM (aggregated) | | | | | 4.17E-08 | **4.17E-08** | POM |
| *POM* | *Polycylic Organic Matter Subtotal* | *1.15E-01* | *0.00E+00* | *0.00E+00* | *1.09E-03* | *3.30E-07* | *1.16E-01* | |
| HAPs | All HAPs | 1.98E+00 | 6.48E-01 | 4.05E-02 | 4.51E-03 | 8.92E-04 | 2.68E+00 | |

**Conversions**

| | | |
|---|---|---|
| 137,000 | *Btu/gal* | *AP-42, Appendix A, Diesel, Rev. 9/85* |
| 1,000,000 | *Btu/MMBtu* | |
| 2,000 | *lb/ton* | |

*Blue values are input , black values are calculated or linked*

**HAPs Emissions for ULSD Engines (Small & Large)**

| cas | pollutant | pom | sm ef | sm tpy | lg ef | lg tpy |
|---|---|---|---|---|---|---|
| | | | Small ULSD Engines* | | Large ULSD Engines** | |
| CAS No. | Pollutant | POM | *(lb/MMBtu)* | *ton/yr* | *(lb/MMBtu)* | *ton/yr* |
| 106990 | 1,3-Butadiene | | 3.91E-05 | 1.18E-02 | | |
| 83329 | Acenaphthene | POM | 1.42E-06 | 4.28E-04 | 4.68E-06 | 1.41E-03 |
| 208968 | Acenaphthylene | POM | 5.06E-06 | 1.53E-03 | 9.23E-06 | 2.78E-03 |
| 75070 | Acetaldehyde | | 7.67E-04 | 2.31E-01 | 2.52E-05 | 7.60E-03 |
| 107028 | Acrolein | | 9.25E-05 | 2.79E-02 | 7.88E-06 | 2.38E-03 |
| 120127 | Anthracene | POM | 1.87E-06 | 5.64E-04 | 1.23E-06 | 3.71E-04 |
| 56553 | Benzo(a)anthracene | POM | 1.68E-06 | 5.07E-04 | 6.22E-07 | 1.88E-04 |
| 71432 | Benzene | | 9.33E-04 | 2.81E-01 | 7.76E-04 | 2.34E-01 |
| 50328 | Benzo(a)pyrene | POM | 1.88E-07 | 5.67E-05 | 2.57E-07 | 7.75E-05 |
| 205992 | Benzo(b)fluoranthene | POM | 9.91E-08 | 2.99E-05 | 1.11E-06 | 3.35E-04 |
| 191242 | Benzo(g,h,l)perylene | POM | 4.89E-07 | 1.48E-04 | 5.56E-07 | 1.68E-04 |
| 207089 | Benzo(k)fluoranthene | POM | 1.55E-07 | 4.68E-05 | 2.18E-07 | 6.58E-05 |
| 218019 | Chrysene | POM | 3.53E-07 | 1.06E-04 | 1.53E-06 | 4.62E-04 |
| 53703 | Dibenzo(a,h)anthracene | POM | 5.83E-07 | 1.76E-04 | 3.46E-07 | 1.04E-04 |
| 206440 | Fluoranthene | POM | 7.61E-06 | 2.30E-03 | 4.03E-06 | 1.22E-03 |
| 86737 | Fluorene | POM | 2.92E-05 | 8.81E-03 | 1.28E-05 | 3.86E-03 |
| 50000 | Formaldehyde | | 1.18E-03 | 3.56E-01 | 7.89E-05 | 2.38E-02 |
| 193395 | Indeno(1,2,3-c,d)pyrene | POM | 3.75E-07 | 1.13E-04 | 4.14E-07 | 1.25E-04 |
| 91203 | Naphthalene | POM | 8.48E-05 | 2.56E-02 | 1.30E-04 | 3.92E-02 |
| 85018 | Phenanthrene | POM | 2.94E-05 | 8.87E-03 | 4.08E-05 | 1.23E-02 |
| 129000 | Pyrene | POM | 4.78E-06 | 1.44E-03 | 3.71E-06 | 1.12E-03 |
| 108883 | Toluene | | 4.09E-04 | 1.23E-01 | 2.81E-04 | 8.48E-02 |
| 1330207 | Xylene | | 2.85E-04 | 8.60E-02 | 1.93E-04 | 5.82E-02 |
| *POM* | *Polycylic Organic Matter Subtotal* | | | *5.07E-02* | | *6.38E-02* |
| **HAPs** | **All HAPs** | | | **1.17E+00** | | **4.75E-01** |

* *AP-42, Table 3.3-2, Rev. 10/96, diesel engines (≤ 600 hp)*

** *AP-42, Tables 3.4-3 & 3.4-4, Rev. 10/96, large diesel engines (> 600 hp)*

**Diesel Combustion Metal Emissions**

| CAS No. | Pollutant | HAP | *lb/$10^{12}$ Btu** | *lb/MMBtu* | *ton/yr* |
|---|---|---|---|---|---|
| 7440382 | Arsenic | HAP | 4 | 4.00E-06 | 1.94E-03 |
| 7440417 | Beryllium | HAP | 3 | 3.00E-06 | 3.82E-03 |
| 7440439 | Cadmium | HAP | 3 | 3.00E-06 | 1.04E-02 |
| 7440473 | Chromium | HAP | 3 | 3.00E-06 | 3.26E-03 |
| | Copper | | 6 | 6.00E-06 | 5.09E-04 |
| 7439921 | Lead | HAP | 9 | 9.00E-06 | 2.57E-04 |
| 7439976 | Mercury | HAP | 3 | 3.00E-06 | 3.21E-01 |
| 7439965 | Manganese | HAP | 6 | 6.00E-06 | 1.06E-04 |
| 7440020 | Nickel | HAP | 3 | 3.00E-06 | 4.59E-04 |
| 7782492 | Selenium | HAP | 15 | 1.50E-05 | 2.30E-04 |
| | Zinc | | 4 | 4.00E-06 | 9.01E-05 |
| **Total Diesel Combustion Metal Emissions** | | | | | **3.42E-01** |

* *AP-42, Table 1.3-10, Rev. 5/10*

| Air Sciences Inc. | PROJECT TITLE: Resolution Copper EI | BY: N. Tipple | | |
|---|---|---|---|---|
| | PROJECT NO: 262-9-01 | PAGE: 3 | OF: 4 | SHEET: HAPs |
| AIR EMISSION CALCULATIONS | SUBJECT: Hazardous Air Pollutants | DATE: August 20, 2014 | | |

**HAPs Emissions for Propane Combustion**

**Propane Sources**

| Source | Operation (hr/yr) | Throughput (MMBtu/hr) | (MMBtu/yr) |
|---|---|---|---|
| Hydro House Propane Heater (0.045 MMBtu/hr) | 8,760 | 0.045 | 394.2 |
| Hydro House Propane Heater (0.065 MMBtu/hr) | 8,760 | 0.065 | 569.4 |
| **Total** | | **0.11** | **963.6** |

**Propane HAP & Metal Emissions**

| CAS No. | Pollutant | Emission Factor* (lb/MMScf) | (lb/MMBtu)** | Emissions ton/yr |
|---|---|---|---|---|
| 71432 | Benzene | 2.10E-03 | 2.06E-06 | 9.92E-07 |
| 106467 | Dichlorobenzene | 1.20E-03 | 1.18E-06 | 5.67E-07 |
| 50000 | Formaldehyde | 7.50E-02 | 7.35E-05 | 3.54E-05 |
| 110543 | Hexane | 1.80E+00 | 1.76E-03 | 8.50E-04 |
| 91203 | Naphthalene | 6.10E-04 | 5.98E-07 | 2.88E-07 |
| 108883 | Toluene | 3.40E-03 | 3.33E-06 | 1.61E-06 |
| POM | POM (aggregated) | < 8.82E-05 | 8.65E-08 | 4.17E-08 |
| 7440382 | Arsenic | 2.00E-04 | 1.96E-07 | 9.45E-08 |
| 7440417 | Beryllium | < 1.20E-05 | 1.18E-08 | 5.67E-09 |
| 7440439 | Cadmium | 1.10E-03 | 1.08E-06 | 5.20E-07 |
| 7440473 | Chromium | 1.40E-03 | 1.37E-06 | 6.61E-07 |
| 7440484 | Cobalt | 8.40E-05 | 8.24E-08 | 3.97E-08 |
| 7439965 | Manganese | 3.80E-04 | 3.73E-07 | 1.79E-07 |
| 7439976 | Mercury | 2.60E-04 | 2.55E-07 | 1.23E-07 |
| 7440020 | Nickel | 2.10E-03 | 2.06E-06 | 9.92E-07 |
| 7782492 | Selenium | < 2.40E-05 | 2.35E-08 | 1.13E-08 |
| | **Total HAPs** | | | **8.92E-04** |

**AP-42, Table 1.4-3 & 1.4-4 (7/98) Natural Gas Combustion*

***Natural Gas Higher Heating Value* 1,020 *Btu/scf*

**HAPs Emissions from Process & Fugitive Dust**

**Ore HAPs Concentrations & Emissions**

| CAS No. | | Pollutant | Concentration* % | Emissions ton/yr |
|---|---|---|---|---|
| 7440360 | Sb | Antimony | 0.0003% | 1.72E-03 |
| 7440382 | As | Arsenic | 0.0040% | 2.24E-02 |
| 7440417 | Be | Beryllium | 0.0003% | 1.57E-03 |
| 7440439 | Cd | Cadmium | 0.0001% | 7.71E-04 |
| 7440473 | Cr | Chromium | 0.0222% | 1.24E-01 |
| 7440484 | Co | Cobalt | 0.0030% | 1.66E-02 |
| 7439921 | Pb | Lead | 0.0088% | 4.95E-02 |
| 7439965 | Mn | Manganese | 0.0248% | 1.39E-01 |
| 7439976 | Hg | Mercury | 0.0473% | 2.65E-01 |
| 7440020 | Ni | Nickel | 0.0038% | 2.14E-02 |
| 7782492 | Se | Selenium | 0.0010% | 5.58E-03 |

* *Average of 6 ore body samples (RES-009A, 017L, 017M, 023D, 025D, 002B). 5/20/14 emails from K. Ballard.*

**PM Emissions**

| | PM ton/yr |
|---|---|
| East Plant | 139.8 |
| Mill | 98.4 |
| Loadout | 1.8 |
| Tailings | 320.7 |
| **Total** | **560.7** |

**HAPs Emissions from Reagent Handling & Storage**

| CAS No. | Pollutant | lb/yr | ton/yr | Source |
|---|---|---|---|---|
| 7783064 | Hydrogen sulfide* | 51.4 | 2.57E-02 | NaHS (Sodium hydrosulfide solution) |
| 106445 | p-Cresol* | 0.05 | 2.50E-05 | CYTEC 8989 |
| 79061 | Acrylamide** | | 1.48E-02 | Flocculant (CIBA Magnafloc 10 & 155) |

* *Calculated using EPA Tanks 4.0.9d*

** *Assuming all PM emitted from material transfer is Acrylamide*

**HAPs Emissions from Diesel Storage Tanks**

| CAS No. | Pollutant | Weight Percent* | Emissions ton/yr | POM |
|---|---|---|---|---|
| 71432 | Benzene | 0.001% | 1.13E-06 | |
| 92524 | Biphenyl | 0.100% | 1.41E-04 | POM |
| 100414 | Ethyl benzene | 0.013% | 1.83E-05 | |
| 110543 | Hexane | 1.000% | 1.41E-03 | |
| 91203 | Naphthalene | 0.550% | 7.74E-04 | POM |
| 108952 | Phenol | 0.064% | 9.01E-05 | |
| 100425 | Styrene | 0.032% | 4.50E-05 | |
| 108883 | Toluene | 0.032% | 4.50E-05 | |
| 95636 | 1,2,4-trimethylbenzene | 1.000% | 1.41E-03 | |
| 1330207 | Xylenes (mixture) | 0.290% | 4.08E-04 | |
| 85018 | Phenanthrene | 0.125% | 1.76E-04 | POM |
| *POM* | *Polycylic Organic Matter Subtotal* | 7.75E-03 | 1.09E-03 | |

* *Default data - EPCRA Section 313 Industry Guidance - Metal Mining Facilities, January 1999 (EPA 745-B-99-001), Table 3-8*

**List of References**

| Value | Unit | Description | Location in EI | Reference |
|---|---|---|---|---|
| 0.63 | *m/s* | LHD/Ore Pass/Grizzly Wind Speed | Gen Info L26 | 2.5 m/s: RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf, Pg. 49 & 75% wind speed reduction per email from C. Pascoe 7/24/14. |
| 1.00 | *m/s* | Rail Haulage Ore Flow Wind Speed | Gen Info L27 | email from C. Pascoe 7/24/14 |
| 1.79 | *m/s* | Primary Crushing Ore Flow Wind Speed | Gen Info L28 | email from C. Pascoe 7/24/15 |
| 1.07 | *m/s* | Lower Level Conveyor Ore Flow Wind Speed | Gen Info L29 | email from C. Pascoe 7/24/16 |
| 0.60 | *m/s* | Hoisting System Ore Flow Wind Speed | Gen Info L30 | email from C. Pascoe 7/24/17 |
| 2.00 | *m/s* | Upper Level Conveyor System Ore Flow Wind Speed | Gen Info L31 | 2.0 m/s: RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf, Pg. 25 |
| 4 | % | UG Ore Moisture Content | Gen Info I26 - I31 | Email from K. Ballard 4/2/2014 |
| 96 | % | Incline Conveyor to Mine Transfer Conveyor Moisture Content | Gen Info G33 | Mill Flowcharts (6000-FS-601 through 623) |
| 95.8 | % | Enclosed Stockpile Moisture Content | Gen Info G34 | Mill Flowcharts (6000-FS-601 through 623) |
| 95.8 | % | Stockpile Reclaim Moisture Content | Gen Info G35 | Mill Flowcharts (6000-FS-601 through 623) |
| 4.8 | % | Mill Moisture Content | Gen Info I36 - I39 | Largest moisture content listed in AP-42, Ch. 13.2.4 |
| 4.8 | % | Loadout Moisture Content | Gen Info I41 | Largest moisture content listed in AP-42, Ch. 13.2.4 |
| 1.3 | *mph* | Incline Conveyor to Mine Transfer Conveyor Wind Speed | Gen Info K33 | RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf |
| 1.3 | *mph* | General Enclosed Transfer Wind Speed | Gen Info K34 - K41 | Enclosed |
| 2 | % | Ore Silt Content | Gen Info C49 | Email from K. Ballard, 6/5/14, based on grindability studies |
| 150,000 | *tonne/day* | Mine Throughput | Gen Info E14 | Phone conversation with V. Peacey and K. Ballard 4/1/14; Nominal: 120,000; Max: 150,000 |
| 43,800,000 | *tonne/yr* | Mine Throughput | Gen Info E15 | Design Criteria Section 6.3 |
| 92 | % | Mill Availability | Gen Info U12 | Phone Conversation with R. Heig 12/16/2014 |
| 8,214 | *tonne/hr* | SAG Mill Stockpile Throughput | Gen Info V17 | Design Criteria Section 7.1 |
| 138,000 | *tonne/day* | SAG Mill Stockpile Throughput | Gen Info V18 | Design Criteria Section 7.1 |
| 43,800,000 | *tonne/yr* | SAG Mill Stockpile Throughput | Gen Info V19 | Design Criteria Section 6.2 |
| 5,000 | *tonne/hr* | Sag Mill Throughput | Gen Info X17 | Design Criteria Section 7.3 |
| 138,000 | *tonne/day* | Sag Mill Throughput | Gen Info X18 | Phone Conversation with R. Heig 12/16/2014 |
| 1,875 | *tonne/hr* | SAG Mill Screen Oversize Throughput | Gen Info AB17 | Design Criteria Section 7.4 |
| 1,875 | *tonne/hr* | Pebble Circuit Throughput | Gen Info V33 | Design Criteria Section 7.2 |
| 3.1 | *tonne/hr* | Moly Filter Cake to Dryer Throughput | Gen Info X33 | Flow Sheet 4000-FS-613 |
| 2.8 | *tonne/hr* | Dried Moly Concentrate Throughput | Gen Info Z33 | Flow Sheet 4000-FS-613 |
| 262.9 | *tonne/hr* | Cu Concentrate Loadout Throughput | Gen Info AB33 | Flow Sheet 4000-FS-616 |
| 0.002 | *grain/dscf* | Baghouse grain loading | East Plant_CALC, Column J | Assuming (per C. Pascoe) same manufacturer (Donaldson Torit) as dust collector at stockpile reclaim. Manufacturer (phone conversation) says this is appropriate under normal operating conditions. |
| 0.0185 | % | S in Propane | Mill_CALC B85 | Standard: GPA 2140-97 |
| 0.002 | *grain/dscf* | Baghouse grain loading | Mill_CALC, Column J | Assuming (per C. Pascoe) same manufacturer (Donaldson Torit) as dust collector at stockpile reclaim. Manufacturer (phone conversation 3/8/2014) says this is appropriate under normal operating conditions. |
| 99 | % | Control of Filter Vents | Mill_CALC V8 - V9 | According to AP-42 Appendix B2, Fabric filters have a control efficiency of 99% |
| 0.045 | *MMBtu/hr* | Hydro House Heater Rating | Mill_CALC BH65 | Email from K. Ballard 8/19/2014 |
| 0.065 | *MMBtu/hr* | Hydro House Heater Rating | Mill_CALC BH65 | Email from K. Ballard 8/19/2014 |
| 7 | *[year]* | Max Production Year (7 Year Ramp Up) | EP_Fleet H8 | Email from K. Ballard 8/19/2014 |
| 10 | *[quantity]* | Quantity of Cable Bolters | EP_Fleet K22 | Per meeting with C. Pascoe 5/7/47 |
| | | East Plant Equipment List | EP_Fleet | Email from M. Morissette 12/19/12, RCM Mine Data for Air Modeling 2012.xlsx |
| 4 | *[tier]* | Minimum Engine Tier Rating | EP_Fleet, Column L | EI Finalization meeting 4/9/14 (V. Peacey) |
| 15 | % | Fuel Contingency | EP_Fleet, Column P | Per RCM Mine Data for Air Modeling 2012.xlsx |
| | | Vehicle Speeds | EP_Fleet, Column CA | Meeting with C. Pascoe 5/7/14, Phone Meeting K. Ballard 5/14/14 |
| 2 | % | Road Silt Content | EP_Fleet, Column CB | Email from K. Ballard, 6/5/14, based on grindability studies |
| | | Vehicle Weights | EP_Fleet, Column CC | Meeting with C. Pascoe 5/7/14, Phone Meeting K. Ballard 5/14/14 |
| 95 | % | Control of Unpaved Roads | EP_Fleet CM51 - CN51 | AP-42, Figure 13.2.2-2, Rev. 11/06 |
| 4 | *[tier]* | Minimum Engine Tier Rating | Mill_Fleet, Column L | EI Finalization meeting 4/9/14 (V. Peacey) |
| | | Miscellaneous Mill Fleet Updates/Edits (ratings, hours, etc.) | Mill_Fleet | Per RCM Mine Data for Air Modeling 2012.xlsx, Updated based on feedback from K. Ballard and R. Heig 4/16/14. |
| | | Vehicle Speeds | Mill_Fleet, Column CA | Assumption based on similar equipment, phone conversation with K. Ballard |
| 2 | % | Road Silt Content | Mill_Fleet, Column CB | Email from K. Ballard, 6/5/14, based on grindability studies |
| 95 | % | Control of Unpaved Roads | Mill_Fleet CN44 | AP-42, Figure 13.2.2-2, Rev. 11/06 |
| 4 | *[tier]* | Minimum Engine Tier Rating | Loadout_Fleet, Column L | EI Finalization meeting 4/9/14 (V. Peacey) |
| | | Miscellaneous Mill Fleet Updates/Edits (ratings, hours, etc.) | Loadout_Fleet | Per RCM Mine Data for Air Modeling 2012.xlsx, Updated based on feedback from K. Ballard and R. Heig 4/16/14. |
| 95 | % | Control of Unpaved Roads | Loadout_Fleet CN27 | AP-42, Figure 13.2.2-2, Rev. 11/06 |
| 4 | *[tier]* | Minimum Engine Tier Rating | Tailings_Fleet, Column L | EI Finalization meeting 4/9/14 (V. Peacey) |
| | | Miscellaneous Mill Fleet Updates/Edits (ratings, hours, etc.) | Tailings_Fleet | Per RCM Mine Data for Air Modeling 2012.xlsx, and EquipmentHREst1252013.xlsx and phone call with K. Ballard 4/25/14., Updated based on feedback from K. Ballard and R. Heig 4/16/14. |
| | | Vehicle Speeds | Tailings_Fleet, Column CA | Based on EquipmentHREst1252013.xlsx and phone call with K. Ballard 4/25/14. |
| 2 | % | Road Silt Content | Tailings_Fleet, Column CB | Email from K. Ballard, 6/5/14, based on grindability studies |
| 95 | % | Control of Unpaved Roads | Tailings_Fleet CN27 | AP-42, Figure 13.2.2-2, Rev. 11/06 |
| 800 | *[quantity]* | Number of Employees at East Plant | Employees E12 | Email from K. Ballard, "Employees/contractors", 7/21/2014 |
| 285 | *[quantity]* | Number of Employees at Mill | Employees E13 | Email from K. Ballard, "Employees/contractors", 7/21/2014 (570 at Mill + Tailings, half used) |
| 30 | *[quantity]* | Number of Employees at Loadout | Employees E14 | Email from K. Ballard, "Employees/contractors", 7/21/2014 |
| 285 | *[quantity]* | Number of Employees at Tailings | Employees E15 | Email from K. Ballard, "Employees/contractors", 7/21/2014 (570 at Mill + Tailings, half used) |
| 2 | % | Road Silt Content | Employees G32 - G35 | Email from K. Ballard, 6/5/14, based on grindability studies |
| 0.75 | *ton* | Average Vehicle Weight | Employees I32 - I35 | Assumption based on phone conversation with K. Ballard |
| 95 | % | Control of Unpaved Roads | Employees C62 | AP-42, Figure 13.2.2-2, Rev. 11/06 |
| | | Mill Generators | E_Gen | Loosely based on KUC generators and Correspondence with M. Woloch |
| 14 | *[quantity]* | East Plant Emergency Generator Quantity | E_Gen AN17 | Email from M. Woloch, 3/10/2014 |
| 500 | *hr/yr* | East Plant Emergency Generator Hours of Operation | E_Gen W19, AN18, BE21 | Email from K. Walch, 4/14/2014 |
| 6,562 | *ft* | Depth of Mine | Fuel Tanks C30 | 2000 m, RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf, p. 9 |
| 4,200 | *l/s* | Surface Cooling Tower Circulation Rate | EP Cooling G11 | Refrigeration and Ventilation Strategy, Section 8.3, Rev. 11/12 |
| 0.002 | % | | EP Cooling G12, G15 | Email from V. Peacey (assumption from KUC), 03/07/2012 |
| 1,250 | *l/s* | UG Cooling Tower Circulation Rate | EP Cooling G14 | Refrigeration and Ventilation Strategy, Section 9.3, Rev. 11/12; 2 towers @ 375 l/s, each |
| 3,000 | *ppm* | Total Dissolved Solids Content | EP Cooling G19 | Refrigeration and Ventilation Strategy, Section 11.2, Rev. 11/12 |
| | | Reagent Tank Volumes | Reagents | Design Criteria 2013 08 6.pdf |
| 28 | % | Conversion of NaHS to $H_2S$ | Reagents I51 | Phone conversation with manufacturer (3/28/14) |
| 17,583,045 | *ton/yr* | Material Mined (2026) | Drill & Blast W10 | RCM Mine Data for Ari Modelling 2012.xlsx |
| 2.1 | *tonne/m* $^3$ | Material Density | Drill & Blast W11 | Design Criteria 2013 08 6.pdf |
| 1,351,220 | *kg/yr* | Blasting Agent Used | Drill & Blast W13 | Explosives.xlsx |
| 444 | *blasts/yr* | Number of Blasts | Drill & Blast W15 | D. Randall's December 2013 meeting notes |
| 2 | *max blasts/day* | Number of Blasts | Drill & Blast W16 | D. Randall's December 2013 meeting notes |
| 225.7 | $m^2$ *(max daily)* | Blast Area | Drill & Blast W23 | D. Randall's December 2013 meeting notes |
| 57,600 | $m^2$ *(annual)* | Blast Area | Drill & Blast W26 | D. Randall's December 2013 meeting notes |
| 32.53 | *lb/ton* | CO EF | Drill & Blast W29 | NIOSH - Fumes Studies - Richard Mainiero, Emulsion |
| 6.2 | *lb/ton* | $NO_X$ EF | Drill & Blast W30 | NIOSH - Fumes Studies - Richard Mainiero, Emulsion |
| 40 | °C | Underground Temp | Flow C47 | RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf, p. 12 |

**List of References**

| Value | Unit | Description | Location in EI | Reference |
|---|---|---|---|---|
| 6,562 | *ft* | Depth of Mine | Flow I39 | 2000 m, RCM Pre-feasibility Refrigeration and Ventilation study 12-14-2012.pdf, p. 9 |
| 18,950 | *acfm* | Stockpile Reclaim Dust Collector Flow | Flow C27 | Email from Eric Pedersen, M3, 3/27/14 |
| 22,500 | *a* $m^3$*/hr* | Crusher Dust Collector Flow | Flow C51 | UG Flowsheet 0000 |
| 5,100 | *a* $m^3$*/hr* | Conveyor Transfer Dust Collector Flow | Flow C55 | UG Flowsheet 0000 |
| 22,500 | *a* $m^3$*/hr* | Silos Dust Collector Flow | Flow C59 | UG Flowsheet 0000 |
| 17,000 | *a* $m^3$*/hr* | Skip Loading Dust Collector Flow | Flow C63 | UG Flowsheet 0000 |
| 17,000 | *a* $m^3$*/hr* | Bin Unloading Dust Collector Flow | Flow C67 | UG Flowsheet 0000 |
| 40 | *days* | East Plant Precip Data (days >0.01") | Precip F2 | 3/1/12 - 2/28/14 onsite precip data |
| 41 | *days* | West Plant Precip Data (days >0.01") | Precip L2 | 3/1/12 - 2/28/14 onsite precip data |
| 48.27 | *°F* | East Plant Avg Temp | Temp C1 | 3/1/12 - 2/28/14 onsite temp data |
| 56.77 | *°F* | West Plant Avg Temp | Temp F1 | 3/1/12 - 2/28/14 onsite temp data |
| 776 | *hours* | Hours > 5.4 m/s | EP Wind E2 | 3/1/12 - 2/28/14 onsite wind data, According to Control of Open Fugitive Dust Sources, EPA, MRI, September 1988 |
| 731 | *hours* | Hours > 5.4 m/s | WP Wind E2 | 3/1/12 - 2/28/14 onsite wind data, According to Control of Open Fugitive Dust Sources, EPA, MRI, September 1989 |
| 30 | *acre* | Exposed area at East Plant | WindblownDust B2 | GIS Analysis with K. Ballard |
| 200 | *acre* | Exposed area at Subsidence Area | WindblownDust B3 | email from K. Ballard 8/1/14 & Discussion with K. Ballard and C. Pascoe |
| 70 | *acre* | Exposed area at Mill | WindblownDust F2 | GIS Analysis with K. Ballard |
| | | Beach Length | WindblownDust | Near West Tailings Management Order of Magnitude Study, Attachment 1: Summary of MUCK 3D Staging, 130607R-NearWestTM_OOM.pdf |
| 10 | *m* | Beach Width | WindblownDust P6 | discussion between K. Ballard and F. Deal 7/14 |
| 50 | *%* | Dry/Wet Beach Area Ratio | WindblownDust AD3 | discussion between K. Ballard and F. Deal 7/14 |
| 121.38 | *acre* | Average Dam Area | WindblownDust W12 | Near West Areas.xlsx, F. Deal; KCB 2013 |
| 926 | *acre* | Average Beach Area | WindblownDust W10 | Near West Areas.xlsx, F. Deal; KCB 2013 |
| 90 | *%* | PM>10 Control (Water Droplet Scrubbing) | UG Scrubbing B12 | Resolution project Exhaust Shaft Emissions Report, 5/08, p. 20 |
| 40 | *%* | PM4-10 Control (Water Droplet Scrubbing) | UG Scrubbing B13 | Resolution project Exhaust Shaft Emissions Report, 5/08, p. 20 |
| 10 | *%* | PM<4 Control (Water Droplet Scrubbing) | UG Scrubbing B14 | Resolution project Exhaust Shaft Emissions Report, 5/08, p. 20 |
| 22.5 | *%* | PM7 Control (Heat Rejection Sprays) | UG Scrubbing W13 | R08-006(Resolution - Exhaust Shaft Emissions)(R2).doc, p. 24 |
| 8.75 | *%* | NOX Control (Heat Rejection Sprays) | UG Scrubbing W15 | R08-006(Resolution - Exhaust Shaft Emissions)(R2).doc, p. 24 |
| 3.5 | *%* | CO Control (Heat Rejection Sprays) | UG Scrubbing W16 | R08-006(Resolution - Exhaust Shaft Emissions)(R2).doc, p. 24 |
| 25 | *%* | SO2 Control (Heat Rejection Sprays) | UG Scrubbing W17 | R08-006(Resolution - Exhaust Shaft Emissions)(R2).doc, p. 24 |
| 50 | *%* | Air that Flows Through the Heat Rejection Sprays | UG Scrubbing T20 | R08-006(Resolution - Exhaust Shaft Emissions)(R2).doc, p. 24 |
| 7 | *m* | width of shaft 9 | UG Scrubbing BE26 | Refrigeration and Ventilation Study, p. 9 |
| 8.5 | *m* | width of shaft 10 | UG Scrubbing BE27 | Refrigeration and Ventilation Study, p. 9 |
| 10 | *m* | width of shaft 14 | UG Scrubbing BE28 | Refrigeration and Ventilation Study, p. 9 |
| > 2,000 | *m* | length of chamber | UG Scrubbing BE29 | Refrigeration and Ventilation Study, p. 9 |
| 622 | $m^3/s$ | chamber air flow rate (all vents) | UG Scrubbing BE30 | Refrigeration and Ventilation Study, p. 49 |
| | | Concentration of HAPs/Metals in Ore | HAPs, Column AO | Average of 6 ore body samples (RES-009A, 017L, 017M, 023D, 025D, 002B). 5/20/14 emails from K. Ballard. |
| | | Drilling, Blasting, and Prodcution Values | Drill & Blast | RCM Mine Data for Ari Modelling 2012.xlsx & Explosives.xlsx |

# APPENDIX E

Subsidence Management Plan




General Plan of Operations

# Subsidence Management Plan

September 2014

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# 1. INTRODUCTION

Resolution Copper Mining (Resolution Copper) is planning a panel caving mine near the town of Superior, Arizona. Cave mining is a well-established mining method currently used at over 20 mining operations around the world, many of which have been in continuous operation for decades. The Panel Caving mining method consists of creating a continuous slot, undercut, underneath the orebody to initiate flow and caving of the orebody under gravity. The method has environmental, safety and cost advantages that make it suited to mining large, low-grade deep ore bodies that otherwise would not be feasible to mine. Caving of the ore is sometimes associated with surface subsidence. With the help of powerful computer technology, the geotechnical engineers around the world have developed accurate methods of predicting, measuring and controlling subsidence. Resolution Copper will use these techniques to ensure that the subsidence associated with its underground operations is predicted with a high degree of confidence, is monitored, is controlled, and that a process of continuous improvement is implemented as mining expands and further knowledge is gained.

This Subsidence Management Plan (SMP) is written with a focus on geotechnical issues and is not intended to replace specific related environmental and water management control plans. The view of the project site and mining application area along with significant surface features are shown in ***Figure 1***.

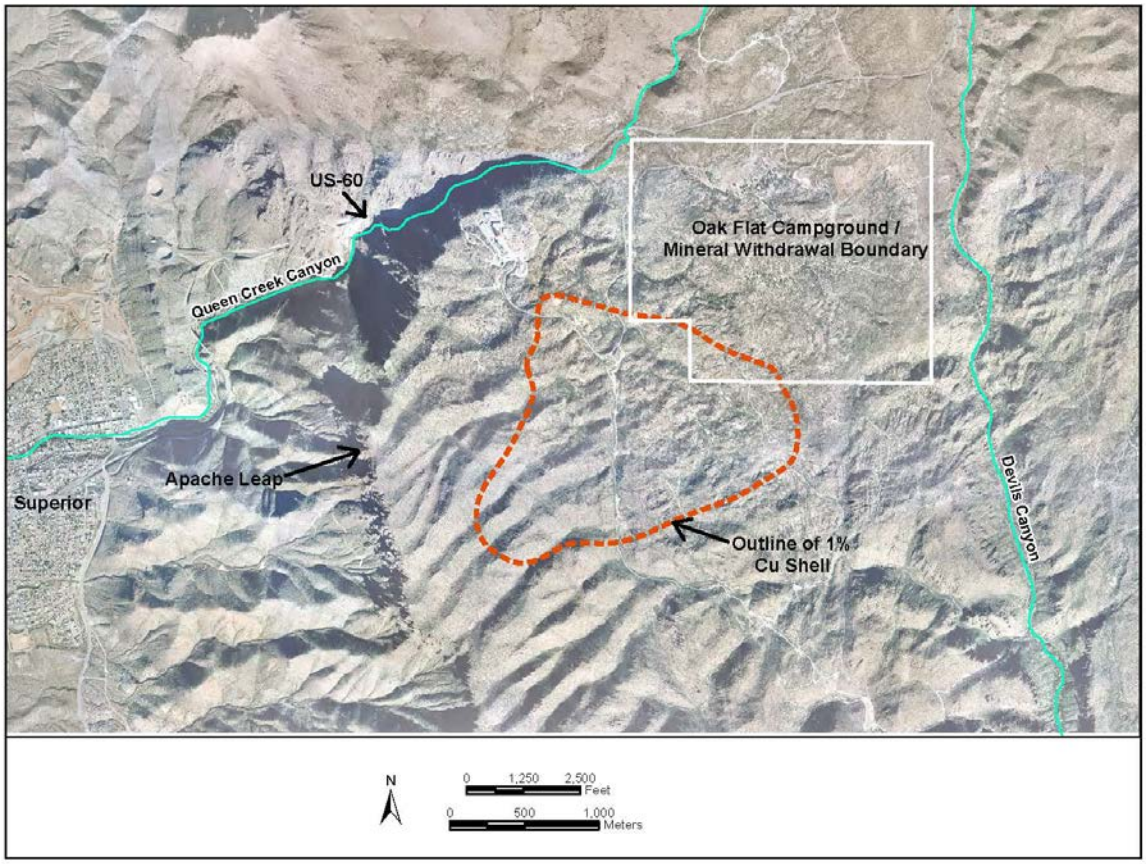


**Figure 1. Overview of mining area**

## 2. OBJECTIVES AND SCOPE

Resolution Copper aims to minimize the potential impact that may result from mining undertaken by its operations and to proactively manage subsidence impacts that may result from underground operations. This includes the prediction of subsidence magnitudes, assessment of subsidence impacts, a monitoring plan to control and provide early identification of impacts, as well as actions and contingency plans.

## 3. DEFINITIONS OF KEY PARAMETERS OF SUBSIDENCE

Key parameters used in the description, prediction and assessment of surface movements resulting from underground mining of the Resolution Copper orebody include subsidence, vertical and horizontal displacements, tilt, strain, caved rock zone, fracture zone, continuous subsidence zone, stable zone, and crater depth. These terms, some of which can vary by geographic region, are defined below. Rio Tinto has developed a common set of terminology that it consistently applies to all of its projects. A schematic showing the various subsidence zones is presented in ***Figure 2***.

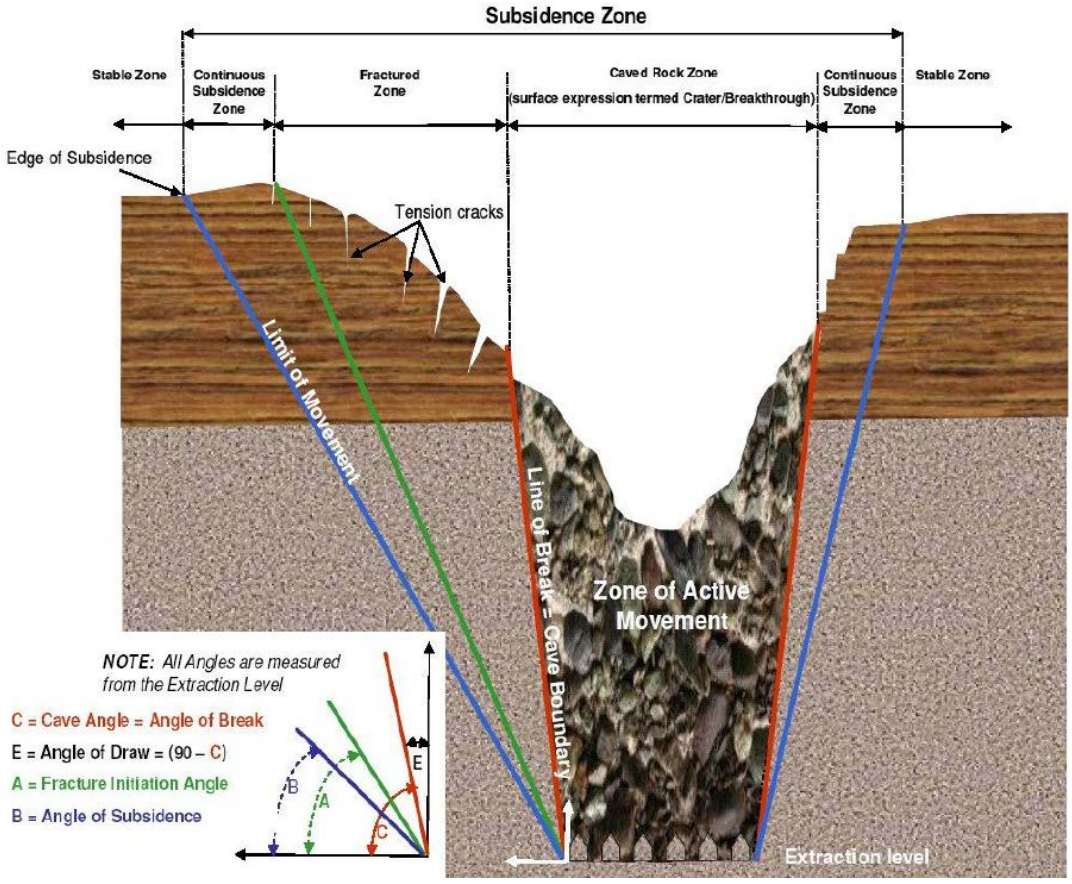


**Figure 2. Schematic showing the various subsidence zones**

## 3.1. SUBSIDENCE

The term subsidence typically refers to the deformation of surface and sub-surface geology and topography due to both vertical and horizontal forces and to movement caused by the full or partial removal/mining of the orebody, and the resultant progressive movement of the overlying rock mass downwards.

## 3.2. TILT

Tilt is the derivative of the vertical displacement with respect to the horizontal displacement. Tilt occurs when a land surface has different levels of vertical subsidence on either end. Surface features most affected by tilt are typically tall structures and structures such as steep slopes, cliffs, and pillars.

## 3.3. HORIZONTAL STRAIN

Horizontal strain results from horizontal movement in the rock mass. It is determined by calculating the horizontal change in length from two set points on the ground and dividing this by the original horizontal length of that section. If the section has been lengthened, the ground is in tension (being pulled apart), referred to as tensile strain. If the section has been shortened, the ground is in compression (being pushed together), referred to as compressive strain.

## 3.4. CAVED ROCK ZONE

This is a common feature of many block, panel, and sub-level caves (SLC) and is often termed the zone of active movement, or the mobilized zone. This zone is usually located just above the active cave footprint, and is the zone with the greatest vertical displacement. The zone typically comprises fragmented rocks ranging from large boulders to fine material. ***Figure 3*** shows an example of the caved rock zone.

Each cave produces a unique subsidence impact as a result of its specific size, depth, and geologic setting. The picture below is from the Northparkes underground mine in Australia and shows a subsidence zone that is essentially conical in shape. Resolution Copper's subsidence zone is predicted to be more bowl shaped than cone shaped.

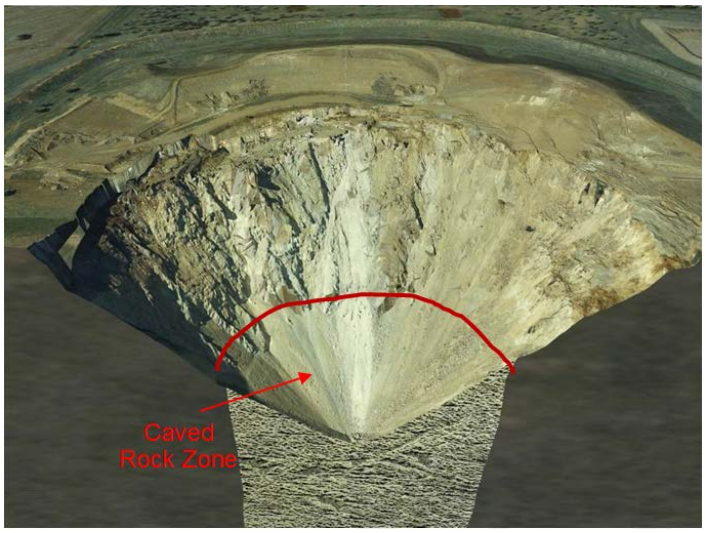


**Figure 3. Limit of caved rock zone (red line), E26 Mine at Northparkes (Oblique View)**

## 3.5. FRACTURED ZONE

The fractured zone is the area outside the caved rock zone where visible deformation (cracking and dislocations) can be seen. The fractured zone is also referred to as the surface cracking zone. Adjacent to the caved rock zone, this zone is characterized by radial cracks and typically rotational and toppling mode failures. As in the previous figure, ***Figure 4*** is of a conical shaped subsidence zone, whereas the Resolution Copper subsidence is predicted to be bowl shaped. The surface cracking zone has been outlined in green, and the caved rock zone has been outlined in red in ***Figure 4***.

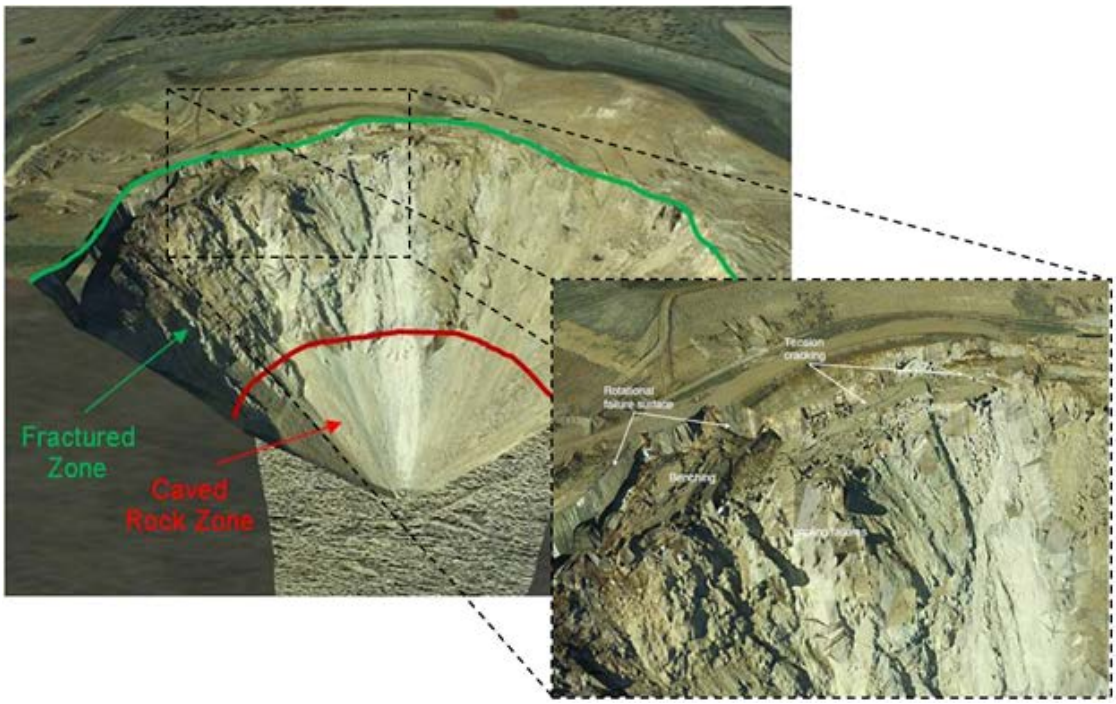


**Figure 4. Limits of fractured zone (green line), the E26 Mine at Northparkes (Oblique View)**

### 3.6. CONTINUOUS SUBSIDENCE ZONE AND STABLE ZONE

The area outside of the fractured zone is deemed the continuous subsidence zone. This zone is characterized by extremely small rock deformations that can only be detected using high-resolution monitoring equipment such as extensometers, and tilt meters. If deformations are significant enough, in some cases they can create small hairline cracks in the surface of concrete, but will not be visible in the soil or on the ground. This zone is also commonly referred to as the elastic zone, because the deformations are usually below the damage threshold for rock. ***Figure 5*** below further illustrates the limits of a continuous subsidence zone. The edge of the continuous subsidence zone is deemed the limit of subsidence.

The zone adjacent to the continuous subsidence zone is the stable zone. The stable zone can be characterized as the zone where rock is essentially undisturbed.

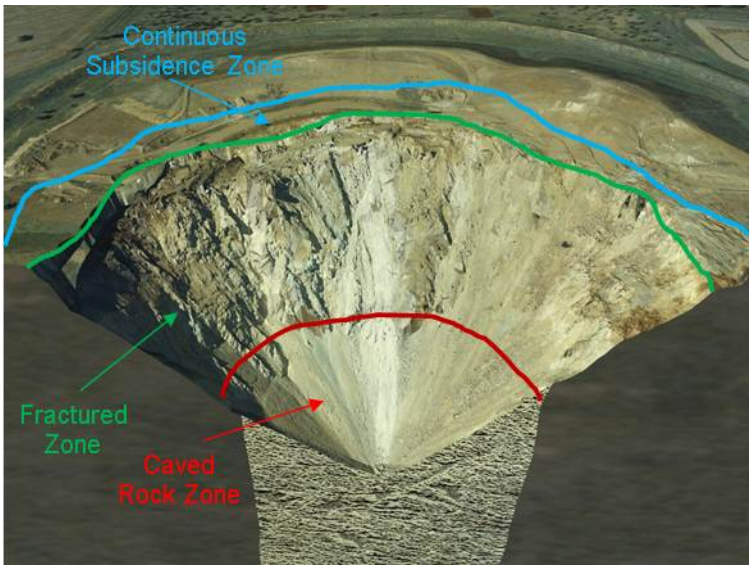


**Figure 5. Limit of continuous subsidence zone (blue line), E26 Mine at Northparkes (Oblique View)**

### 3.7. CRATER DEPTH

Due to the removal of material through the caving process, material has to mobilize and bulk to compensate for the voids created during this process. The maximum vertical distance that the surface ground lowers as a result of subsidence and bulking is called the crater depth. The amount of material removed offset by the bulking process controls the ultimate subsidence crater depth. Higher bulking factors result in shallower craters.

## 4. SUBSIDENCE PREDICTION METHODOLOGY

Resolution Copper has utilized and commissioned various geotechnical experts to conduct a number of empirical and numerical model simulations for the prediction of subsidence. Simulations have been completed using industry standard models that have been well calibrated and tested. The methods used

include Itasca's Fast Lagrangian Analysis of Continua (FLAC3D), Beck Engineering's Discontinuum Finite Element (DFE), Newtonian Cellular Automata (NCA), and Laubscher's Empirical Method.

The data inputs for the model were obtained from Resolution Copper's extensive geotechnical testing and analysis program to define the rock characteristics in the orebody and surrounding rock. Each of the models took into account a sensitivity analysis to predict subsidence across a range of potential outcomes, including the maximum reasonable worst case scenario.

## 4.1. EMPIRICAL SUBSIDENCE ESTIMATES

The empirical method used to estimate subsidence is Laubscher's method (Laubscher 2000), which uses the Mining Rock Mass Rating (MRMR) method.This method estimates the cave angle or angle of break based on the MRMR, the height and density of the caved material, and the cave geometry (depth and span). The premise is that the stronger the rock mass (the higher the MRMR), the steeper the cave angles. Laubscher's MRMR chart is shown in ***Figure 6*** below.

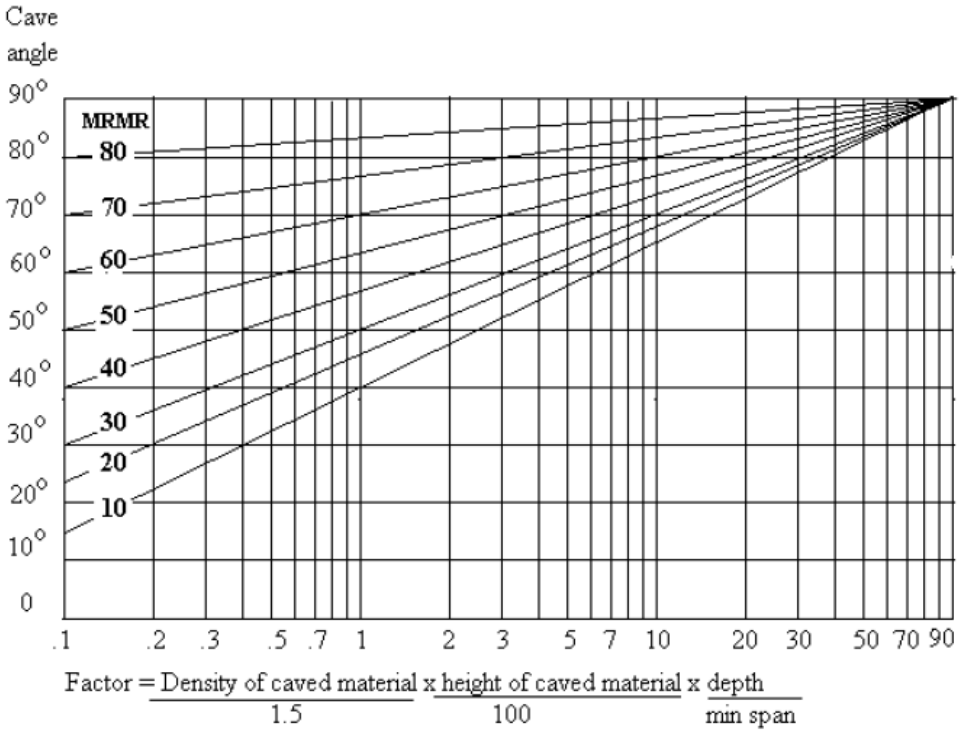


**Figure 6. Empirical cave angle chart (Laubscher 2000)**

The empirical simulations only provide an estimated cave angle, which is the extent of the cave rock zone. Since the empirical simulations do not provide derived extents of the fractured zone and continuous subsidence zone, there are clearly limitations to using this approach for a comprehensive subsidence analysis. However empirical models do provide a decent first approximation, and can be used as a tool to compare and calibrate against numerical model approaches. The cave angle from the empirical simulations was estimated to range from 72 to 84 degrees with an average value of 76 degrees.

## 4.2. NUMERICAL SUBSIDENCE ESTIMATES

The initial subsidence statistical analysis completed at Resolution Copper identified stress orientation, stress magnitude, and major structure strength, orientation, and thickness as the main controlling factors of subsidence. Following this initial work, additional study and test work was executed to reduce the uncertainty around each of the controlling parameters as listed above. This work included over-coring measurements, material testing campaigns, structural mapping, and various instrumentation packages for measuring rock mass response; as a result, the uncertainty associated with these parameters has been significantly reduced.

To date, a series of models have been completed by Itasca Consulting Group and Beck Engineering Ltd. to investigate the cave's behavior throughout the life of the mine. The Itasca simulations used FLAC3D as the numerical modeling package, whereas the Beck Engineering simulations used a coupled code that uses a DFE and Newtonian Cellular Automata NCA to simulate the cave's behavior. The biggest difference between the two approaches was Beck's use of a coupled (DFE-NCA) code, which allows the cave to grow without intervention, meaning that the rocks' life cycles are modeled from failure to disintegration. In the Itasca simulations no flow is simulated, and the cave is assumed to be a continuum, which means that caving is induced through physical stresses on nodes at the bottom of the cave. Both approaches are industry accepted.

All models used to date include the regional geological model, the structural model, material properties, regional stresses, and the full development and production schedule. By including all of this information in the simulations, the results are more likely to represent a more probable realization of the true caves behavior.

***Figures 7, 8, and 9*** show the maximum extent of subsidence for the caved rock zone, the fracture zone and the zone of continuous subsidence based on the Beck Engineering simulations in 10-year increments through 40 years of mine life. The subsidence zone is predicted to remain more than 1,500 ft (457 m) from the Apache Leap after mining has ceased. Resolution Copper plan to locate its surface mining infrastructure within the outer areas of the Zone of Continuous Subsidence, where strains can be measured but no visible evidence of surface subsidence will be evident.

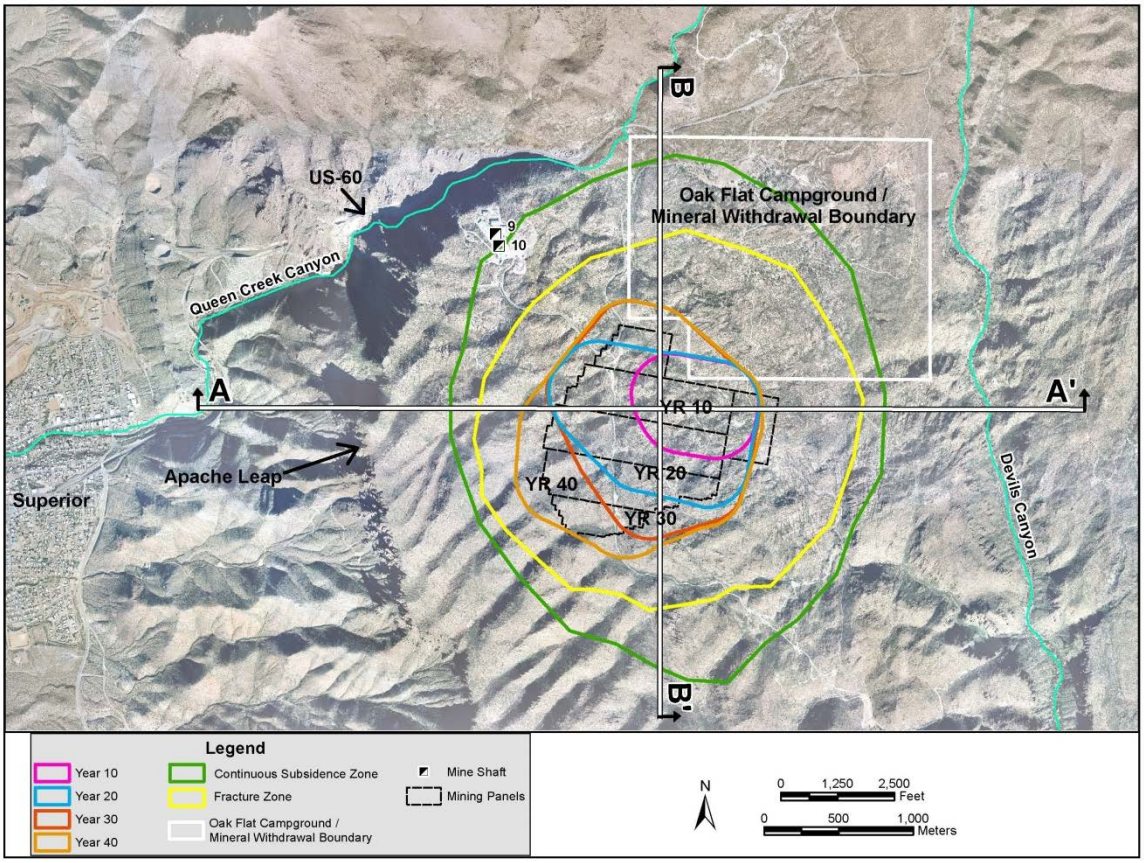


**Figure 7. Predicted subsidence limits zones in 10-year increments**

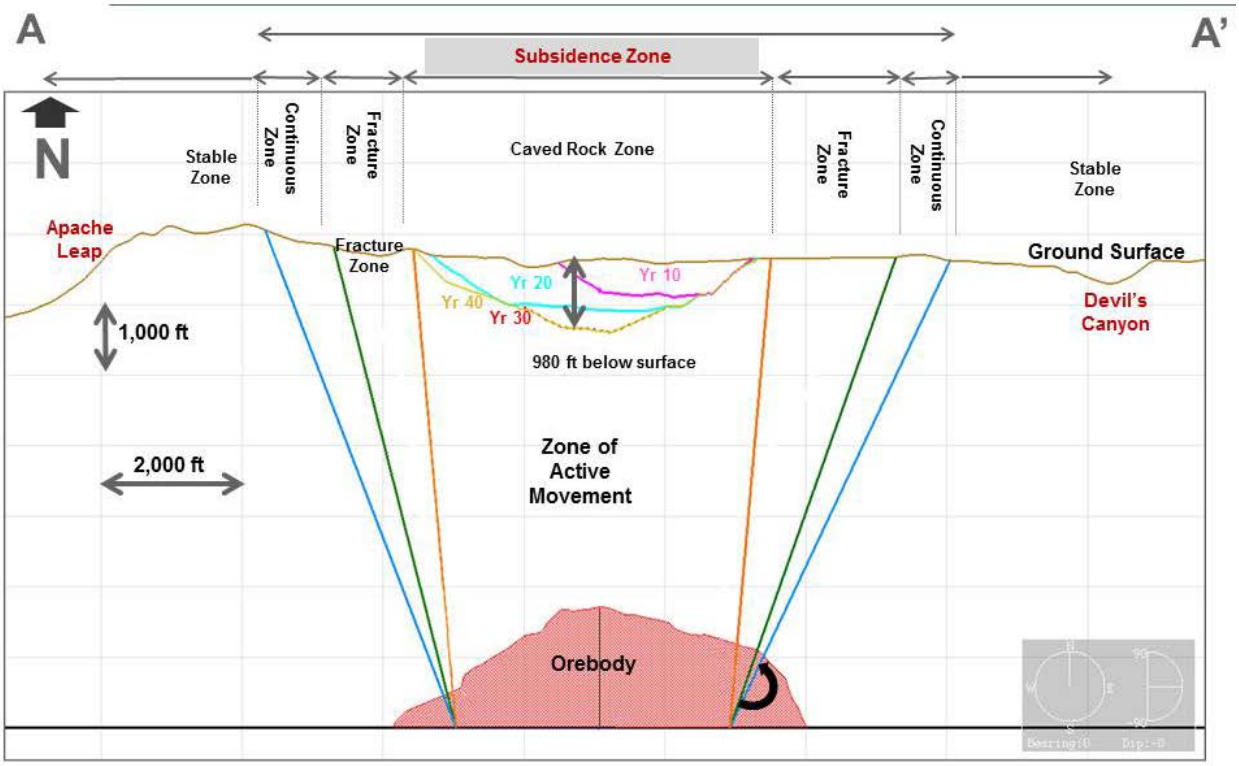


**Figure 8. West to east cross section of predicted subsidence limits at 10, 20, 30 and 40 years of mining**

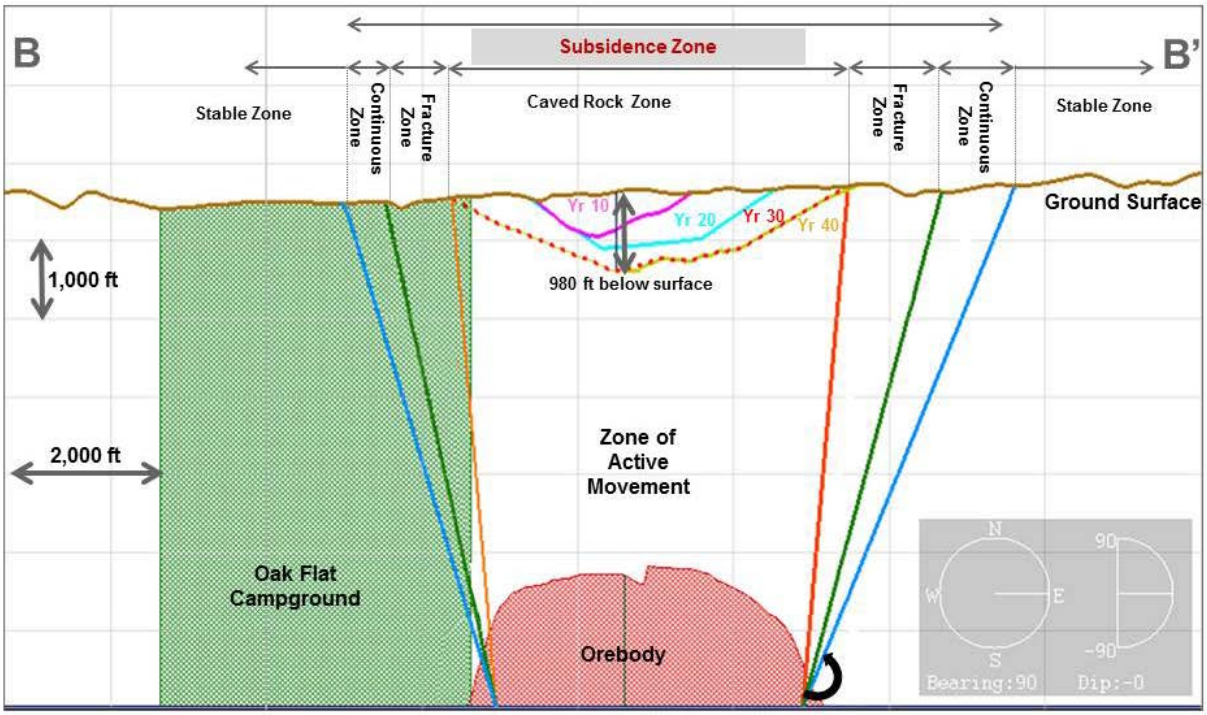


**Figure 9. North to south cross section of predicted subsidence limits at 10, 20, 30 and 40 years of mining**

### 5.1. SUBSIDENCE CRATER DEPTH

Based on all the simulations to date, the cave is predicted to breach the surface sometime during its lifetime. Current estimates put break through somewhere between four and eight years after commercial mining starts. Prior to this time measureable displacements are predicted to occur on the surface, but an actual crater is not expected to develop until sometime between the above mentioned periods.

The depth of the crater has been estimated from numerical simulations and also from experience at other operations. As part of the Second International Caving Study a database of bulking factors was developed to assist in the estimation of bulking from the caving process. Based on this work the average life of mine bulking factor for Resolution Copper is expected to range between 8 and 12 percent. If these values are used to estimate the potential crater depth, the maximum depth is projected to range between 656 and 984 ft (200 and 300 m) in depth. Numerical simulations both completed by Beck Engineering and Itasca Consulting also estimate that the crater depth could have a maximum value ranging from 656 to 984 ft (200 to 300 m), with an average depth of roughly 590 ft (180 m).

## 6. SUBSIDENCE MONITORING

Subsidence is a slow and gradual process that is predicted, closely monitored, and controlled. Mining will start from a point away from Apache Leap, and after 40 years of block-cave mining, the subsidence zone is projected to be at its deepest (984 ft), but is predicted to remain more than 1,500 ft from the Leap after mining has ceased. It is important to note that Resolution Copper's surface mining infrastructure is located between the subsidence zone and Apache leap and would be impacted before any impacts to Apache Leap. Subsidence impacts will also be controlled by limiting the lateral extent of the block caving panels and by not mining some ore to protect key surface features like Apache Leap.

The impact of subsidence will continue to be monitored and managed throughout the life of the mine and thereafter as described below.

### 6.1. APPROACH TO SUBSIDENCE MONITORING

Resolution Copper has been collecting relevant field and laboratory data to understand and predict the impact of subsidence. Before, during, and after operations Resolution Copper will implement a subsidence monitoring program designed to:

- Provide data that allows validation of mining-related impacts and ongoing model calibrations and refinements.
- Develop threshold and alarm levels for early warning and detection of subsidence impacts before any impacts occur.
- Identify surface movements or impacts due to mining of the Resolution Copper orebody.
- Gain knowledge to support future mining, including refinement of impact predictions.

- Ensure corrective actions and contingency plans are implemented.
- Allow for the inclusion of advances in the science of impact assessment and monitoring as well as changing technology associated with mining.

The Resolution Copper's overall strategy for subsidence monitoring and management is:

- Collect extensive data before mining starts to establish robust baseline and background data for the area above and within a reasonable perimeter around the mine.
- Start mining at a point far away from Apache Leap. The easement will allow many years to gather technical information to reassess the cave and subsidence angles.
- Declare sections of the orebody off limits to mining and leave these sections out of the mining plan to ensure a stable buffer zone of more than 1,500 ft between the subsidence zone (continuous) and Apache Leap after mining has ceased.
- Continuously monitor the effect of mining on key features (Apache Leap, Devils Canyon, Queen Creek Canyon) at key positions relating to the mining front. The early monitoring data will be collected to ensure that the Apache Leap easement is not encroached as mining progresses westwards.
- Regularly assess, analyze, and interpret monitoring data to identify any variations from predictions or unexpected anomalies.
- Supply regular reports to the U.S. Forest Service (FS), along with periodic review meetings. Such updates will review the monitoring data, monitoring, and model results.
- Notable but not specifically part of the strategy is the placement of Resolution Copper's surface mining infrastructure between the subsidence zone and Apache leap so any impacts from subsidence would impact the mine infrastructure before Apache Leap.

## 6.2. PRE-MINING MONITORING AND BASELINE STUDIES

Apache Leap, Queen Creek Canyon, and the surface area above the planned underground mine are currently monitored using terrestrial LIDAR scans and select rock spires using digital tilt meters. This baseline data is being collected using biannual LIDAR scans of cliff faces and rock formations for future comparisons. Terrestrial LIDAR scans use Maptek's I-Site 8800 scanner to provide the baseline coverage. The digital tilt meters have shown that surface pillars will tilt during strong winds. Experience from the use of tilt meters shows that it is feasible to accurately and remotely monitor pillar deformation on a nearly continual basis.

## 6.3. DURING MINING MONITORING

During mining, the surface mining area will be subdivided into a no-go zone, consistent with the limit of the fracture zone (where no person may enter) and a restricted public access zone consistent with the zone of continuous subsidence (where Resolution Copper personnel are permitted for geotechnical monitoring and inspections). These zones will be re-assessed periodically based on information collected

from cave propagation monitoring, the re-assessment of cave angles and propagation rates, the subsidence monitoring results, and the mining plan. Surface subsidence will be monitored through the use of available industry best practice and demonstrated technology including, but not limited to:

- Extensometers: These are electronic cable devices that will be installed in the rock mass to measure relative displacements in the rock.
- Survey prisms: These prisms will be installed in selected locations and their three dimensional location will be surveyed automatically to provide the relative displacements of the ground.
- Crack Displacement Monitors: These are wire extensometers that will be installed in the ground to will detect crack formation, propagation rate, as well as crack extension.
- Aerial photography: This technique is utilized to take pictures on a quarterly basis and process the pictures to detect relative changes. Digital Terrain Models (DTM) will be generated from aerial photography to calculate the relative displacements of the surface ground.
- Interferometry Synthetic Aperture Radar (INSAR): This is a satellite monitoring technique that will be utilized to monitor surface deformation and relative digital elevation in the subsidence area.
- Microseismic monitoring system: This system consists of an array of seismic sensors and geophones that will be installed in the ground to detect and determine the location and magnitude of seismic events associated with rock deformation and fracturing.

### 6.4. POST MINING MONITORING

Resolution Copper will continue to monitor the impact of surface subsidence on key infrastructures for at least 15 years after mining. There are no standard criteria that are used to determine how long to monitor subsidence after mining ceases, but 15 years of monitoring is viewed as conservative as the cave should come to equilibrium within 5 years or less. A 15-year monitoring period will provide enough monitoring data to prove that the displacement has not and will not cross the boundary between the continuous subsidence and the stable zones. If the monitoring data are still showing movement, then the monitoring program may be extended accordingly. The post mining monitoring will be done by means of the same techniques used before and during mining. The frequencies as well as the areas of focus are further discussed in Section 7 below.

## 7. SUBSIDENCE RISK AND IMPACT ASSESSMENT

There are a number of prominent geologic features in and around the proposed mining operation that have been part of Resolution Copper's baseline geotechnical monitoring program and include the Apache Leap Cliff, Queen Creek Canyon, Devils Canyon, US Highway 60 (US 60) and the Oak Flat Campground. Baseline data collection from these areas will help us to understand the results of monitoring of potential impacts during mining.

## 7.1. APACHE LEAP, CLIFFS AND PILLARS

Apache Leap is an approximately 1-mi long cliff that rises to a height of approximately 4,200 ft above sea level in the town of Superior Arizona. Resolution Copper is committed to preserving the Apache Leap.

Both numerical and empirical subsidence modeling conducted to date indicate that the Apache Leap is predicted to be in the stable zone. In addition, Resolution Copper will initiate mining far away from the Apache Leap and will monitor deformation due to subsidence to ensure that the prediction of subsidence is continuously improved and is in line with the observed and measured subsidence progression.

Pre-mining monitoring of the Apache Leap is being conducted and will continue during and after mining operations. Results obtained from monitoring will be used to determine ongoing monitoring requirements, appropriate controls, and responses to potential surface instability resulting from mining activities. This will contribute to an improved understanding of the effects of mining activities on the Apache Leap and other cliffs.

There are many small cliffs that are present in the area. Numerical modeling was conducted by geotechnical experts targeting stability of individual cliffs. Steep slope cliffs are naturally unstable; however the numerical modeling conducted has shown that these cliffs are stable even when subjected to 5-degree tilts. On the other end, the subsidence modeling conducted indicates that mining activities are predicted to induce tilts of magnitude less than a fraction of a degree indicating that the cliffs should remain stable during and after mining. ***Table 1*** below is a summary of the monitoring plans for the Apache Leap and other cliffs in the area.

**Table 1. Apache Leap and Cliffs Monitoring Schedule**

| Monitoring Period | Monitoring Techniques | Frequency | Trigger |
|---|---|---|---|
| Baseline Studies Pre-Mining | - Aerial Surveys of the area<br>- LIDAR Scans of Apache Leap<br>- Google Earth observation | Twice a year | Observation of changes and rock falls in area, rock movements |
| | Seismic monitoring | Once every two years (USGS) | Seismic events of large magnitude |
| | Tiltmeters installed on selected pillars | Continuously | Tilts of more than 3 degrees |
| During Mining | - Aerial Surveys of the area<br>- LIDAR Scans of Apache Leap<br>- Prisms survey<br>- Extensometers<br>- Google Earth observation | Once a quarter | Observation of changes and rock falls in area, rock movements |
| | Seismic monitoring | Once every 6 months (USGS) | Seismic events of large magnitude |
| | INSAR Imaging | Twice a year | Observation of changes, cracking, movement |

| Monitoring Period | Monitoring Techniques | Frequency | Trigger |
|---|---|---|---|
| | Tiltmeters installed on selected pillars | Continuously | Tilt of more than 3 degrees |
| | Micro-seismic monitoring | Continuously | Large seismic events |
| Post-Mining | - Aerial Surveys of the area<br>- LIDAR Scans of Apache Leap<br>- Google Earth observation | Twice a year for 15 years after mining | Observation of changes and rock falls in area, rock movements |
| | Seismic monitoring | Once every two years (USGS) for 15 years after mining | Seismic events of large magnitude |
| | Tiltmeters installed on selected pillars | Continuously for 15 years after mining | Tilts of more than 3 degrees |

## 7.2. QUEEN CREEK AND DEVILS CANYONS

The Resolution Copper project area is located within two surface water basins:

- Queen Creek Canyon, which is approximately 3,940 ft (1,200 m) north-northwest of the proposed underground mine. Queen Creek is ephemeral above the town of Superior and it flows west of the town (effluent dependent).
- Devils Canyon, which is approximately 3,940 ft (1,200 m) east of the proposed underground mine. Devils Canyon drains into Mineral Creek approximately 8 km southeast of the proposed panel cave footprint. Devils Canyon has two perennial flow sections approximately 1.92 and 2.88 mi (3.2 and 4.8 km) southeast of the proposed block cave.

Hydrogeological studies conducted at the site have indicated that there are no perennial stretches of surface flow or springs in the area above the Resolution Copper deposit or the currently estimated surface extent of subsidence. The primary surface water related impact is the small percentage of runoff that is predicted to be intercepted during mining due to the caving process. The subsidence modeling conducted to date has shown that both Devils Canyon and Queen Creek Canyon are outside the subsidence. ***Table 2*** summarizes the monitoring techniques and frequencies for the major water features. General locations designated for surface joints mapping are presented in ***Figure 10***.

**Table 2. Water Features Monitoring Schedule for Queen Creek and Devils Canyon**

| Monitoring Period | Monitoring Techniques | Frequency | Trigger |
|---|---|---|---|
| Baseline Studies Pre-Mining | Occurrence surveys & measurement of base flow | Quarterly | Observation of water loss (reduction in seeps and springs outside baseline range) |
| | Surface joints mapping[1] | Once a year | Enlargement or propagation of joints |
| During Mining | Occurrence surveys & measurement of base flow in streams and water captured in mine | Quarterly and after precipitation events | Observation of water loss (reduction in seeps or springs outside baseline range) |
| | Surface joint mapping [1] (length, aperture, spacing) | Quarterly | Enlargement or propagation of joints |
| | Subsidence Fracturing mapping | Quarterly | Minor cracking, signs of erosion |
| Post-Mining | Occurrence surveys & measurement of base flow | Quarterly and after precipitation events | Observation of water loss (reduction in seeps and springs outside baseline range) or re-occurrence. |
| | Surface joints mapping [1] | Once a year for 15 years after mining | Enlargement or propagation of joints |

[1]Surface joints mapping general locations are presented in ***Figure 10***.

## 7.3. US HIGHWAY 60

US 60 constitutes the main man-made feature within the vicinity of the project. The highway cuts through the cliffs and pillars of the Apache Leap and is located north to north-west of the proposed mining operations. Based on the results of subsidence modeling, the highway is in the stable zone.

There will already be monitoring across the subsidence zone and the areas immediately adjacent to it. These areas are closer to the cave zone than US 60 and subsidence impacts would be observed at these areas long before US 60, which is not expected to be impacted by subsidence. If there was an unexpected subsidence response that was detected, the monitoring plan would be adapted to include an expanded monitoring program. Subsidence is a rather slow and continuous process, and as such there would be time to apply an adaptive monitoring plan if required. ***Table 3*** summarizes the techniques and frequencies for monitoring of US 60.

**Table 3. US Highway 60 Monitoring Schedule**

| Monitoring Period | Monitoring Techniques | Frequency | Trigger |
|---|---|---|---|
| Baseline Studies Pre-Mining | Observation of road condition, Google Earth observation, survey marks and prisms | Once prior to mining | Observation of unsafe road conditions |
| During Mining | Observation of road condition, Google Earth observation | | Minor cracking |
| | | | Major cracking or traffic impedance |
| Post-Mining | Observation of road condition, Google Earth observation, survey marks and prisms | Once every two years for 15 years after mining | Observation of unsafe road conditions |

## 7.4. SURFACE SUBSIDENCE AREA AND OAK FLAT CAMPGROUND

Owing to its proximity to the mining footprint, part of the campground is expected to be subject to subsidence. The fracture zone is predicted to extend almost towards the middle of the campground. This is projected to occur towards the end of mine life, or approximately 35 years from start of mining. Based on subsidence predictions, Resolution Copper will establish barricades and/or fences and warning signs to restricted subsidence areas for public safety. The location of warning signs and structures to limit public access will move through time depending on the monitoring results of cave propagation and subsidence initiation. The monitoring techniques and frequencies are summarized in ***Table 4***.

**Table 4. Surface Subsidence and Oak Flat Campground Monitoring Schedule**

| Monitoring Period | Monitoring Techniques | Frequency | Trigger |
|---|---|---|---|
| Baseline Studies Pre-Mining | - Aerial Surveys of the area<br>- Google Earth observation | Twice a year | Observation of changes and rock falls in area, rock movements |
| | Survey marks, prisms and extensometers | Once prior to mining | Large displacements |
| | Crack displacement monitors | Once prior to mining | Crack extensions |
| | Tiltmeters installed on selected pillars | Continuously | Tilt of more than 3 degrees |
| | Seismic monitoring | Once every two years (USGS) | Seismic events of large magnitude |

| Monitoring Period | Monitoring Techniques | Frequency | Trigger |
|---|---|---|---|
| During Mining | - Aerial Surveys of the area<br>- Google Earth observation | Once a quarter | Observation of changes and rock falls in area, rock movements |
| | Survey marks, prisms and extensometers | Monthly | Large displacements |
| | Crack displacement monitors | Monthly | Crack extensions |
| | Seismic monitoring | Once every 6 months (USGS) | Seismic events of large magnitude |
| | INSAR Imaging | Twice a year | Observation of changes, cracking, movement |
| | Tiltmeters installed on selected pillars | Continuously | Tilt of more than 3 degrees |
| | Smart Markers, cave trackers and TDR installed before cave initiation | Continuously | Fast cave propagation, cave angle wider than predicted, air gap detected |
| | Micro-seismic monitoring | Continuously | Large seismic events |

## 8. REPORTING

Resolution Copper will document and store all the results of surface subsidence inspection and monitoring. The performance of the cave and subsidence development will be monitored and tracked and the results compiled into an annual status report that will be issued to the FS. The annual subsidence management status report will include and not be limited to:

- The mining front and location of the current panel.
- A summary of any subsidence management actions undertaken by Resolution Copper in the period subsequent to the last report.
- A summary of any observed and/or reported subsidence impacts, and any other relevant information in the period subsequent to the last status report, and a summary of Resolution Copper's response actions.
- A summary of cave performance and subsidence development based on monitoring information compared with any defined triggers and/or the predicted subsidence to facilitate early detection of any potential subsidence impacts.
- A statement regarding any additional and/or outstanding management actions to be undertaken or the need for early responses or emergency procedures to ensure adequate management of any potential subsidence impacts due to mining.

# 9. TRAINING

Resolution Copper will ensure that qualified and trained personnel conduct subsidence inspections and monitoring. All personnel who conduct inspections will be trained in the requirements of this Subsidence Management Plan. Training will be conducted at least once a year on the identification of the various subsidence impacts.

# 10. REVIEWS AND AUDITS

To ensure that the program is adequately and efficiently measuring subsidence parameters, this plan will be reviewed annually and after the completion of each panel. The plan may also be reviewed as needed as a result of changing conditions, an inspection, or if subsidence levels are significantly higher than predicted.

# 11. RESPONSIBILITIES

Specific roles and responsibilities of key mine personnel in relation to this Subsidence Management Plan (SMP) are outlined below. The roles may be different from the ones that will be effective during operations of the mine and can change to reflect the exact titles at the time.

## 11.1. MINE MANAGER

- Ensure that this SMP and associated specific management plans are implemented and adhered to
- Ensure that adequate resources are available to Resolution Copper personnel to allow the completion of their responsibilities under this SMP
- Authorize internal and external reporting requirements of this plan
- Approve this plan and its subsequent revisions

## 11.2. TECHNICAL SERVICES MANAGER

- Ensure that all subsidence monitoring and reporting required under this SMP are carried out within the timeframes specified.
- Ensure Resolution Copper's provision of subsidence-related information and data.
- Receive technical comments regarding the subsidence impacts on the surface features.
- Ensure that audits and reviews are carried out as detailed in this SMP.

## 11.3. HEALTH, SAFETY AND ENVIRONMENTAL MANAGER

- Ensure that all environmental monitoring associated with this SMP is carried out within the timeframe specified.

- Ensure that all environmental monitoring results are checked, processed, and filed appropriately so that they can be immediately identified and accessed.

### 11.4. MINE SURVEYOR

- Ensure that all subsidence surveys are carried out to the accuracy required and within the timeframe specified.
- Ensure that all subsidence survey results are checked, processed, and filed appropriately so that they can be immediately identified and accessed.

### 11.5. GEOTECHNICAL ENGINEER

- Ensure that all subsidence surveys and inspections are carried out to the accuracy required and within the timeframe specified.
- Ensure that all subsidence monitoring results are checked, processed, and filed appropriately so that they can be immediately identified and accessed.
- Ensure that this SMP is reviewed and audited as specified.
- Ensure that mine personnel are properly trained in the SMP process and reporting.
- Ensure that persons conducting the inspection are appropriately trained and understand their obligations and the specific requirements of this plan.
- Review and assess subsidence monitoring results and inspection checklists.
- Promptly notify the Technical Services Manager of any identified public safety issue.

## 12. REFERENCES

Laubscher, D.H., 2000. Block Caving Manual, Prepared for International Caving Study. JKMRC and Itasca Consulting Group, Inc. Brisbane.

**FIGURE 10**

Document Path: M:\Jobs\800's\807.94\ENV\GPO_Responce2TNF\Monitoring_Locations_QC and DC\Fig1a_MonitoringLocations_QCandDC.mxd

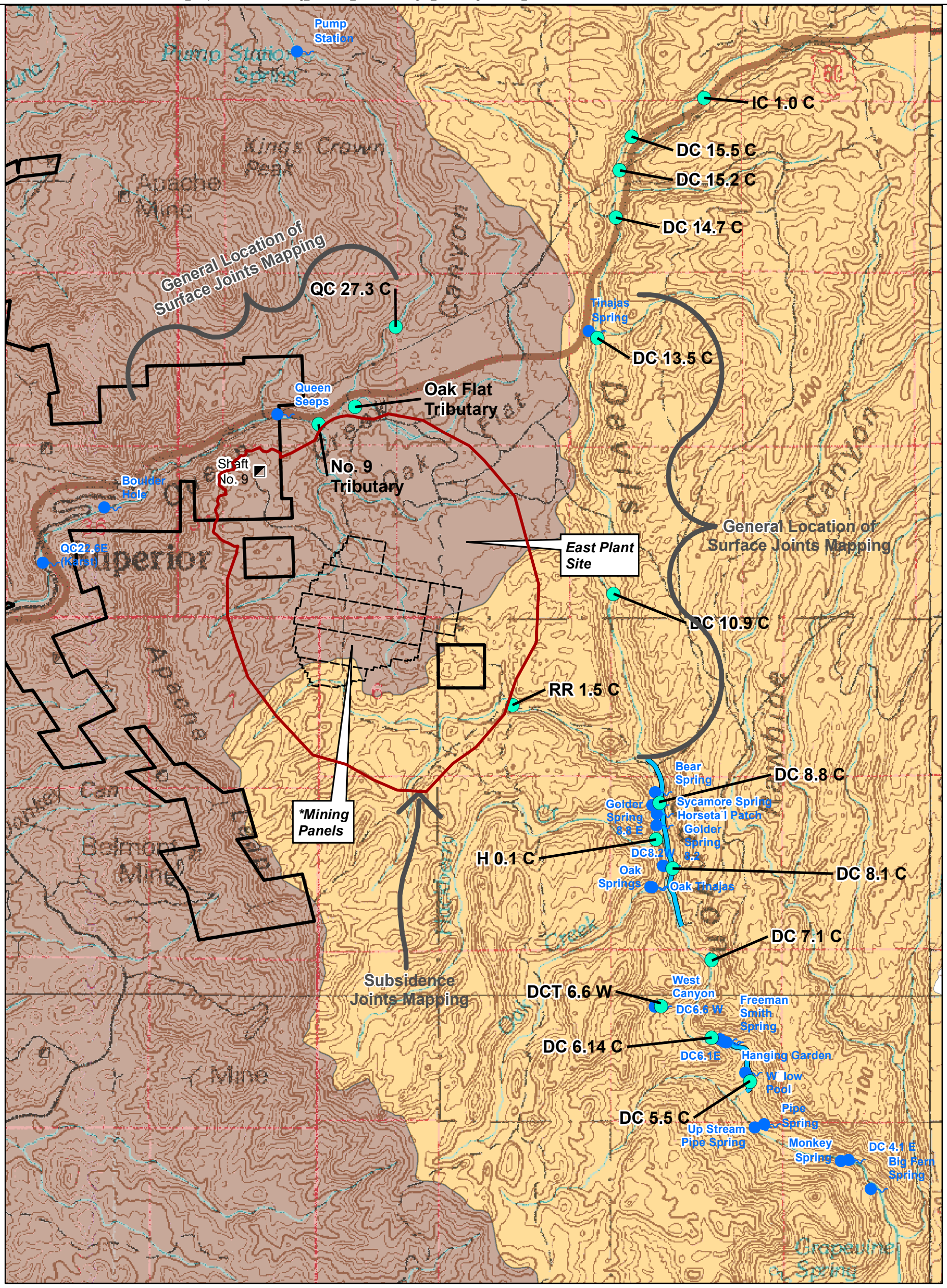


Image Source: Mesa 1:100,000 USGS Quadrangle

**Legend**

- Resolution Holdings
- Project Area
- Perennial Reach
- Spring Location and ID
- Surface Water Sample Location and ID

**Watershed**

- Upper Queen Creek
- Devils Canyon

Data Source: Springs, Surface Water, Sample Locations
Perennail Reach Data
Provided by Montgomery & Associates
2012

Additional Spring Data
Provided by WestLand Resources
Wetland Plant Survey of Springs in the Resolution Project Area.
2012

Watershed Data
Provided by USGS - Hydrologic Unit Code (HUC)
Aquired August 13, 2012

Note: Mine Panel Configuration Subject to Change

N

0 1,500 3,000 Feet

0 500 1,000 Meters

# RESOLUTION COPPER
## General Plan of Operations

MONITORING LOCATIONS IN QUEEN CREEK AND DEVIL'S CANYON

Figure 10

# APPENDIX F

Physical Characteristics of Rock Types
and Rock Mass Characterization




General Plan of Operations

# Physical Characteristics of Rock Types and Rock Mass Characterization

September 2014

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# 1. INTRODUCTION

Resolution Copper has been collecting geotechnical data to understand the physical characteristics of rock types, or rock mass parameters, in the vicinity of the proposed underground mine. This information is used as an input to the mine design and also to predict the extent of subsidence. Subsidence predictions are conducted using a combination of empirical methods, benchmarking and numerical modelling, which are further described in the Subsidence Management Plan (***Appendix E of the GPO***). The types of data collected, he methods used for data collection and data analyses and rock mass characterization are described in the following sections, but generally, the physical characteristics of rock types in and around the proposed underground mine are collected through the following activities:

- extensive detailed geotechnical and geophysical core logging of surface drill holes;
- underground shaft mapping using photogrammetry method;
- underground stress measurements using over-coring and hydro-fracturing techniques;
- rock strength laboratory testing;
- rock mass monitoring and response observations during development activities; and
- Historic surface mapping and information from the old Magma Mine.

# 2. GEOLOGICAL SETTINGS

## 2.1. REGIONAL FAULTS

The geology and structure of the Resolution Copper deposit is described in ***Section 2.2*** of the GPO and includes a section on faulting and structure. This section includes additional detail as it relates to geotechnical properties and physical characteristics of rock types. Regional Faults are faults that have an offset greater than 328 feet (100 m) and extend more than half a mile. ***Figure 1*** below shows a plan view of the major regional faults identified around the Resolution deposit. The vertical extents of these faults are shown in cross sections presented in ***Figure 2***

In general, the regional faulting is dominated by a north-northeast trending set of steeply west-dipping faults and a subordinate set of north-northwest trending, steeply east-dipping faults.

Many of the pre-mineral faults are strongly annealed by veins of hydrothermal quartz, anhydrite, intrusive dikes and sills and are pervasively mineralized by strong silica, potassium feldspar and/or sulfides. In some instances the infill may be stronger than the surrounding rock, increasing the rock mass strength.

Faults that occurred post mineralization appear to be the most active and weakest structures within the deposit. The plan view of regional faults is based on surface mapping, underground photogrammetric mapping from the No.10 Shaft and drill core logging. Offsets in lithological boundaries observed in drill

core have been represented in the geological model by adding a fault with the required offset necessary for balancing and accounting for various offsets and tilts in stratigraphy.

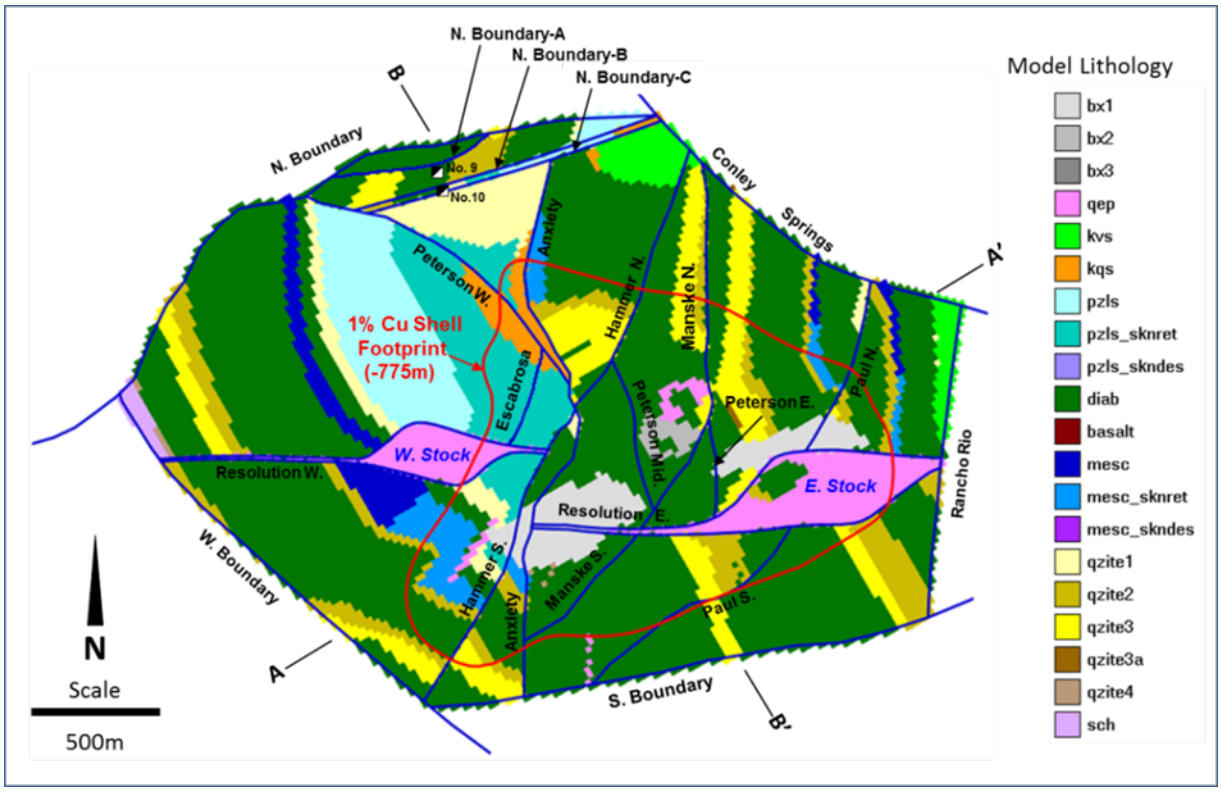


**Figure 1. Plan view of regional faults in the Resolution graben.**

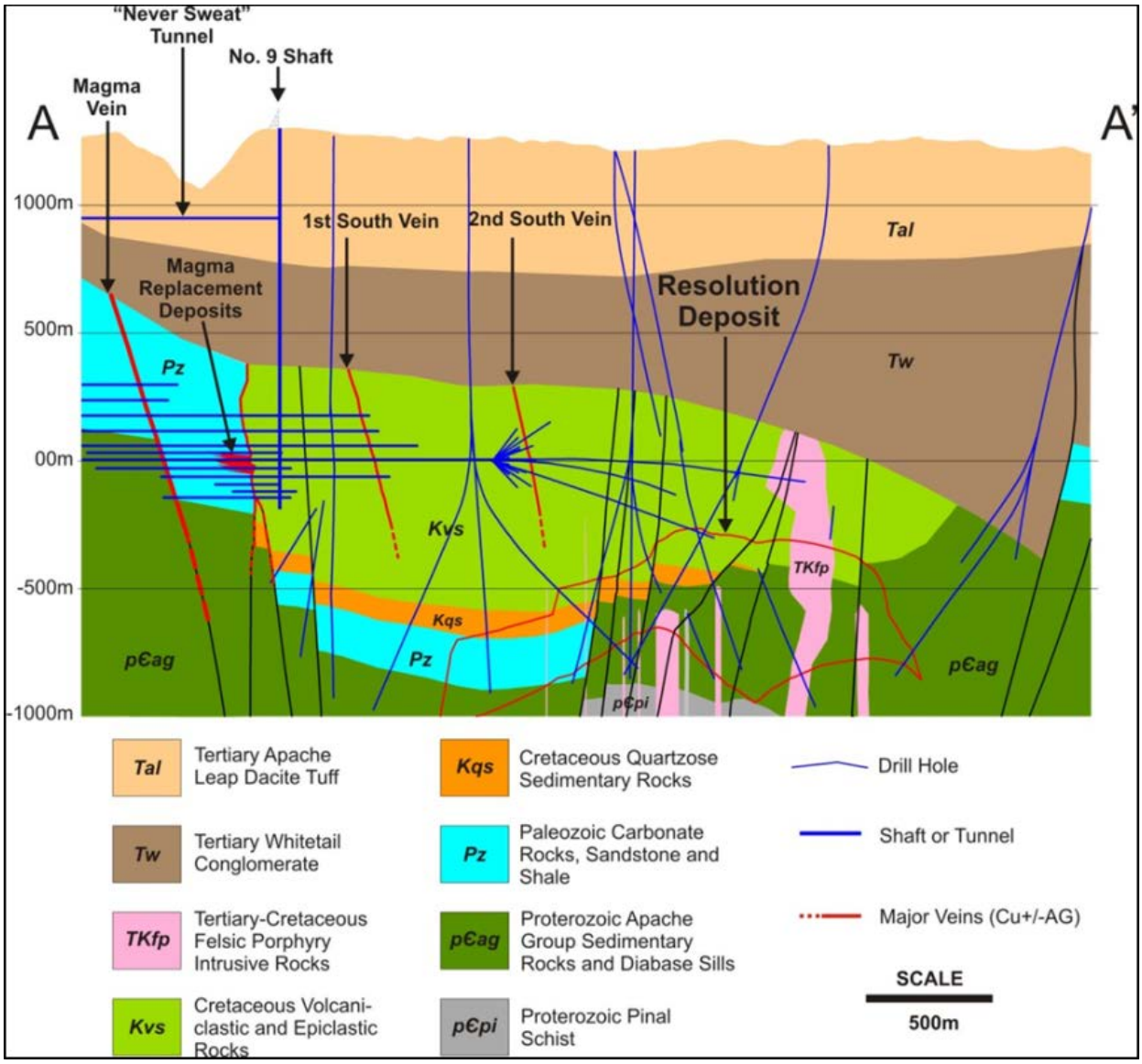


**Figure 2. Generalized Resolution deposit cross section looking northeast through No. 9 Shaft**

## 3. ALTERATION TYPES AND EFFECTS

With porphyry copper systems, hydrothermal fluids infiltrate the host rock and alter their mineralogy. This alteration has various effects on the rock strength. In general, the phyllic and argillic alteration zones, within the mineralization tend to reduce the strength of the rock mass whereas the potassic alteration zones tend to increase the strength of the rock mass.

# 4. DATA SOURCES

## 4.1. CORE LOGGING FOR PHYSICAL PROPERTIES

All drill cores are subject to geological and geotechnical logging for physical rock mass properties. The core handling and logging systems at Resolution Copper aims to preserve the integrity of the core and to collect geological, geotechnical, and geophysical parameters and includes the following information:

- ***Major Structure***. This parameter is recorded as "True" if the entire interval being logged is considered to be a major structural feature.
- ***Total core recovery (1 cm or 0.4inch accuracy)***. This is the total measured length (in meters) of actual core recovered by the drillers within the selected core logging interval.
- ***Artificial breaks***. Artificial breaks are relatively clean, through-going breaks formed by severe mechanical vibrations, impacts, or flexures of the core tube which occur during the actual drilling process, but which occur before actual removal of core from the core tube.
- ***Rock quality designation (1 cm or 0.4 inch accuracy)***. This records the total, cumulate length of all pieces of solid core greater than 10 cm long.
- ***Solid core recovery (1 cm or 0.4 inch accuracy)***. This is the record of the total, cumulative length (in meters) of all solid core, regardless of the length of the individual pieces.
- ***Solid length (1 cm 0.4 inch accuracy)***. This is the total, cumulate length (meters) of all solid core which lies outside of the non-annealed, non-cohesive major structure intervals identified as such in the core log (e.g. fault/gouge zones, void intervals).
- ***Micro-defects (intensity, hardness and strength)***. All unopened or annealed natural defects or discontinuities with less than 1 mm thickness of infill and/or open space are recorded as an intensity of micro-defects. The estimated weighted average Mohs hardness of all micro-defects is recorded as the microdefect hardness. A relative strength test is conducted by dropping two average representative pieces of core that each contain one or more typical micro-defects (of average character and strength/hardness for that domain) from a height of 20 cm (8 inches) onto a smooth, solid concrete surface, striking the surface evenly along the surface of the core cylinder; the resulting breakage (one breaks, both break, neither breaks) is recorded as an indication of micro-defect strength.
- ***Cemented joints.*** The total number of cemented joints (veins), of any mineral filling type is recorded as a count. The estimated, weighted average Mohs hardness of all cemented joints identified within a logged interval is recorded as a hardness figure.
- ***Open joints***. The total number of open joints identified within a logged interval, regardless of joint conditions/qualities is recorded as a count. An index value related to the total number of structural sets (and random joints) identified within a logged interval is recorded as a joint set.

### 4.2. UNDERGROUND PHOTOGRAMMETRY MAPPING

Photogrammetry is the practice of determining the geometric properties of objects from photographic images. Photogrammetry is used in No. 10 Shaft where high resolution photographs are taken for every shaft round.

The photos are processed on the computer to create a three dimensional model used for geological and geotechnical mapping. Characteristics of joint and major structures, such as continuity, termination, infill, roughness, alteration and orientation, are collected and included with the model. Classification and descriptions of structures are taken directly from the Resolution Copper logging procedures referenced above. This ensures consistency between core logging data and underground mapping data for the sole purpose of comparison, analysis and data interpretation.

## 5. GEOTECHNICAL DOMAIN DELINEATION

### 5.1. METHODOLOGY

The objective of a geotechnical domaining is to subdivide the total rock mass into zones that have similar geotechnical behavior or parameters. Within a domain there will be a natural variability between samples but these will show a greater similarity with each other than with samples from another domain. The parameters used to subdivide an orebody (or any rock mass) into domains are different for every deposit. In rock it might be the lithological composition, the type or intensity of fracturing, the orientation of fractures, the strength of the rock material or any combination of these parameters that will define a particular geotechnical domain. The geotechnical domains at Resolution Copper are most generally determined by lithology and alteration as these two parameters have the greatest effect on the behavior of the rock material.

### 5.2. CURRENT DOMAINS

Multiple geotechnical domains have been created in similar lithologies where significant differences in rock properties have been recognized. ***Table 1*** gives a general explanation of each of the geotechnical domains.

**Table 1. Summary of Geotechnical Domains**

| Formation | Geotechnical Domain | Description |
|---|---|---|
| Apache Leap Tuff (Tertiary Volcanics) | Tal | Volcanic tuff |
| Whitetail Conglomerate | Tw-Ss/Shl | Sandstone/shale unit |
| | Tw-Cgl | Conglomerate |
| Kvs | Kvs-Pro | Propylitically altered volcanic sediments |
| | Kvs-Phy | Phyllically altered volcanic sediments |

| Formation | Geotechnical Domain | Description |
|---|---|---|
| Diabase | Diab-Phy | Phyllically altered diabase |
| | Diab-Pot | Potassically altered diabase |
| | Diab-APot (Diab-Pot-A) | Potassically altered diabase with anhydrite |
| Quartzite | Quartzite | Paleozoic and Precambrian quartzite |
| Fault | Fault | Fault zones |
| Tertiary Intrusives | Ti | Tertiary porphyry intrusive |
| | Breccia | Breccia bodies related to porphyry intrusive |
| Skarn | Skarn | Skarn altered limestones |

## 6. GEOLOGICAL STRUCTURES WITHIN DOMAINS

The main geological structures include major structures, open joints, cemented joints or veins and micro-defects. During logging, a significant effort is made to differentiate between naturally occurring open joints and artificial breaks which are mechanically induced due to the drilling and handling processes.

The classification of the geological features is important in the stability assessment of mine openings and infrastructure. However, it is believed that, regardless of their classification, on a fragmentation level these structures will serve to weaken the rock mass and reduce the fragmentation size during the caving process. These features are summarized and discussed below.

Major Structures

Major structures are discontinuities within the core that are larger or more than 2 cm (0.8 inches) thick and that are texturally different from standard open joints observed in the core. Typical major structures include individual shears, shear zones, faults, and heavily jointed zones. ***Figure 3*** shows average orientations for the major structures identified in cores in the immediate deposit area.

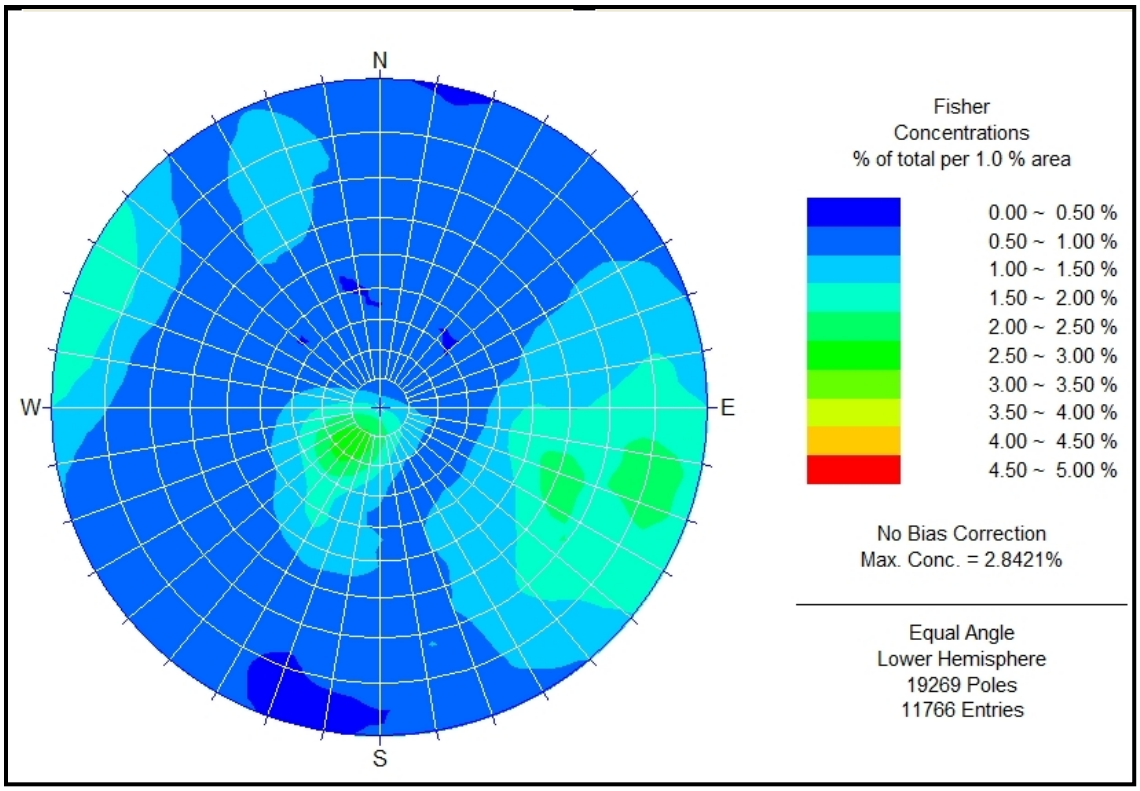


**Figure 3. Orientation of all weak major structures**

In general, major structures in the Resolution deposit area are composed of three steeply dipping structure sets and relatively shallow bedding planes. These orientations were observed in cores for almost every geotechnical domain except the Whitetail Conglomerate which is predominantly characterized by bedding planes with no steep joints.

The estimated mean true thickness of the major structures logged varies from less than an inch (or a few centimeters) to 3.6 feet (1.1 m). Very few major structures were found with a true thickness exceeding 13.12 feet (4 m). A detailed analysis of major structures has found that there is a good agreement between the orientation of major structures and the regional faults.

Naturally, major structures tend to be persistent. Whereas drill hole data cannot provide a direct measurement of the structures' persistence, the analysis conducted by Golder Associates has shown the potential for fault intersections to be persistent between holes. Based on this analysis, it was concluded that the persistence of major structures at Resolution Copper may not exceed 1640 feet (500 m) and are preferentially constrained by the regional geotechnical faults boundaries within which these major structures are observed.

In addition to the standard weak and open structures, it is common at Resolution Copper to observe very strong annealed major structures with similar and in some cases greater strength than the intact core. ***Figures 4 and 5*** show some typical weak and annealed major structures identified in drill core.




**Figure 4. Major structures -- Anxiety Fault**




**Figure 5. Annealed -- Hammer North Fault**

## 6.1. OPEN JOINTS

Open (natural) joints are created in the rock by natural stress change due to geological events including faulting, cooling, and shearing. An open joint is an open, planar to sub-planar discontinuity that must transect the entire core diameter, and must possess at least one of the following characteristics:

- It follows closely along an identifiable continuous natural planar/sub-planar defect in the rock;
- It is identifiable in the Acoustic Borehole Image;
- Its bounding surfaces conform to, or closely follow a pre-existing natural defect or discontinuity (e.g. shear, vein, micro-defect, dike contact, bedding plane, etc.); and
- Its wall surfaces have natural staining, weathering effects, alteration or hydrothermal mineral coatings.

The dip and dip direction as well as joint control, joint roughness, and filling types are recorded for all identified open joints. After logging of an entire drill hole, all open joints are plotted on a stereonet to identify different joint sets within a single logged interval.

Fracture frequency or number of fractures per meter is an indication of apparent joint spacing. ***Figure 6*** below shows distribution of joint fracture frequency for each geotechnical domain. From ***Figure 6***, it is noted that 50% of all the fracture frequency logged in various geotechnical domains ranges from 0.05 to 1.3 fractures/meter. The Whitetail Conglomerate (Tw-Cgl) is the least jointed of all the geotechnical domains and the Diabase Potassic (Diab-Pot) is the most jointed geotechnical domain.

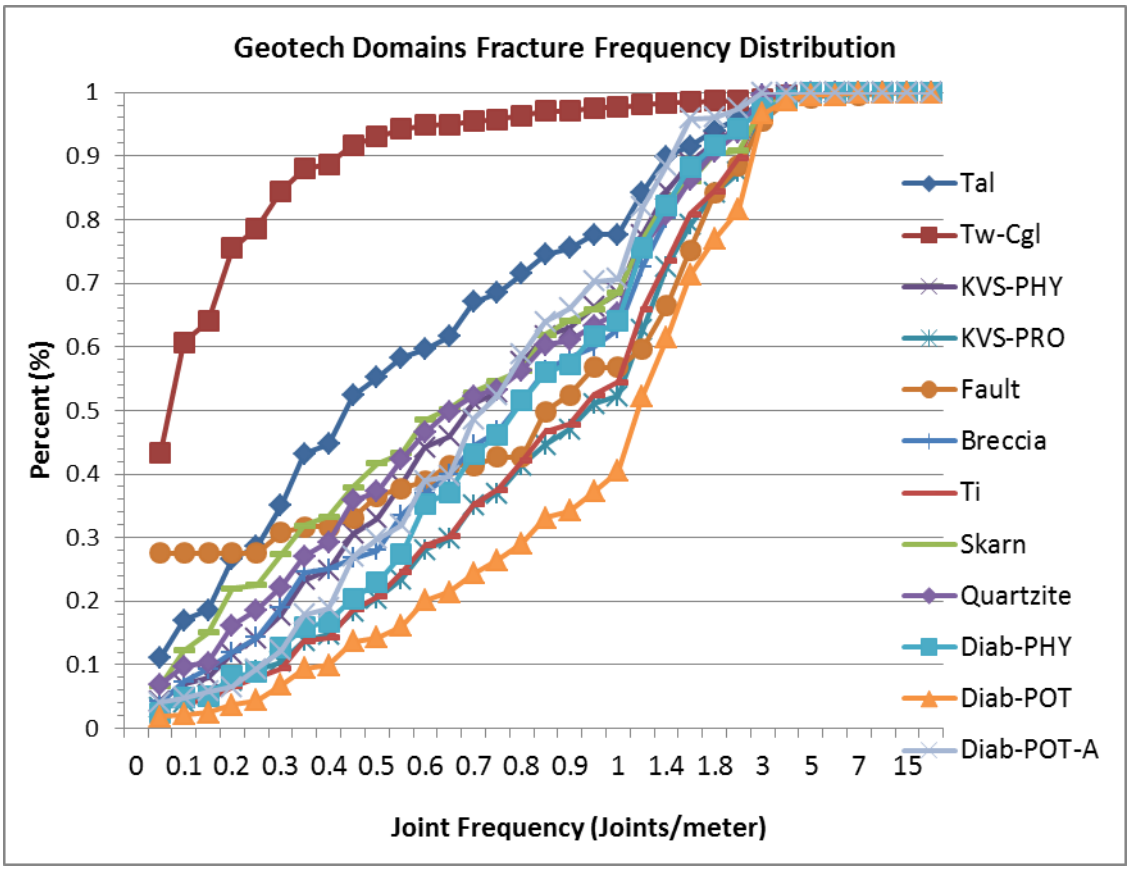


**Figure 6. Fracture frequency distributions per geotechnical domain**

## 6.2. ARTIFICIAL BREAKS

Artificial breaks are defined as core breaks that are relatively clean, through-going breaks formed by severe mechanical vibrations, impacts, or flexures of the core tube which occur during the actual drilling process, but which occur before actual removal of core from the core tube. Artificial breaks are an indication of rock mass behavior during caving and can affect primary as well as secondary fragmentation. Thus it is important to differentiate artificial breaks from natural open joints. The logger identifies artificial breaks before logging any other geotechnical parameters.

***Figure 7*** shows the distribution of artificial breaks frequency for each geotechnical domain. With the exception of the Tw-Cgl, the trend of artificial break frequency shown ***Figure 7*** is similar to the trend of open joints fracture frequency observed in ***Figure 6*** above. Although the Tw-Cgl has fewer open joints per meter, it has a much higher artificial breaks frequency which indicates its propensity to break during drilling and handling process.

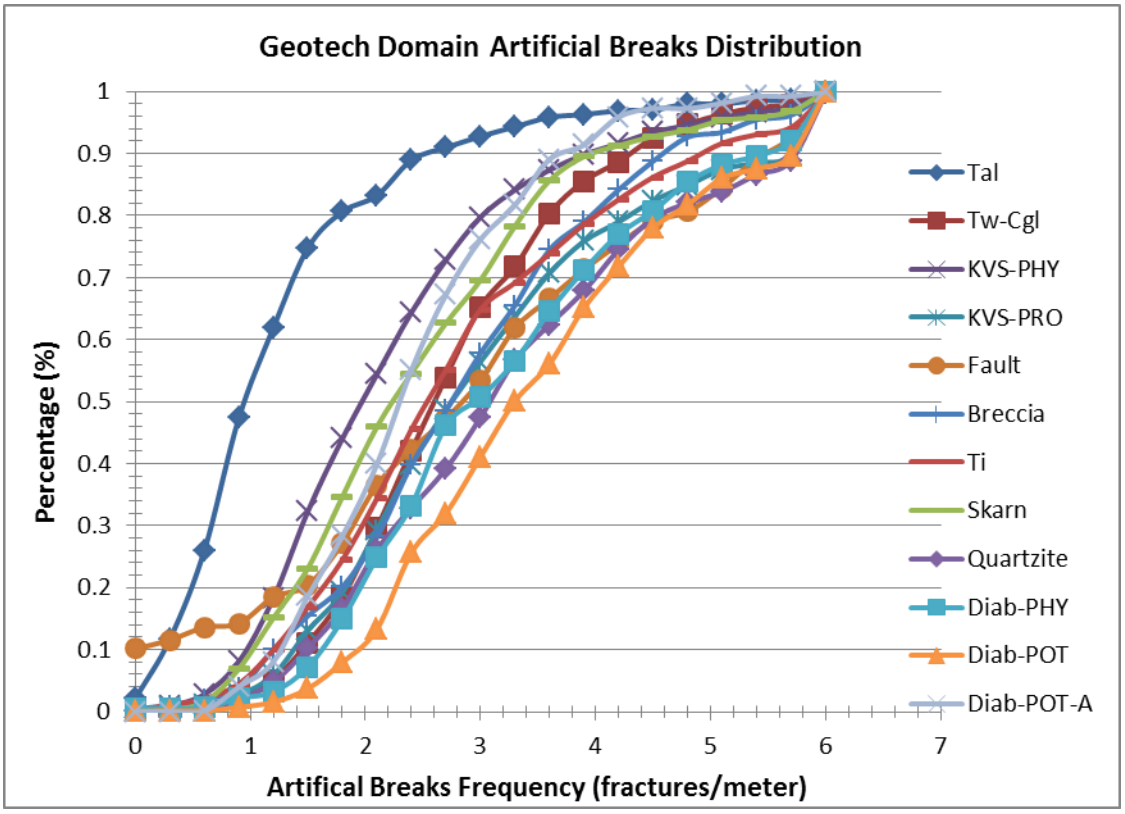


**Figure 7. Artificial breaks frequency distribution for each geotechnical domain**

## 6.3. CEMENTED JOINTS OR VEINS

Cemented joints include all continuous natural veins >0.04 inches (1mm) average thickness which transect the entire core diameter. Minor dislocations of up to half the true vein thickness are allowable in determination of a cemented joint. Cemented joints are essentially veins, but for all intents and

purposes will be called cemented joints in this report for consistency. They are commonly composed of one or more of the following; quartz, molybdenum, pyrite, chalcopyrite, anhydrite, calcite, bornite, and/or chalcocite.

***Figure 8*** below shows a plot of cemented joint frequency distribution for each geotechnical domain.

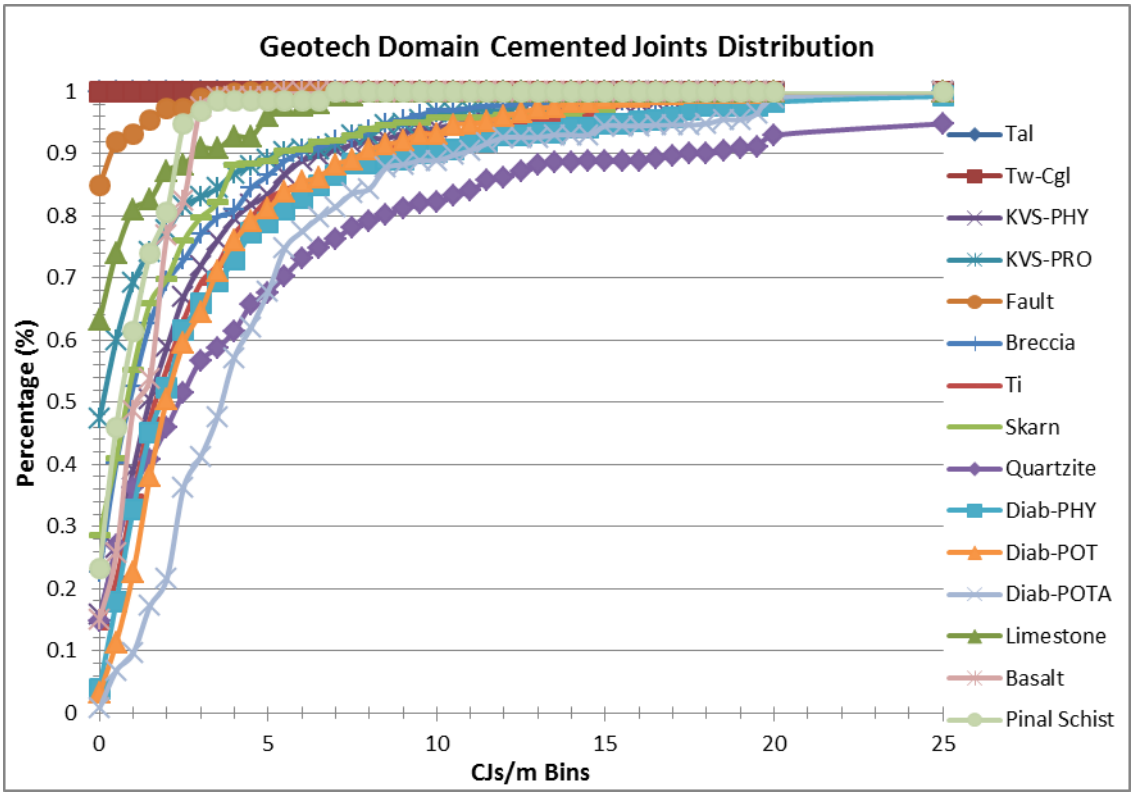


**Figure 8. Cemented joint frequency**

### 6.3.1. MICRO-DEFECTS

Micro-defects include all unopened or annealed natural defects, veins or discontinuities of less than 0.04 inches (one millimeter) thickness. Unlike cemented joints, the micro-defects need not necessarily transect the entire core diameter. The intensity of micro-defects is expressed as an average frequency as the estimated number of micro-defects per meter. The micro-defects at Resolution Copper are commonly filled with sulfide minerals such as pyrite or chalcopyrite, although not uncommon to find defects filled with quartz, sericite, dickite, and/or kaolinite.

Micro-defect frequencies can vary from virtually zero to more than 100 (High) per meter. Although data to date is inconclusive, high densities of strong micro defects (quartz-rich) may increase rock strength and high densities of weak micro defects may decrease rock strength.

Weak micro-defects are commonly the preferred pathways for small scale artificial and real joints to occur in the rock mass. ***Figure 9*** shows cumulative core meters of defect intensities for each of the geotechnical domains.

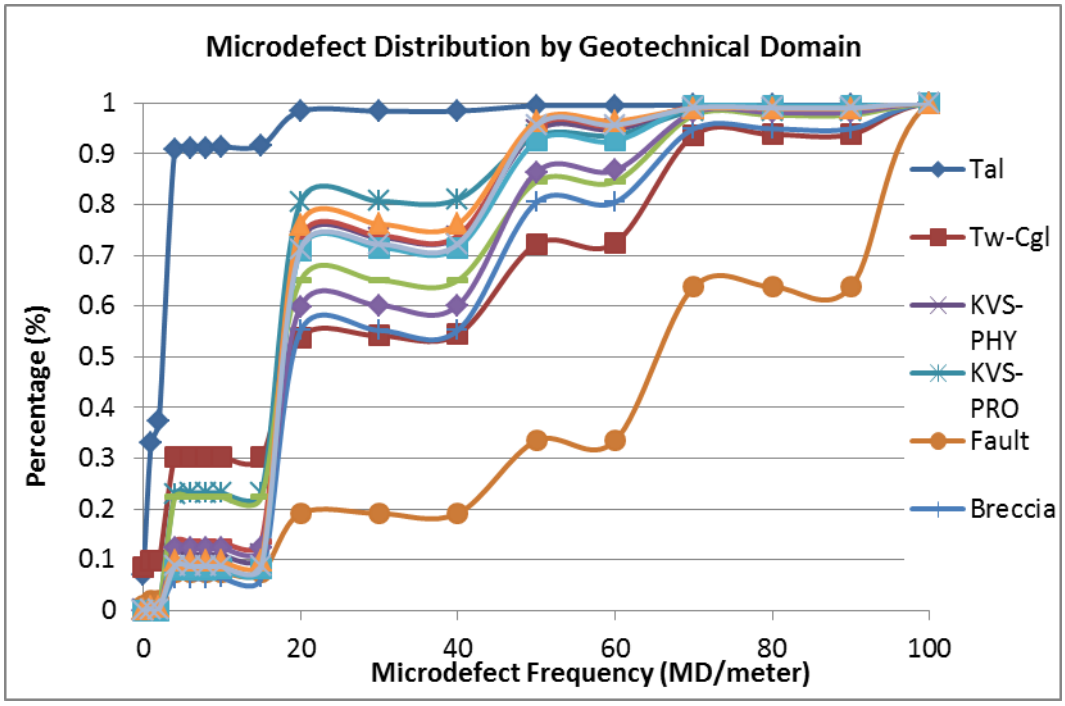


**Figure 9. Distributions of micro defects intensity for each geotechnical domain**

## 6.4. NO. 10 SHAFT GEOLOGICAL STRUCTURES

Photogrammetry mapping is used to collect orientations and characteristics of geological features in No. 10 shaft. A number of major geotechnical domains have been completely exposed in the No. 10 Shaft including Apache Leap Tuff (Tal); Whitetail Conglomerate (Tw); and the Cretaceous Volcanic Sediments (Kvs).

The orientations of major structures, joints and faults mapped in the exposed geotechnical domains in No.10 Shaft are compared to the data collected during core logging.

The joints and major structures observed in No. 10 Shaft in the Tal and the Tw are in good agreement with what was observed in the drill core. The major structures logged from photogrammetry in the Kvs in No. 10 Shaft are mostly steeply dipping while those logged form drill cores are shallow. The discrepancy could originate from drill hole orientation bias as the drill hole is less likely to intersect vertical and sub-vertical structures whereas the shaft can due to its large diameter.

# 7. ROCK STRENGTH TESTING

Extensive laboratory testing of core has been was undertaken to characterize the strength properties of the various geotechnical domains. The testing data consist of:

- UCS testing;
- point load tests (PLT) with Unconfined Compressive Strength (UCS) correlation;
- triaxial strength testing (at various confinement pressures);
- Brazilian tests; and
- sonic testing (also under confinement).

## 7.1. UCS AND POINT LOAD TESTING

A total of 440 UCS tests have been completed to date by Golder Associates, the University of Arizona, Call & Nicholas, Inc., CANMET Materials Technology Laboratory, and TerraTek. The UCS tests have been reviewed to ensure that only intact failure control tests were being used to estimate the average UCS value for each geotechnical domain. Tests that failed along a pre-existing discontinuity were not used in the determination of the UCS value for a domain.

For each logged core interval, a minimum of two pieces of whole core are selected, cut and photographed for point load tests. Over 20,000 point load tests have been conducted to date and they have been correlated to UCS results for each geotechnical domain by using ASTM D5731-05.

***Figure 10*** shows a distribution of valid UCS values and point Loads values for each geotechnical domain.

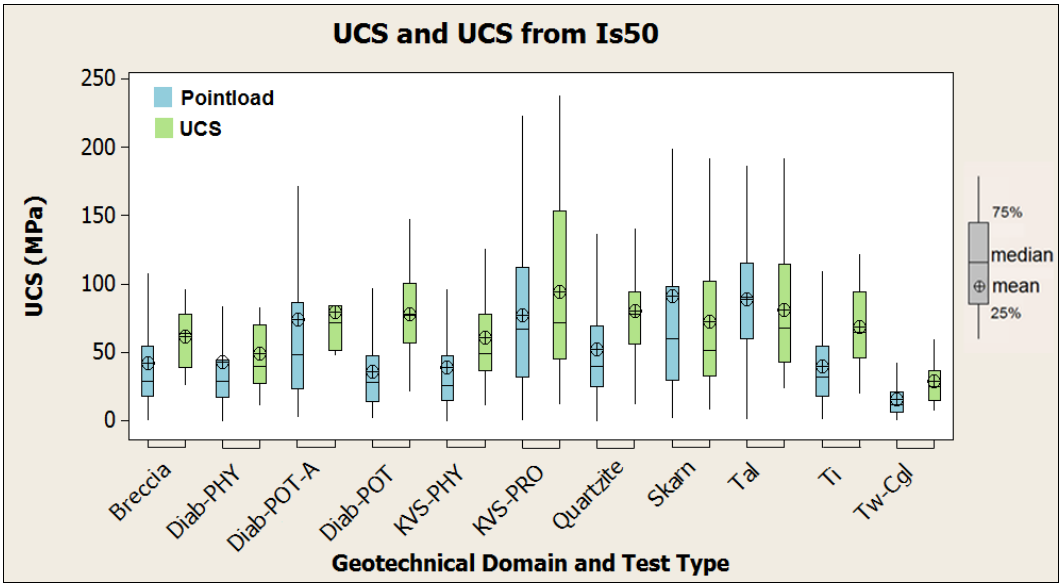


**Figure 10. Valid uniaxial compressive strength and Point Load Results**

### 7.1.1. TRIAXIAL TESTING RESULTS

Over 375 tri-axial tests have been completed by CANMET (Ottawa, Ontario) and TerraTek (Salt Lake City, UT). Tests are done under confining pressures ranging from 2 to 70 MPa. A summary graph of confining pressures versus peak stress for each geotechnical domain is presented in ***Figure 11***.

The triaxial compression testing results demonstrate the variability in the strength characteristics of the different rock units. The results suggest that with even a small amount of confinement, the rock strengths improve significantly from those reported by the UCS and point load testing, especially for the samples from relatively shallow depths, specifically the Quartzite. The testing results show that the Skarn, Diabase, and Quartzite are more brittle than the units above, exhibiting a drop to residual strength very quickly after the peak was reached. The Whitetail Conglomerate on the other hand, exhibits very high residual strengths, with a limited drop in strength with additional load after the peak is reached.

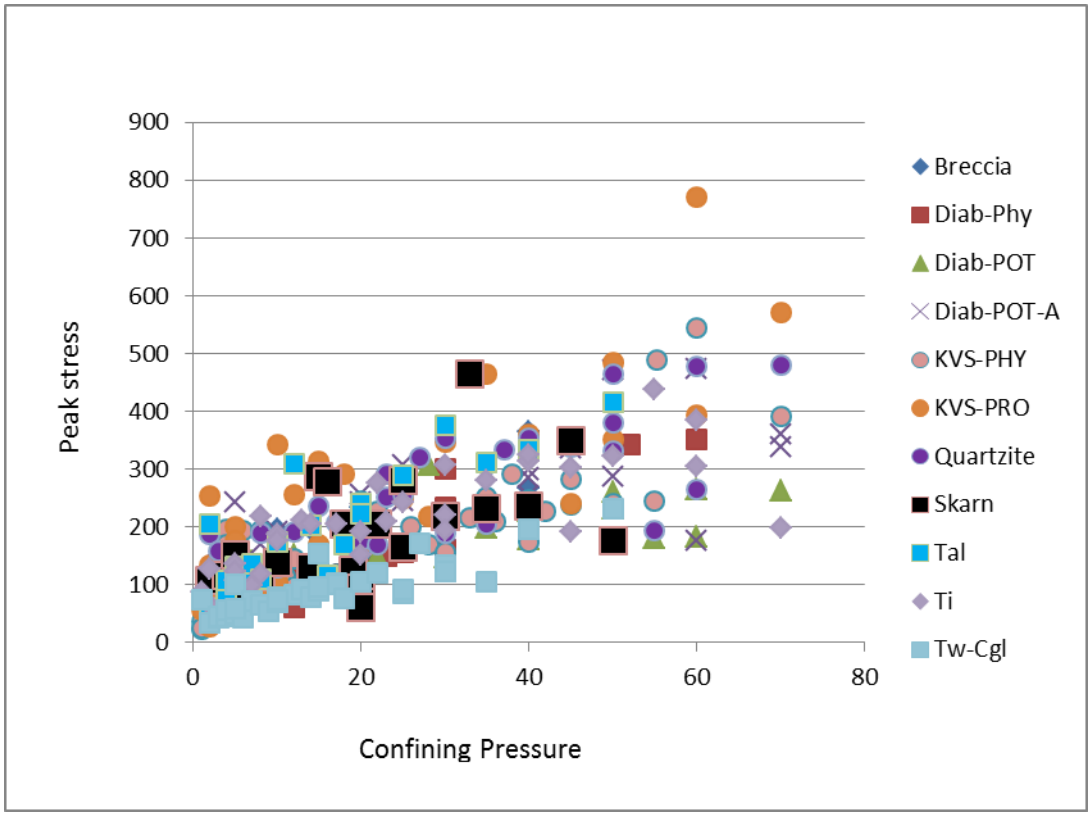


**Figure 11. Peak stress vs. confining pressure for each geotechnical domain**

### 7.2. UNIAXIAL TENSILE STRENGTH TESTING (BRAZILIAN TEST)

Brazilian tensile strength testing has been conducted on a total of 109 samples. The tensile strength results statistics are summarized and presented in ***Figure 12***. The Diab-APOT unit has the highest average tensile strength of 10.3 Mpa and the Tw has the lowest tensile strength averaging about 2.6 Mpa.

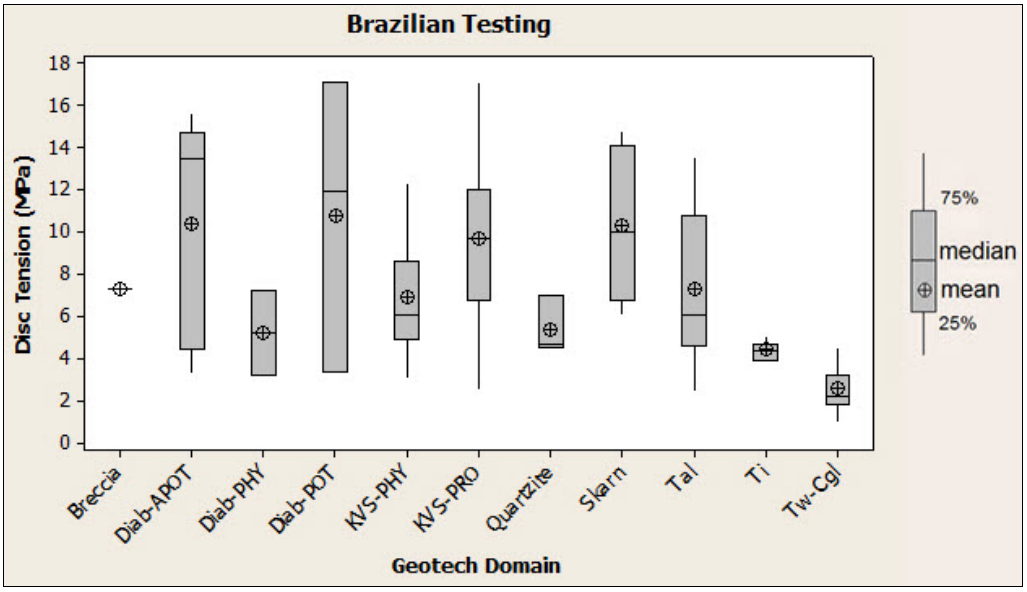


**Figure 12. Distribution of disc tension strength for each geotechnical domain**

### 7.3. ACOUSTIC VELOCITY TESTING

Acoustic velocity testing was performed on a total of 66 rock specimens at various confining pressures ranging from 2 to 25 Mpa. Both P- and S-waves travel times were measured through prepared samples under a minimal setting load, resulting in derivation of sonic velocities and dynamic elastic moduli.

## 8. EMPIRICAL ROCK MASS CHARACTERIZATION

Rock mass characterization includes an assessment of the parameters that will impact on the rock mass strength and behavior. All rock mass characterization and interpretation is based on drill core data, laboratory testing data and photogrammetry mapping and ground monitoring data from No. 10 Shaft.

Resolution Copper uses a variety of rock mass rating that includes the Rock Tunneling Quality Index system or Q system (Barton *et al*., 1974), the Rock Mass Rating, RMR (Bieniawski, 1989), the Geological Strength Index, GSI (Cai *et al*, 2004), and the Intact Rock Mass Rating, IRMR (Laubscher, 2000). The following sections summarize the data derived from these empirical rock mass characterizations.

## 8.1. ROCK TUNNEL QUALITY INDEX (Q')

Q' values calculated during core logging for each geotechnical domain are presented in ***Figure 13***.

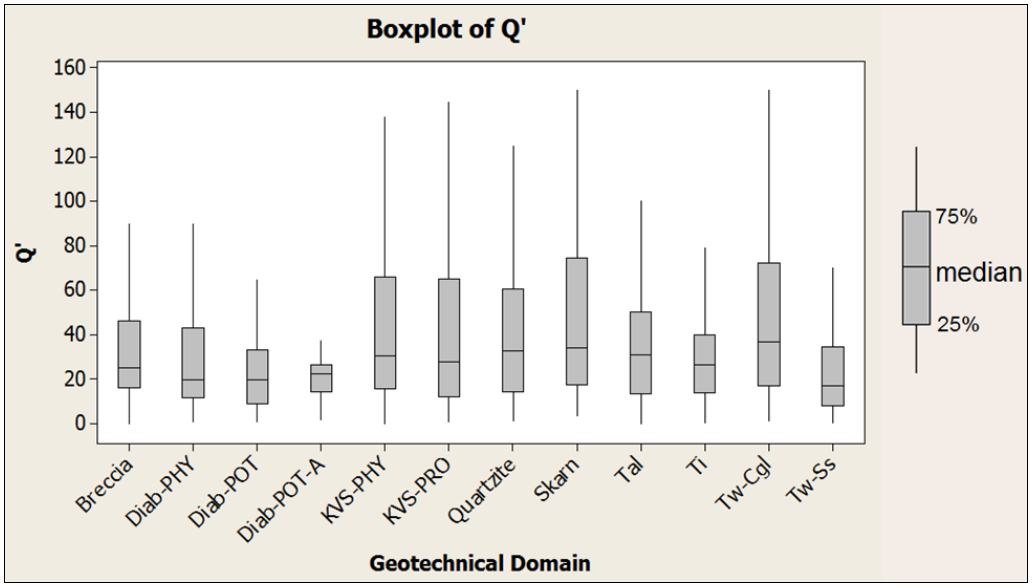


**Figure 13. Distribution of Q' values for each geotechnical domain**

## 8.2. ROCK MASS RATING (RMR)

A summary of the RMR values for each geotechnical domain is presented in ***Figure 14***.

The rock mass rating values seen in ***Figure 14*** calculated using Bieniawski's RMR 1989 represent the observed behavior of the rock from core logging.

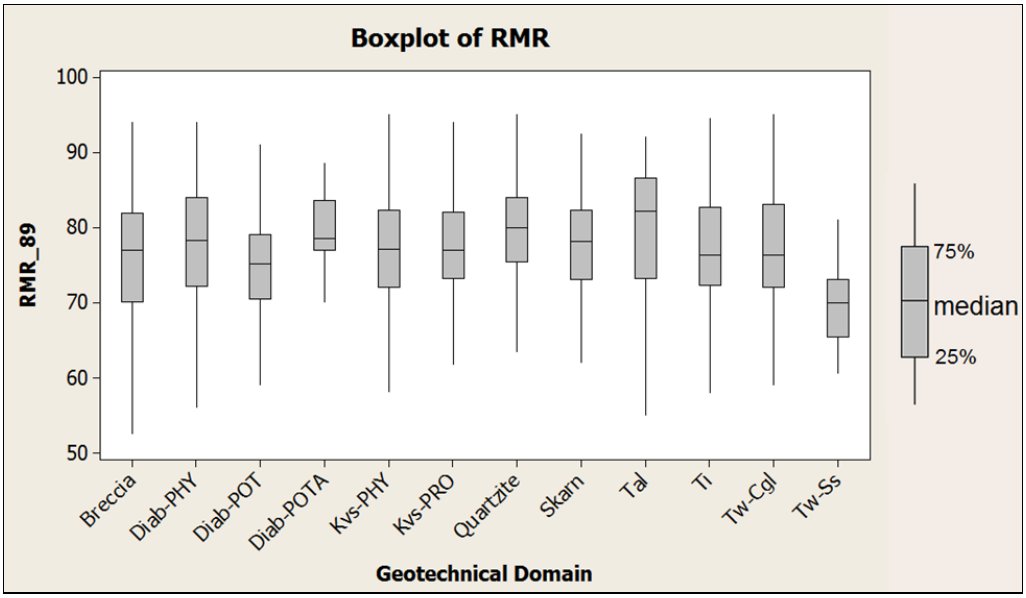


**Figure 14. Distribution of RMR 1989 values**

## 8.3. GEOLOGICAL STRENGTH INDEX (GSI)

The geological Strength Index (GSI) was estimated using the methodology proposed by Cai *et al*. (2004). This methodology allows the calculation of GSI based on *in situ* block volume and joint condition factor. The GSI values were calculated using both the apparent joint spacing methodology and the joint weighted density methodology. The distribution of GSI values for each geotechnical domain is presented in ***Figure 15***.

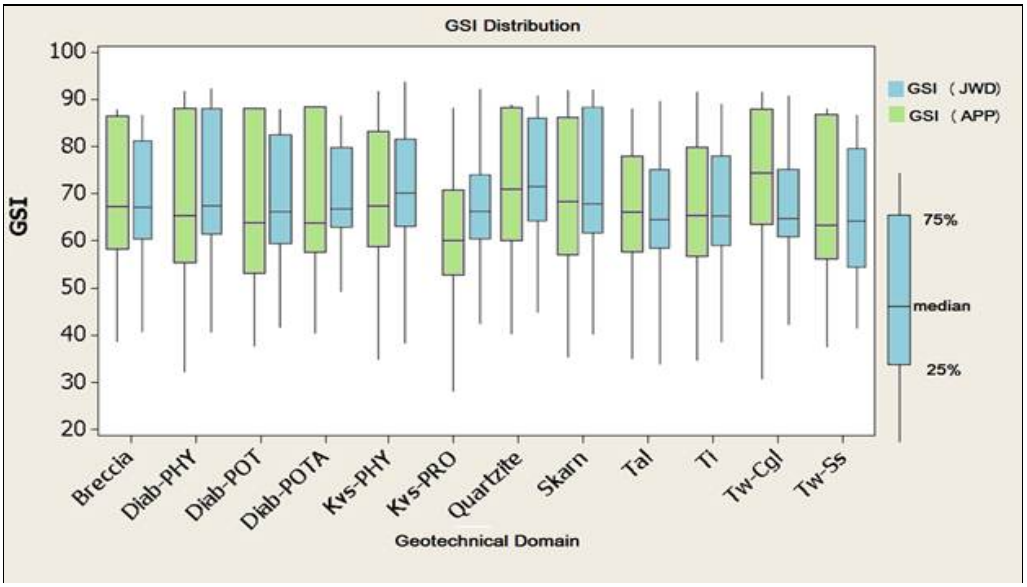


**Figure 15. Distribution of GSI values for each geotechnical domain (block volume estimated from apparent joint spacing) combined figure 18 and 19 into one figure**

## 8.4. *IN SITU* ROCK MASS RATING (IRMR)

The IRMR 2000 values for each geotechnical domain are presented in ***Figure 16***.

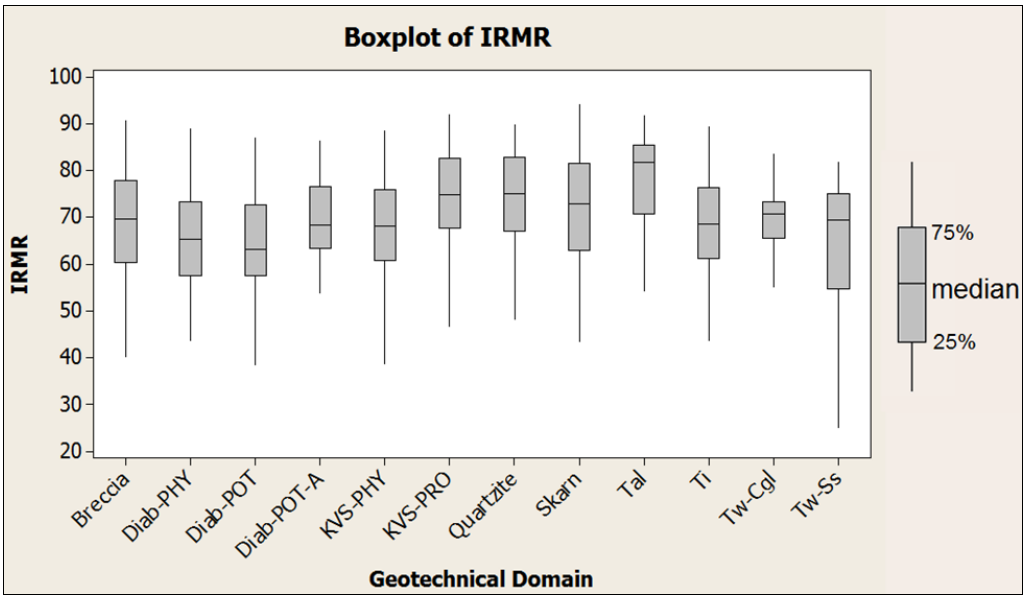


**Figure 16. Distribution of IRMR values for each geotechnical domain**

## 9. ROCK MASS STRENGTH

The rock mass properties are estimated from the average geological strength index (GSI) determined from core logging data and photogrammetry mapping of No. 10 Shaft. The rock mass strength parameters were estimated using triaxial testing data in Roclab (Rocscience, 2007). Hoek Brown's failure criterion was used and the Mohr Coulomb was fit to the data utilizing Roclab. ***Table 2*** summarizes the results for each geotechnical domain.

**Table 2. Rock Mass Strength Properties**

| Geotechnical Domain | Intact Rock | | Hoek-Brown Classification | | | Hoek-Brown Criterion | | | Mohr-Coulomb Fit | | Rock Mass Parameters | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | UCS (Mpa) | Ei(Gpa) | *Sigci (Mpa)* | *GSI* | *mi* | *mb* | *s* | *a* | *cohesion (Mpa)* | *Friction angle (degrees)* | *Tensile Strength (Mpa)* | *UCS (Mpa)* | *Global Strength (Mpa)* | *Erm (Gpa)* |
| ***Tal*** | ***74*** | ***23.5*** | 64 | 71 | 36 | 12.65 | 0.040 | 0.501 | 6 | 48 | -0.20 | 12.63 | 31.38 | 17.7 |
| ***Tw-Ss/Shl*** | ***34*** | ***6.7*** | 26 | 82 | 15 | 7.75 | 0.135 | 0.500 | 3 | 43 | -0.46 | 9.68 | 12.08 | 6.1 |
| ***Tw-Cgl*** | ***35*** | ***20.9*** | 34 | 82 | 10 | 5.30 | 0.135 | 0.500 | 3 | 40 | -0.88 | 12.67 | 14.19 | 18.8 |
| ***Kvs-Pro*** | ***98*** | ***56.5*** | 56 | 66 | 47 | 13.83 | 0.023 | 0.502 | 5 | 48 | -0.09 | 8.40 | 28.27 | 36.9 |
| ***Kvs-Phy*** | ***75*** | ***30.3*** | 59 | 70 | 19 | 6.48 | 0.036 | 0.501 | 5 | 42 | -0.32 | 11.08 | 21.47 | 22.2 |
| ***Diab-Phy*** | ***63*** | ***32.5*** | 44 | 64 | 21 | 5.75 | 0.018 | 0.502 | 3 | 41 | -0.14 | 5.96 | 14.76 | 19.9 |
| ***Diab-Pot*** | ***84*** | ***35.3*** | 67 | 63 | 8 | 2.08 | 0.016 | 0.502 | 4 | 32 | -0.53 | 8.48 | 14.13 | 20.8 |
| ***Diab-Pot-A*** | ***89*** | ***37.0*** | 109 | 68 | 11 | 3.53 | 0.029 | 0.502 | 8 | 37 | -0.88 | 18.30 | 30.19 | 25.7 |
| ***Quartzite*** | ***100*** | ***41.7*** | 95 | 72 | 18 | 6.50 | 0.045 | 0.501 | 8 | 42 | -0.65 | 19.97 | 35.24 | 32.1 |
| ***Fault*** | ***N/A*** | ***N/A*** | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| ***Ti*** | ***79*** | ***27.8*** | 105 | 67 | 11 | 3.28 | 0.026 | 0.502 | 7 | 36 | -0.82 | 16.66 | 27.91 | 18.7 |
| ***Breccia*** | ***80*** | ***37.5*** | 67 | 70 | 17 | 5.80 | 0.036 | 0.501 | 5 | 41 | -0.41 | 12.51 | 23.11 | 27.5 |
| ***Skarn*** | ***101*** | ***50.4*** | 86 | 67 | 9 | 2.91 | 0.026 | 0.502 | 6 | 35 | -0.75 | 13.60 | 21.71 | 34.0 |

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# APPENDIX G

Geochemical Characterization
Data Summary Report

# RESOLUTION COPPER MINING, LLC

# GEOCHEMICAL CHARACTERIZATION DATA SUMMARY REPORT

**AUGUST 2013**



Prepared by:

MWH Americas, Inc.
3665 JFK Parkway, Suite 206
Fort Collins, CO

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## LIST OF ACRONYMNS AND ABBREVIATIONS

| | |
|---|---|
| ABA | acid base accounting |
| ADEQ | Arizona Department of Environmental Quality |
| ADHS | Arizona Department of Health Services |
| AGP | acid generating potential |
| ANP | acid neutralizing potential |
| APP | aquifer protection permit |
| $CaCO_3$ | calcium carbonate (calcite) |
| CCB | continuing calibration blank |
| EDX | energy dispersive x-ray |
| EIS | environmental impact statement |
| EPA | Environmental Protection Agency |
| $H_20_2$ | hydrogen peroxide |
| HCT | humidity cell testing |
| ICP | inductively coupled plasma |
| ICP-MS | inductively coupled plasma – mass spectrometry |
| ICS | interference check standard |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MS/MSD | matrix spike/matrix spike duplicate |
| NAG | net acid generation |
| NNP | net neutralization potential |
| NPAG | not potentially acid generating |

## LIST OF ACRONYMNS AND ABBREVIATIONS (continued)

| | |
|---|---|
| NPR | neutralization potential ratio |
| PAG | potentially acid generating |
| PFS | pre-feasibility study |
| QAPP | quality assurance project plan |
| RCML | Resolution Copper Mining, LLC |
| RPD | relative percent differences |
| SCT | saturated column test |
| SEM | scanning electron microscope |
| SPLP | synthetic precipitation leaching procedure |
| TDS | total dissolved solids |
| XRD | x-ray diffraction |
| XRF | x-ray fluorescence |

## EXECUTIVE SUMMARY

A geochemical characterization was completed as part of the Pre-Feasibility Study for Resolution Copper Mining, LLC. The geochemical characterization of overburden, development rock, and ore will support the Arizona Department of Environmental Quality (ADEQ) Aquifer Protection Permit (APP) Program and the Plan of Operations, which taken together will be used to support the Environmental Impact Statement (EIS) prepared for the project. Additionally, the data generated was used to construct a geochemical model to assess the impacts of block cave mining to groundwater during operations and following closure.

Samples were selected for geochemical testing from exploration core that represented the major geological units that will be mined at the Resolution Copper Mine. The sampling program aimed to characterize rock that will be mined and the rock that will remain in-place above the zone following the cessation of mining activities. Following sample selection, static and kinetic tests were performed to evaluate the geochemical characteristics of the rocks.

Static, Tier 1, testing included acid base accounting, net acid generation, synthetic precipitation leaching procedure, and whole rock chemical analysis. The acid base accounting and net acid generation testing results demonstrated that the majority of the rocks tested had the potential to generate acidic conditions. Leachate tests determined that several samples had elevated levels of aluminum, iron, manganese, chloride, fluoride, and sulfate when compared to U.S. drinking water standards. The results of the whole rock chemical analysis showed that the samples were generally elevated in most metals and metalloids when compared to the crustal averages, these results were as expected for rock associated with an ore deposit.

Kinetic, Tier 2, testing was conducted on a limited number of samples that were representative of the Tier 1 sample results and were weighted toward the abundance of the rock types expected to occur within and above the ore body. Tier 2 testing consisted of humidity cell testing, saturated column testing, grain size analysis, and mineralogical testing of pre- and post- kinetic test material. The humidity cell results demonstrated that most of the samples that were determined to be potentially acid-generating during Tier 1 testing produced acidic leachates. Those samples that were classified as having uncertain potential to generate acid typically did not generate acidic leachate. Saturated column tests on HCTs which produced acidic leachate, showed rapid rinse-out of acidity; however, for columns with alkaline pH, alkalinity showed a less rapid rinse-out. Through mineralogical testing it was determined that typically 30 to 50 percent of the sulfides (pyrite) were encapsulated in silicates, therefore, the oxidation of those sulfides is

many orders of magnitude slower than with exposed pyrite. Testing results also showed that secondary mineral phases that precipitated during humidity cell testing generally could not be detected, suggesting that HCTs operated as designed by rinsing out nearly all of the reaction products on a weekly basis.

# 1.0 INTRODUCTION

As part of the Resolution Copper Mining, LLC (RCML) Pre-Feasibility Study (PFS), a geochemical characterization of the rocks within the mine was completed to support the Arizona Department of Environmental Quality (ADEQ) Aquifer Protection Permit (APP) Program and the Plan of Operations, which taken together will be used to support the Environmental Impact Statement (EIS) prepared for the project. The geochemical characterization of overburden, development rock, and ore at the Resolution Copper Mine will also be used to support a geochemical model developed to assess impacts to groundwater from block cave mining during operations and following closure.

To evaluate geochemical characteristics of the rock at the Resolution Copper Mine, both Tier 1 (static) and Tier 2 (kinetic) tests were performed, as required by the ADEQ APP program. Tier 1 testing included acid base accounting (ABA), net acid generation (NAG), synthetic precipitation leaching procedure (SPLP), and whole rock chemical analysis. Tier 1 testing was performed by ACZ Laboratories, Inc. of Steamboat Springs, Colorado. Tier 2 testing included humidity cell tests (HCTs). Humidity cell testing described in this report was performed between August 2008 and January 2010. In addition, samples used in the humidity cell testing were subsequently analyzed for their mineralogical composition and saturated leaching characteristics. Humidity cell testing and weekly monitoring of general chemistry was performed by Chemac Environmental Services of Centennial, Colorado. Complete chemical analyses of the HCT leachate were performed by ACZ Laboratories. To support parameterization of the geochemical model, grain size analyses were also completed on all of the samples subjected to humidity cell testing and saturated column testing. Grain size analyses were performed by Skyline Laboratories of Tucson, Arizona.

To evaluate water quality that would be expected after mining ceases, when mine dewatering is discontinued and portions of the block cave flood, saturated flow through column testing was completed on a subset of samples that were previously evaluated with humidity cell tests. Saturated column tests (SCTs) described in this report were performed between February and May 2010 by Chemac Environmental Services. Chemical analyses of leachate were performed by ACZ Laboratories.

As a means to more fully understand the geochemical processes and dissolution reactions potentially influencing the chemical composition of groundwater from the block cave mining, mineralogical tests were completed on the samples that were evaluated as part of the saturated cell testing program. Mineralogical tests of the saturated cell test post-mortem HCT materials was performed before saturated column testing in order to identify secondary soluble mineral phases that could affect rinse-out chemistry,

support mineral phases included in the geochemical model, and collect observations of sulfide crystal morphology and grain size. Sulfide mineralogical properties (pyrite encapsulation and crystal habit) were assessed to explain anomalous observations of leachate chemistry measured during humidity cell testing. Mineralogical analyses were not completed on post-mortem SCTs because the testing procedure would dissolve secondary mineral precipitates. Mineralogical tests included petrography (transmitted and reflected light), x-ray diffraction (XRD), and scanning electron microscopy (SEM). Mineralogical tests were by completed by MWH personnel at the Colorado School of Mines, Golden, Colorado, and by personnel at Resolution Copper, Superior, Arizona.

This report presents a summary of the methods used and results obtained from the geochemical characterization program. Data are presented in tables in Appendices A through L. A summary of the data verification is provided in Appendix M.

# 2.0 ANALYTICAL METHODS

## 2.1 Sample Selection

Samples selected for the geochemical testing were collected from exploration core that represented the major geological units that will be mined, covered the range in geochemical properties, and from throughout the area of the ore deposit and associated country rocks. Geochemical information for the block cave and surrounding area, and information supporting the geochemical testing program, are summarized in the *Draft Final Proposal for Geochemical Characterization of Resolution Copper Mining Block-Caving Zone* (Geochimica, 2008). One objective of the sampling program was to characterize the rock that will remain in-place above the ore zone following the cessation of mining activities. The number of samples selected for each lithology and alteration type was weighted by relative abundance. Furthermore, the sampling focused toward rocks overlying the block cave because these units would remain in the mine following closure, whereas the majority of the ore will be removed during mining. As a contingency, several ore-grade samples were also included in the tests to provide representation of all sulfide-bearing rock/alteration types, and provide information regarding leachate chemistry of the ore zone should mining cease earlier than planned. Material is considered to be ore-grade if the material that will be mined is located within the 1 percent copper shell; material located outside the 1 percent copper shell is considered to be non-ore grade.

Tier 1 testing included 226 primary (and 13 duplicate) analyses for ABA, SPLP, NAG, and whole rock analysis (239 total samples). Samples were collected based on information presented in Geochimica (2008) and based on discussions held between RCML, Geochimica, and MWH. Lithologic groups and alteration types as well as the corresponding number of samples included in the Tier 1 testing program are summarized in Table 1. Excluding duplicates, approximately 60 percent of the samples were collected representing lithologic/alteration types located above and outside the 1 percent copper shell and 40 percent were within the 1 percent copper shell (i.e., ore). Samples for Tier 1 testing were collected from boreholes:

- RES-001C (27 samples and 3 duplicates)
- RES-002A (27 samples and 3 duplicates)
- RES-005I & 5J (73 samples and 1 duplicates)
- RES-006D (27 samples and 2 duplicates)
- RES-009, 9D, & 9E (72 samples and 4 duplicates).

Tier 2 testing included 47 primary humidity cell tests, 4 duplicates with identical rock masses, 2 duplicate with a different rock mass, and 1 triplicate with different rock masses (54 total samples). Excluding duplicates, approximately 55 percent of the samples were collected from outside (above) of the 1 percent copper shell, 35 percent were within the 1 percent copper shell, and 10 percent outside of the ore body. Samples collected outside of the ore body were included from RES-008A to evaluate the leachate chemistry of development rock produced during construction of Shaft 10. Samples for Tier 2 testing were collected from:

- RES-001C (6 samples and 2 duplicates)
- RES-002A (5 samples and 1 duplicate)
- RES-005I & 5J (11 samples and 1 duplicate)
- RES-006D (6 samples)
- RES-008 (5 samples)
- RES-009 & 9E (14 samples, 2 duplicate, and 1 triplicate).

Tier 2 tests were performed over a 16-week to 74-week period. Throughout the testing period columns were terminated at variable timeframes typically when chemical steady state was observed in the column leachate for several weeks. Also, 18 of the tests were terminated because the fine-grained material within the columns made standard column operation and sampling impossible. After 10 weeks of testing, these columns were converted to shoeboxes (i.e., a rectangular plastic container with a tight-fitting lid). Half of the shoebox tests were discontinued after six weeks of testing because the configuration did not meet testing program objectives (e.g., shoebox tests appeared to be characterizing surface oxidation, with limited oxygen penetration). Lithologic groups, alteration types, and termination dates for the Tier 2 tests are summarized in Table 2. All 54 samples included as part of the Tier 2 testing program were subjected to grain size analyses.

To evaluate water quality that would be expected after mining ceases and mine dewatering is discontinued (i.e., if parts of the block cave flood), saturated column tests were performed on samples from 14 of the 54 HCTs (Table 3) after the Tier 2 testing program was terminated. Samples selected for saturated column testing represented the major geological units and alteration types that will be mined, covered the range in geochemical properties, and were from material sampled throughout the area of the ore deposit and associated country rocks. One objective of the sampling program was to characterize the rock that will remain in-place above the ore zone following the cessation of mining activities.

Consequently, the sampling focused on rocks overlying the block cave because these units would remain in the mine following closure (and may eventually become reflooded), whereas the majority of the ore will be removed during mining. However, as a contingency, several ore samples were also included in the tests to provide representation of all sulfide-bearing rock/alternation types, and provide information regarding leachate chemistry of the ore zone should mining cease earlier than planned.

For the saturated column testing, 50 percent (7) of the samples were collected from outside of (above) the 1 percent copper shell, 43 percent (6 samples) were within (below) the 1 percent copper shell, and 7 percent (1 sample) was from outside (laterally) the ore body. The sample collected outside of the ore body was included from RES-008A to evaluate the leachate chemistry of a particular rock/alteration type. Samples for saturated column testing were collected from:

- RES-001C (1 sample)
- RES-002A (3 samples)
- RES-005I (1 sample)
- RES-006D (1 sample)
- RES-008 (1 sample)
- RES-009 & 9E (7 samples).

Saturated column testing was initiated on February 28, 2010 and ran for 12 weeks. Saturated column tests were terminated once metals concentrations rinsed-out or equilibration conditions were established. The week 1 sample was collected on March 8, 2010, while the week 12 sample was collected on May 24, 2010.

All 14 saturated column tests samples were subjected to mineralogical testing. Pre-HCT mineralogical analyses included petrography and XRD, and was completed by RCML and MWH. Post-HCT mineralogical analyses included petrography, XRD, and SEM, and was completed by MWH personnel at Colorado School of Mines in Golden, Colorado.

## 2.2 Tier 1 Testing

### 2.2.1 Acid Base Accounting

Acid base accounting tests evaluate the balance between potentially acid generating minerals and acid neutralizing minerals in a rock or soil sample. The results of ABA tests are indicative of the potential of a geologic material to generate acidity due to exposure to air and water. Static-based ABA tests cannot be

used to determine whether a material would actually generate acidic leachate during oxidation, nor do they provide quantitative data regarding leachate chemistry. Kinetic based tests (e.g., HCTs) are generally used for those purposes.

The following ABA measurements were completed: total-sulfur, pyritic-sulfide-sulfur, sulfate-sulfur, and acid neutralization potential. The acid generating potential was calculated from the amount of sulfide-sulfur, which in turn was determined as the difference between the amount of total-sulfur and sulfate-sulfur. The amount of residual-sulfur was computed by difference between the amount of total-sulfur and the summation of all other sulfur species measured, and represents mass balance closure.

The acid generating potential (AGP) of a material was determined from the calculated amount of sulfide-sulfur contained within the rock. The acid neutralizing potential (ANP) is a measure of the amount of carbonate minerals (particularly calcite) within the rock. The ANP does not consider potential ANP from non-carbonate rocks. AGP and ANP are both reported in units of tons of equivalent calcium carbonate ($CaCO_3$) per kiloton of rock (T $CaCO_3$/kT rock). ABA results are interpreted by computing the net neutralization potential (NNP) of the samples (NNP = ANP - AGP) and the neutralization potential ratio (NPR) of the samples (NPR = ANP / AGP).

Rocks with a NNP greater than 0.0 T $CaCO_3$/kT rock or a NPR greater than 1.0 theoretically have more acid neutralizing potential available than acid generating potential, whereas rocks with a NNP less than 0.0 T $CaCO_3$/kT rock and a NPR less than 1.0 theoretically have more acid generating potential than acid neutralizing potential. In addition, rocks with less than 0.3 percent sulfide-sulfur generally are not considered capable of sustaining acid generation and are commonly classified as non-acid generating (Price, 1997; Soregaroli and Lawrence, 1998).

### 2.2.2 Net Acid Generation Testing

Net Acid Generation tests use hydrogen peroxide ($H_2O_2$), which is a strong oxidizing agent capable of rapidly oxidizing sulfide minerals. NAG testing was conducted on all of the Tier 1 samples using the methodology outlined in Stewart et al. (2006). The procedure was developed more than 20 years ago as a method for measuring sulfide content (Sobek et al., 1978), but interpretation of the test results have changed over the last decade. The main purpose of the test is to assess whether a sample is capable of neutralizing the acidity produced by complete oxidation of sulfide minerals. The NAG test greatly accelerates sulfide oxidation with the assumption that neutralization potential dissolution remains proportional. The test also provides an estimate of the expectant leachate chemistry following complete sulfide mineral oxidization. The NAG test can be valuable as a quantitative indicator of the amount of

measured sulfide available to oxidize, but does not provide a quantitative estimate of the neutralization potential (as provided by ABA tests).

After complete oxidation, the pH of the NAG solution indicates whether the sample is not acid generating or potentially acid generating. Test results are interpreted according to the following criteria (Stewart et al., 2006):

- Not potentially-acid generating (NPAG) if final pH > 4.5Potentially acid generating (PAG) if final pH < 4.5

In addition to measurement of final NAG solution pH, the resulting NAG solution was also analyzed as part of this testing program for a full suite of chemical parameters including: acidity (total), electrical conductivity, aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium (total), cobalt, copper, fluoride, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silica, silver, sodium, sulfate, thallium, uranium, vanadium, and zinc.

### 2.2.3 Synthetic Precipitation Leaching Procedure

Synthetic precipitation leaching procedure testing is a procedure used to determine what chemical constituents are likely to initially leach from a geologic material during exposure to precipitation or surface water runoff. SPLP testing was conducted on all of the Tier 1 samples using EPA Method 1312. The SPLP test is a standardized leaching test that uses a 20:1 water to rock ratio (100 grams of rock) in either a percolation column or a bottle roll apparatus, depending on the permeability of the geologic material. The initial leach solution is distilled water that has been slightly acidified (to pH 4.2) to match local precipitation chemistry. The leach solution and geologic material are allowed to remain in contact for 24 hours and the resulting leachate is analyzed for metals, metalloids, and general chemical parameters. The constituents analyzed included: pH, acidity (total), alkalinity (total), alkalinity (carbonate), alkalinity (hydroxide), bicarbonate, electrical conductivity, hardness, total dissolved solids (TDS), aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium (total), cobalt, copper, fluoride, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silica, silver, sodium, sulfate, thallium, uranium, vanadium, and zinc.

### 2.2.4 Whole Rock Chemical Analysis

Whole rock chemical analyses were conducted for the samples using two techniques: (1) strong acid digestion followed by analysis by inductively coupled plasma- mass spectrometry (ICP-MS) for a full suite of major ions and metals and (2) a lithium borate fusion followed by x-ray fluorescence (XRF) spectroscopy for major and minor oxide determinations. In addition, all of the Tier 1 samples were also

analyzed for the radioactive constituents gross alpha, radium 226, and radium 228; approximately 15 percent of the samples were also analyzed for gross beta.

The strong acids used in the digestion process correspond to a mixture of perchloric, nitric, hydrofluoric, and hydrochloric acids. The acid digestions are able to dissolve most minerals; however, the term "near-total" is used because, depending on the sample matrix, not all elements are quantitatively extracted (e.g., including rare earth elements and barium, tin, tantalum, titanium, tungsten, and zirconium). In contrast, fusion of the rock with lithium borate dissolves the entire rock which is presented to the XRF for total oxide analysis. However, because of the dilution of the rock in the lithium borate flux and the elevated detection limits of XRF analysis, trace metals are not reported with this method. Only the weight percents for the lithium borate/XRF fusion method were reported for the oxides of aluminum, barium, calcium, chromium, iron, potassium, magnesium, manganese, sodium, phosphorus, silicon, strontium, and titanium. While whole rock chemistry data cannot be used to define rates of metal leaching, they can be used for qualitative identification of which metals are present at elevated levels and therefore are potentially leachable and should be included in analytical determinations of leachate compositions.

## 2.3 Tier 2 Testing

### 2.3.1 Humidity Cell Testing

Based on the results of the Tier 1 testing, 54 samples were selected for humidity cell testing to determine the kinetics of the oxidation reaction and resultant leachate chemistry. Humidity cell tests are designed to accelerate the rates of natural weathering processes and quantify those rates under ideal laboratory conditions. In addition, HCTs are generally used to determine the probability that a rock type with uncertain ABA characteristics will produce acidic leachates. Rocks with ABA characteristics outside these limits ( that is, either strongly negative or positive NNP values) can generally be expected to produce either acidic or alkaline leachates. Several rocks outside of the uncertain acid generation range were included in the HCTs to determine the oxidation rates and masses of leachable constituents for use in the predictive geochemical model of the block cave.

The HCT method employed was similar to that described in ASTM D5744-96 (1996); however, several different rock masses and water to rock ratios were used depending on rock type and sample availability (see Table 2). Briefly, between 1.5 kg and 20 kg of sample with a particle size ranging between 1.7 millimeter (0.066 inch; 10 mesh) and 6.35 millimeter (0.25 inch) were placed in a cylindrical column. The sample was initially saturated with deionized water and allowed to drain. Dry air was then circulated through the sample for three days followed by three more days of humid air (created by passage of an airstream through deionized water at 30 °C). On the seventh day, deionized water was added to the

samples, allowed to sit for one hour, and then drained. This water was analyzed immediately for pH, electrical conductivity, sulfate, iron (total), acidity (total), and alkalinity (total); these constituents were measured on a weekly basis throughout the duration of the testing program by Chemac Environmental Services. This water also was analyzed by ACZ Laboratories for a full suite of constituents on a weekly basis from week 0 through week 24 and on a monthly basis from week 24 through week 72. The constituents analyzed included: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium (total), cobalt, copper, fluoride, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silica, silver, sodium, sulfate, thallium, uranium, vanadium, and zinc. A portion of these analytes (antimony, boron, chromium (total), mercury, silver, and vanadium) were analyzed at a reduced frequency beginning at week 16 because they were not detected on a consistent basis.

### 2.4 Grain Size Analyses

The grain size analysis method employed was based on ASTM D422-07 (2007). The test method includes quantitative determination of the particle size distribution with sieving, which can be subdivided into the percentage of gravel, sand, and fines (clay and silt). The distribution of particle sizes is used to develop a cumulative particle size distribution plot (i.e., gradation curve).

### 2.5 Saturated Column Testing

After completion of the HCTs, the rock in the HCTs were unloaded and inspected visually for mineral precipitates and staining and select HCTs were converted to the saturated flow through column tests. Rock removed from the HCTs contained minimal moisture. After inspection, the material was then homogenized (i.e., gently mixed, no crushing), which was intended to eliminate any preferential flow paths that may have formed during humidity cell testing, thereby re-exposing any “sealed off” areas. Homogenization was not meant to expose new rock surfaces that were not exposed during the HCTs. Prior to saturating the columns, a small sample split (roughly 50 to 250 grams) was removed from each column for mineralogical testing. Where possible, secondary precipitates were sampled disproportionally (e.g., high-graded) to facilitate their identification during mineralogical testing.

Rock that was loaded into the saturated column tests represented nearly all of the mass used in the original HCT columns. The original HCT columns were used to construct the saturated column tests. After homogenization, sampling, and repacking into the same column, the columns were then cut down to size to minimize the amount of head space above the rock material in the columns. The height ranged between 16.4 and 44.1 centimeters (6.5 and 17.4 inches). Similar to the bottom of the columns, the top of

the columns were loaded with clean quartz sand to further reduce head space and minimize the amount of fine material that could flow out the top of the column. The saturated test columns were then sealed to eliminate the potential for solution leakage and minimize the diffusion of oxygen into the columns. The flow rate through the columns was unique for each test, and was based upon maintaining the same water to rock proportion used in the HCTs. Test cell dimensions, flow rates, and pore volume data are summarized in Table 4. The water used for the saturated column tests was deionized water that was deoxygenated (initially subjected to a vacuum to reduce exposure to gaseous carbon dioxide and oxygen, then sparged with nitrogen while operating the columns) prior to column flooding. The influent water reservoir was also continuously monitored for its dissolved oxygen content to ensure that diffusion of atmospheric oxygen did not increase oxygen levels during testing.

Flow within the saturated columns was directed in the bottom and out the top of the columns with weekly sampling of the collected leachate. All columns were analyzed weekly for pH, electrical conductivity, sulfate, iron (total), acidity (total), and alkalinity (total); these constituents were measured on a weekly basis by Chemac Environmental Services throughout the duration of the testing program. The water also was analyzed by ACZ Laboratories for a full suite of constituents on a weekly basis from week 1 through week 6 and every other week thereafter until testing termination. The constituents analyzed included: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium (total), cobalt, copper, fluoride, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silica, silver, sodium, sulfate, thallium, uranium, vanadium, and zinc.

### 2.6 Mineralogical Testing

As described above, a small sample split (roughly 50 to 250 grams) from each post-test HCT column was removed for mineralogical testing. Where possible, secondary precipitates were sampled disproportionally (e.g., high-graded) to facilitate their identification during mineralogical testing. Pre-test HCT samples were collected from material not originally added to the HCTs (samples archived by MWH) or from additional sample mass retrieved from core (samples analyzed by RCML).

#### 2.6.1 Petrography

Petrography utilizes the principles of optical mineralogy to identify minerals present, encapsulation of minerals (e.g., pyrite or calcite in quartz), mineral morphology (e.g., euhedral, subheudral, framboidal), and mineral reaction rims (e.g., oxidation of pyrite). Light (regular or reflected) is transmitted through a thin section of rock using a polarizing petrographic microscope. A thin section represents a thin (0.03 millimeter) sliver of rock that is cut from the sample using a diamond saw and mounted onto a glass slide.

Thin sections were prepared at the Colorado School of Mines or at Resolution, in order to view and photograph samples.

### 2.6.2 X-Ray Diffraction

X-ray diffraction is an analytical method that is used to identify minerals contained in rocks. XRD measures the distance between plains of regularly repeating atoms in the crystalline structure (i.e., lattice) of a mineral. Samples are crushed to a fine powder and exposed to x-rays, which diffract off the mineral lattice toward a detector. Each mineral has a unique crystalline structure, and therefore, a distinct x-ray pattern that can be identified. However, amorphous solid materials (i.e., glass, poorly crystalline minerals, etc.) do not have a regularly repeating crystalline structure and as such produce XRD results that are ambiguous or impossible to interpret. MWH personnel, using facilities at the Colorado School of Mines, analyzed samples before and after humidity cell testing by XRD.

### 2.6.3 Scanning Electron Microscopy

Scanning electron microscope is used to obtain high-resolution, three-dimensional images of mineral grains or rock samples on a small scale (micron to sub-micron level). SEM can also provide semi-quantitative information regarding elements that are present on a mineral surface. Thin sections prepared for petrographic study can be analyzed with the SEM. The thin section or mineral surface is shot with a focused, high-energy beam of electrons. The interaction of the electrons with the sample produces various forms of radiation, most importantly, secondary electrons (which produce the SEM image) and characteristic X-rays, which provide semi-quantitative chemical analyses (energy dispersive X-ray spectrum or EDX).

**Table 1.** Summary of rock lithologies and alteration types as well as the corresponding number of samples selected for Tier 1 testing (not including duplicates).

| **Lithology Type** | | |
|---|---|---|
| **Code** | **Unit** | **Count** |
| Tal | Tertiary Apache Leap Tuff (Ignimbrite) | 7 |
| Tw | Tertiary Whitetail Conglomerate | 11 |
| Kvs | Cretaceous volcanics & sediments (undifferentiated) | 101 |
| Kqs | Cretaceous quartz-rich sediments | 1 |
| QEP | Quartz eye porphyry; rhyodacite porphyry | 37 |
| FP/LP | Felsic porphyry; latite porphyry | 3 |
| Dm | Devonian Martin limestone (skarn) | 21 |
| Andesite | Andesite | 1 |
| Diabase | Diabase | 22 |
| Qzite | Quartzite | 17 |
| Breccia/Hbx | Heterolithic Breccia | 3 |
| Fault | Fault | 2 |
| TOTAL | | 226 |

| **Alteration Type** | | |
|---|---|---|
| **Code** | **Unit** | **Count** |
| AA | Advanced Argillic | 19 |
| ARG | Argillic | 1 |
| HFLRET | Retrograde Hornfels | 5 |
| PHY | Phyllic | 111 |
| POT | Potassic | 31 |
| PRO | Propylitic | 16 |
| SA | Supergene argillic | 7 |
| SIL | Siliceous | 1 |
| SKN/SKRET | Skarn/Retrograde Skarn | 16 |
| UNALT | Unaltered | 18 |
| ZEO | Zeolite | 1 |
| TOTAL | | 226 |

**Table 2.** Summary of samples selected for Tier 2 testing.

| Hole ID | Depth Interval (m) | Test ID | Mass (g) | Water:Rock Proportion | Grain Size | Lithology | Alteration | 1% Copper Shell | Weeks Tested |
|---|---|---|---|---|---|---|---|---|---|
| RES-001C | 1639.00-1642.00 | 1S | 10000 | 1:3 | fine (-10mesh) | Kvs | PRO | above | 24 |
| | 1745.00-1748.00 | 2 | 10000 | 1:3 | fine (-10mesh) | Kvs | POT | above | 51 |
| | 1771.75-1791.40 | 3 | 20000 | 1:5 | coarse (-1/2") | Dm | SKRET | above | 24 |
| | 1855.00-1858.00 | 4S | 5000 | 1:2.78 | very fine (-10mesh) | Dm | SKN | above | 16 |
| | 1855.00-1858.00 (dup) | 5 | 5000 | 1:2.78 | very fine (-10mesh) | Dm | SKN | above | 16 |
| | 1873.00-1876.00 | 6 | 8000 | 1:3 | fine (-10mesh) | Dm | HFLRET | below | 51 |
| | 2041.00-2044.00 | 7 | 1500 | 1:1.5 | fine (-10mesh) | Diab | POT | below | 24 |
| | 2041.00-2044.00 (dup) | 8 | 8000 | 1:3 | fine (-10mesh) | Diab | POT | below | 24 |
| RES-002A | 888.00-891.00 | 9S | 8000 | 1:3 | very fine (-10mesh) | Kvs | PHY | above | 16 |
| | 1154.00-1156.00 | 10S | 5000 | 1:2.78 | very fine (-10mesh) | Kvs | PHY | above | 16 |
| | 1414.60-1417.00 | 11 | 5000 | 1:2.78 | fine (-10mesh) | QEP | PHY | above | 24 |
| | 1454.00-1457.00 | 12 | 5000 | 1:2.78 | fine (-10mesh) | Kvs | PHY | below | 74 |
| | 1454.00-1457.00 (dup) | 13 | 5000 | 1:2.78 | fine (-10mesh) | Kvs | PHY | below | 24 |
| | 1927.00-1930.00 | 14 | 10000 | 1:3 | fine (-10mesh) | Diab | POT | below | 51 |
| RES-005I | 1317.28-1320.28 | 15 | 12000 | 1:3 | coarse (-1/2") | Tw | UNALT | above | 16 |
| | 1428.18-1431.18 | 16S | 4000 | 1:2 | very fine (-10mesh) | Kvs | AA | above | 16 |
| | 1428.18-1431.18 (dup) | 17S | 4000 | 1:2 | very fine (-10mesh) | Kvs | AA | above | 16 |
| | 1499.00-1502.00 | 18S | 4000 | 1:2 | very fine (-10mesh) | Kvs | PHY | above | 16 |
| | 1586.46-1589.46 | 19S | 4000 | 1:2 | very fine (-10mesh) | QEP | PHY | above | 16 |
| | 1632.56-1635.56 | 20S | 5000 | 1:2.78 | very fine (-10mesh) | Kvs | PHY | above | 24 |
| | 1652.00-1654.93 | 21 | 2000 | 1:1.5 | fine (-10mesh) | QEP | PHY | above | 51 |
| | 1654.93-1659.80 | 22S | 4000 | 1:2 | very fine (-10mesh) | QEP | PHY | below | 24 |
| | 1759.23-1761.23 | 23 | 1500 | 1:1.5 | very fine (-10mesh) | QEP | PHY | below | 51 |
| | 1892.81-1895.00 | 24 | 1500 | 1:1.5 | very fine (-10mesh) | Qzite | PHY | below | 24 |
| | 1917.29-1920.90 | 25S | 2000 | 1:1.5 | fine (-10mesh) | Diab | POT | below | 24 |
| RES-005J | 1660.40-1686.47 | 26 | 20000 | 1:5 | coarse (-1/2") | QEP | PHY | below | 74 |

**Table 2.** Summary of samples selected for Tier 2 testing (continued).

| Hole ID | Depth Interval (m) | Test ID | Mass (g) | Water:Rock Proportion | Grain Size | Lithology | Alteration | 1% Copper Shell | Weeks Tested |
|---|---|---|---|---|---|---|---|---|---|
| RES-006D | 1750.40-1753.40 | 27 | 5000 | 1:2.78 | fine (-10mesh) | Kvs | PHY | above | 24 |
| | 1898.21-1901.09 | 28 | 5000 | 1:2.78 | very fine (-10mesh) | Qzite | PHY | above | 51 |
| | 1952.56-1954.83 | 29S | 2000 | 1:1.5 | very fine (-10mesh) | Qzite | PHY | above | 24 |
| | 1954.83-1972.00 | 30 | 20000 | 1:5 | coarse (-1/2") | Qzite | ZEO | above | 51 |
| | 1980.60-1983.60 | 31S | 4000 | 1:2 | fine (-10mesh) | Qzite | PHY | below | 16 |
| | 2091.13-2094.13 | 32S | 5000 | 1:2.78 | fine (-10mesh) | Diab | POT | below | 24 |
| RES-008A | 1597-1600 | 33 | 10000 | 1:3 | coarse (-3/8") | Kvs | HFL | outside | 24 |
| | 1717-1720 | 34 | 10000 | 1:3 | coarse (-3/8") | Kvs | PRO | outside | 63 |
| | 1844.1-1846.6 | 35 | 8000 | 1:3 | coarse (-3/8") | Skn | PHY | outside | 51 |
| | 1979.95-1982.94 | 36 | 10000 | 1:3 | coarse (-3/8") | Qzite | SIL | outside | 51 |
| | 2053.81-2056.81 | 37 | 5000 | 1:2.78 | coarse (-3/8") | Diab | PHY | outside | 51 |
| RES-009 | 278.90-281.09 | 38 | 12000 | 1:3 | coarse (-1/2") | Tal | UNALT | above | 16 |
| | 645.59-647.52 | 39 | 11500 | 1:3 | coarse (-1/2") | Tw | UNALT | above | 16 |
| | 804.84-807.00 | 40 | 5000 | 1:2.78 | coarse (-1/2") | Tw | UNALT | above | 16 |
| | 804.84-807.00 (dup) | 41 | 5000 | 1:2.78 | coarse (-1/2") | Tw | UNALT | above | 16 |
| | 994.67-997.67 | 42 | 7000 | 1:3 | fine (-10mesh) | Kvs | SA | above | 16 |
| RES-009E | 1351.03-1354.03 | 43 | 10000 | 1:3 | fine (-10mesh) | Kvs | PHY | above | 51 |
| | 1510.74-1527.19 | 44 | 20000 | 1:5 | coarse (-1/2") | Kvs | PHY | above | 63 |
| | 1510.74-1527.19 (dup) | 45 | 5000 | 1:2.78 | coarse (-1/2") | Kvs | PHY | above | 24 |
| | 1510.74-1527.19 (trip) | 46 | 2000 | 1:1.5 | coarse (-1/2") | Kvs | PHY | above | 24 |
| | 1597.32-1599.88 | 47S | 4000 | 1:2 | fine (-10mesh) | Kvs | PHY | above | 24 |
| | 1634.46-1637.47 | 48S | 4000 | 1:2 | very fine (-10mesh) | Kvs | PHY | below | 16 |
| | 1739.63-1742.63 | 49S | 4000 | 1:2 | very fine (-10mesh) | Qzite | AA | below | 24 |
| | 1829.95-1832.48 | 50 | 1500 | 1:1.5 | very fine (-10mesh) | Dm | SKRET | below | 24 |
| | 1867.87-1884.35 | 51 | 20000 | 1:5 | coarse (-1/2") | Dm | SKRET | below | 51 |
| | 1899.00-1901.88 | 52S | 2000 | 1:1.5 | very fine (-10mesh) | Dm | SKRET | below | 24 |
| | 1984.74-1987.74 | 53 | 4000 | 1:2 | very fine (-10mesh) | Qzite | POT | below | 24 |
| | 2056.38-2075.00 | 54 | 20000 | 1:5 | coarse (-1/2") | Diab | POT | below | 74 |

Note: A Test ID with a "S" indicates that the column was converted to a shoebox during humidity cell testing. Lithology types include: Kvs = Cretaceous volcanic & sediments (undifferentiated); QEP = quartz eye porphyry; Diab = diabase; Qzite = quartzite; Tal = Tertiary Apache Leap Tuff (Ignimbrite); Tw = Tertiary Whitetail Conglomerate; Dm = Devonian Martin limestone (skarn). Alteration types include: POT = Potassic; PHY = Phyllic; UNALT = unaltered; AA = Advanced Argillic; SKRET = Retrograde Skarn.

**Table 3.** Summary of samples selected for saturated flow through column testing.

| Hole ID | Depth Interval (m) | Test ID | Mass (g) | Grain Size | Lithology | Alteration | 1% Copper Shell | HCT Weeks Tested |
|---|---|---|---|---|---|---|---|---|
| RES-001C | 1745.00-1748.00 | 2 | 10000 | fine (-10mesh) | Kvs | POT | above | 51 |
| RES-002A | 1414.60-1417.00 | 11 | 5000 | fine (-10mesh) | QEP | PHY | above | 24 |
| | 1454.00-1457.00 | 12 | 5000 | fine (-10mesh) | Kvs | PHY | below | 74 |
| | 1927.00-1930.00 | 14 | 10000 | fine (-10mesh) | Diab | POT | below | 51 |
| RES-005I | 1652.00-1654.93 | 21 | 2000 | fine (-10mesh) | QEP | PHY | above | 51 |
| RES-006D | 1898.21-1901.09 | 28 | 5000 | very fine (-10mesh) | Qzite | PHY | above | 51 |
| RES-008A | 1717-1720 | 34 | 10000 | coarse (-3/8") | Kvs | PRO | outside | 63 |
| RES-009 | 278.90-281.09 | 38 | 12000 | coarse (-1/2") | Tal | UNALT | above | 16 |
| | 645.59-647.52 | 39 | 11500 | coarse (-1/2") | Tw | UNALT | above | 16 |
| RES-009E | 1510.74-1527.19 | 44 | 20000 | coarse (-1/2") | Kvs | PHY | above | 63 |
| | 1739.63-1742.63 | 49S | 4000 | very fine (-10mesh) | Qzite | AA | below | 24 |
| | 1829.95-1832.48 | 50 | 1500 | very fine (-10mesh) | Dm | SKRET | below | 24 |
| | 1899.00-1901.88 | 52S | 2000 | very fine (-10mesh) | Dm | SKRET | below | 24 |
| | 2056.38-2075.00 | 54 | 20000 | coarse (-1/2") | Diab | POT | below | 74 |

Notes: A Test ID with a "s" indicates that the column was converted to a shoebox during humidity cell testing. Saturated column (SC) tests are designated in the database as SC (e.g., Test 52S is referred to as SC52). Lithology types include: Kvs = Cretaceous volcanic & sediments (undifferentiated); QEP = quartz eye porphyry; Diab = diabase; Qzite = quartzite; Tal = Tertiary Apache Leap Tuff (Ignimbrite); Tw = Tertiary Whitetail Conglomerate; Dm = Devonian Martin limestone (skarn). Alteration types include: POT = Potassic; PHY = Phyllic; UNALT = unaltered; AA = Advanced Argillic; SKRET = Retrograde Skarn.

**Table 4.** Summary of test set-up and pore volume data for samples characterized with saturated flow through column testing.

| Test ID | Cell Diameter (cm) | Height of Rock Column (cm) | Leach Solution (mL) | Flow Rate (mL/hr) | Time Pump is on (days) | Dry Bulk Density ($g/cm^3$) | Porosity (-) | One Pore Volume (mL) | Pore Volumes Flushed (-) | SCT Weeks Tested |
|---|---|---|---|---|---|---|---|---|---|---|
| SC2 | 16.2 | 24.3 | 3333 | 19.84 | 7.00 | 2.0 | 0.33 | 1667 | 22 | 12 |
| SC11 | 10.2 | 30.8 | 1800 | 15.00 | 5.00 | 2.0 | 0.33 | 833 | 25 | 12 |
| SC12 | 10.2 | 30.8 | 1800 | 15.00 | 5.00 | 2.0 | 0.33 | 833 | 25 | 12 |
| SC14 | 16.2 | 24.3 | 3333 | 19.84 | 7.00 | 2.0 | 0.33 | 1667 | 23 | 12 |
| SC21 | 7.6 | 21.9 | 1500 | 15.00 | 4.17 | 2.0 | 0.33 | 333 | 53 | 12 |
| SC28 | 10.2 | 30.8 | 1800 | 15.00 | 5.00 | 2.0 | 0.33 | 833 | 24 | 12 |
| SC34 | 16.2 | 22.1 | 3333 | 19.84 | 7.00 | 2.2 | 0.27 | 1212 | 30 | 12 |
| SC38 | 16.2 | 26.5 | 4000 | 23.81 | 7.00 | 2.2 | 0.27 | 1455 | 30 | 12 |
| SC39 | 16.2 | 25.4 | 3833 | 22.82 | 7.00 | 2.2 | 0.27 | 1394 | 31 | 12 |
| SC44 | 16.2 | 44.1 | 4000 | 23.81 | 7.00 | 2.2 | 0.27 | 2424 | 18 | 12 |
| SC49 | 10.2 | 24.7 | 1800 | 15.00 | 5.00 | 2.0 | 0.33 | 667 | 31 | 12 |
| SC50 | 7.6 | 16.4 | 1500 | 15.00 | 4.17 | 2.0 | 0.33 | 250 | 72 | 12 |
| SC52 | 7.6 | 21.9 | 1500 | 15.00 | 4.17 | 2.0 | 0.33 | 333 | 52 | 12 |
| SC54 | 16.2 | 44.1 | 4000 | 23.81 | 7.00 | 2.2 | 0.27 | 2424 | 18 | 12 |

Notes: The dry bulk density and porosity were calculated based on test cell dimensions, mass of material, and assumption that density of solids was 3.0 $g/cm^3$. Dry bulk density is equal to the mass of rock divided by total cell volume. Porosity is equal to one minus the ratio between the dry bulk density and density of solids. The pore volume was calculated by multiplying the total cell volume by the porosity. The number of pore volumes flushed was calculated from the total volume of leachate collected divided by the quantity of one pore volume.

# 3.0 RESULTS

## 3.1 Tier 1 Testing

### 3.1.1 Acid Base Accounting

Results of the Tier 1 testing showed that the majority of the rocks tested had the potential to generate acidic conditions. All of the ABA results are tabulated in Appendix A.

Sixty-one percent of the samples had a NNP that are indicative of rocks that are potentially-acid generating. Approximately 30 percent of the samples had an uncertain potential to generate acid and approximately nine percent of the samples would be classified as not-potentially-acid generating.

Similar to the NNP evaluation, using the NPR criteria, the majority of rocks tested were classified as potentially-acid generating; however, the fractions with uncertain or not-potentially-acid generating classifications were slightly different than the distributions using NNP classification criteria. Based on the NPR criteria, 68 percent of the samples tested indicated that they were potentially-acid generating with a NPR less than 1. Approximately 13 percent of the samples had an uncertain potential to generate acid ($1 < NPR < 3$) and approximately 19 percent of the samples would be classified as not potentially acid generating with NPR values greater than 3. Figure 1 shows the distribution of acid generating and acid neutralizing rocks in a plot that graphically represents the NPR.

Approximately 27 percent of the Tier 1 samples had sulfide-sulfur concentrations below 0.3 percent, and could be classified as not potentially acid generating because they do not have sufficient sulfide-sulfur generally considered capable of sustaining acid generation (Price, 1997; Soregaroli and Lawrence, 1998). When these samples were removed from consideration (i.e., only considering the rocks with sufficient sulfide-sulfur to sustain acid generation), approximately 90 percent of the rocks were potentially acid generating, five percent were uncertain, and five percent were not potentially acid generating, regardless of the criteria applied.

The Tier 2 samples selected for humidity cell testing were representative of the Tier 1 ABA sample results, and weighted toward the abundance of the rock types expected to occur within and above the ore body. The ABA results for Tier 2 samples showed a similar distribution of rocks classified as potentially-acid generating, uncertain, and not potentially acid generating as the larger Tier 1 results. An NPR evaluation of the Tier 2 data showed 72 percent of the samples were potentially acid generating, six percent were uncertain, and 21 percent were not potentially acid generating; whereas, the NNP evaluation showed 66 percent of the samples were potentially-acid generating, 17 percent were uncertain, and 17

percent were not-potentially-acid generating. Figure 1 shows the distribution of acid generating and acid neutralizing potentials for Tier 2 samples in a plot that graphically represents the NPR.

### 3.1.2 Net Acid Generation Testing

As described in Section 2.2.2, NAG test results provide rapid analysis of whether a particular rock is likely to generate acid, but does not provide an indication of the neutralizing potential of that rock. The final pH measurement of the NAG tests indicated that approximately 60 percent of the rocks were potentially acid generating (pH less than 4.5) and 40 percent were not-potentially-acid generating (pH greater than 4.5). All of the NAG results are tabulated in Appendix B.

Because NAG tests do not provide a measure of the neutralizing potential of the rocks, it is helpful to examine the NAG results in conjunction with the ABA results. Figure 2 is a plot of the NNP results as a function of the NAG results. The plot can be used as further confirmation that the distribution of rocks identified as potentially-acid generating is similar between testing procedures. Using both NAG and NNP classifications 57 percent of the rocks would be classified as potentially-acid generating, while nine percent of the rocks would be classified as not-potentially-acid generating. The percentage of rocks that fall under the uncertain range (30 percent) is solely based on the NNP results, because there is no uncertain range defined by the NAG criteria. Figure 3 compares the ore and non-ore samples in a plot of NNP results as a function of NAG results. Using both NAG and NNP classifications, 85 percent of the ore samples and 39 percent of the non-ore samples would be classified as potentially-acid generating.

The arithmetic means of the NAG pH and NNP results for the different rock types are compared in Figure 4 with error bars showing the one standard deviation of the sample results. Based on NAG and NNP classifications, the following rock types are either considered non-potentially acid generating by both criteria or potentially acid generating only by the NNP criteria: andesite, Tertiary Whitetail conglomerate, Devonian Martin limestone, and the Tertiary Apache Leap tuff. All other rock types can be classified as potentially-acid generating by both criteria.

The resulting leachate of the NAG testing following complete oxidation of the sulfide minerals was also analyzed for a full suite of typical major ion and metals and is included in Appendix B. It should be noted that several of the constituents (i.e., beryllium, chloride, fluoride, and mercury) we analyzed using detection limits that were greater than the corresponding drinking water standard.

### 3.1.3 Synthetic Precipitation Leaching Procedure

Leachates generated from the SPLP tests indicate the constituents that were easily leachable from a given sample. All of the SPLP results are tabulated in Appendix C. Compared to U.S. drinking water

standards, several samples had elevated levels of aluminum and a lesser number of samples had elevated concentrations of iron, manganese, chloride, fluoride, and sulfate. These elevated results could be the result of small amounts of oxidation that may have occurred in the core between collection of the core and the SPLP analysis, or from naturally occurring soluble minerals within the rock.

### 3.1.4 Whole Rock Chemical Analysis

The typical approach for evaluating whole rock analytical data is to compare them to crustal averages. All of the whole rock results are tabulated in Appendix D, while XRF results are tabulated in Appendix E. A review of the data indicates that the samples are elevated in most metals and metalloids (e.g., antimony, arsenic, bismuth, copper, lead, molybdenum, potassium, selenium, silver, tellurium, tin, and zinc) relative to ranges normally found in average crustal rocks. These enrichments in metal concentrations are to be expected for rocks associated with an ore deposit. While whole rock chemistry data cannot be used to define rates of metal leaching, they can be used for qualitative identification of which metals are present at elevated levels (e.g., arsenic, selenium, etc.) and therefore are potentially leachable.

## 3.2 Tier 2 Testing

### 3.2.1 Humidity Cell Testing

As described in Section 2.3.1, HCTs were used to evaluate whether samples with an uncertain potential to generate acid (as measured in ABA testing) will produce acidic leachate under accelerated laboratory conditions. In addition, the HCTs were used to determine sulfide oxidation rates and masses of leachable constituents of the potentially acid generating and not-potentially acid generating rocks for use in the predictive geochemical model of the block cave. A full compilation of the analytical results for the HCTs is presented in Appendix F.

HCT results with respect to the range of pH values and sulfate concentrations of the column effluents are summarized in Table 5. Table 5 also includes the ABA results for each sample. As expected, most of the samples with strongly negative NNP values produced acidic leachates; however, skarns and dolomites tended to produce circumneutral pH values regardless of their NNP values. Samples with NNP values that had uncertain potential to generate acid typically did not generate acidic leachate.

## 3.3 Grain Size Analyses

Grain size analysis was performed by sieving and the clay fraction was not determined (no hydrometer testing). Grain size data and gradation curves are plotted in Appendix G.

### 3.4 Saturated Column Testing

The SCT results provide information regarding the quality of water that would be expected to occur within reflooded portions of the block cave. All of the SCT results are tabulated in Appendix H. The number of pore volumes flushed during testing is summarized in Table 4. On average, approximately three pore volumes were flushed during each week of testing (minimum of one pore volume and maximum of six pore volumes per week).

The leachate chemistries (pH, alkalinity (total), acidity (total), and sulfate) for the final week of humidity cell testing, first week of saturated column testing, and final week of saturated column testing are summarized in Table 6. The initial solute concentrations of the SCT leachate (week 1) were much higher than the final HCT leachate concentrations. This difference is attributed to evapoconcentration of pore water after the HCTs were terminated and sat dormant in the laboratory. However, despite the temporary, large increase in concentrations, continued flow under saturated conditions resulted in rapid rinse-out of metals. Typically, non-detect concentrations were reported after a few weeks of testing.

For SCTs with acidic pH, acidity showed a rapid rinse-out (alkalinity generally reported at level of detection). While for SCTs with alkaline pH, alkalinity showed a less rapid rinse-out (acidity generally reported at level of detection). Samples with week 1 acidic pHs (<5 s.u.) in the leachate increased between 0.5 and 1.7 pH units during testing, but still remained acidic at week 12. Samples with alkaline pHs remained more or less stable. The major cations (Ca, K, Na, Mg, and Si) typically remained detectable but at lower concentrations than during week 1 and week 2. Sulfate had a bimodal response: some columns showed rapid rinse-out reaching concentrations around <10 to 90 mg/L, while other columns showed more or less steady concentrations around 1,400 mg/L throughout testing. Differences in rinse-out response for sulfate could be associated with rapid dissolution of soluble secondary iron-sulfate (sulfosalt) precipitates, or slower transition toward equilibrium conditions with respect to gypsum.

Tests were terminated after week 12 because of the rapid decrease in the concentration of metals, acidity, and sulfate. For acidic columns, dissolution of less soluble secondary precipitates was anticipated to occur at a slow rate and was therefore not evaluated as a termination criterion. Consistent with the timeframes required for closure modeling, the number of pore volumes flushed through the SCTs in 12 weeks would take thousands of years to flush the equivalent number of pore volumes through the block cave.

## 3.5 Mineralogical Testing

### 3.5.1 Petrography

A comparison of samples collected pre- and post-humidity cell testing indicates that the starting and final mineralogy remained largely unchanged. Petrographic photographs are presented in Appendix I. Petrographic examination revealed occurrences of stained silicate grains adjacent to partially oxidizing sulfide grains. However, no mineral reaction rims were observed in contact with the sulfide mineral grains. Thin sections showed that typically 30 to 50 percent of the sulfides (pyrite) were encapsulated in silicates. Encapsulation of pyrite does not mean that the minerals are completely unavailable to oxidation, but because oxygen has to diffuse through the silicate and reaction products have to diffuse out, the oxidation of the sulfides is many orders of magnitude slower than with exposed pyrite (i.e., oxidation of pyrite may be slow enough such that the mine could be reflooded before such oxidation occurs).

### 3.5.2 X-ray Diffraction

A comparison of samples collected pre- and post-humidity cell testing indicates that the starting and final mineralogy remained largely unchanged with the occasional inclusion of ferrihydrite, gypsum, and some clay minerals in the post-test samples. The results of the XRD analyses indicate that the secondary mineral phases that precipitated during humidity cell testing generally could not be detected. The lack of detection, despite some sampling procedures that included high-grading of mineral precipitates, can be attributed to either: (1) the low modal concentrations (<1 percent) and/or (2) the phases observed visually are amorphous (poorly crystalline) solids which are difficult to detect with XRD. Since minimal secondary precipitates were observed, the XRD results also suggest that HCTs operated as designed by rinsing out nearly all of the reaction products on a weekly basis. The combined mineralogic data resulting from petrographic and XRD observations for selected pre- and post- HCT samples are presented in Appendices J and K.

### 3.5.3 Scanning Electron Microscopy

Similar to the petrographic results, the results of SEM showed iron staining adjacent to oxidizing pyrite grains, and based on EDX spectra the precipitate is either iron sulfate or jarosite. SEM also showed that the vast majority of the sulfide grains had no reaction rims or visible oxidation rinds. SEM and thin section analyses showed that pyrite grains were subheudral to subrounded, and are therefore potentially less reactive because the smaller surface area to volume ratio relative to a framboidal texture which would be anticipated to oxidize more quickly. SEM photographs are presented in Appendix L.

**Table 5.** Summary of acid base accounting data and selected chemical parameters from humidity cell testing.

| Hole ID | Depth Interval (m) | Test ID | ANP | AGP | NNP | Min pH | Max pH | Final pH | Min Sulfate | Max Sulfate |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | (T $CaCO_3$/kT) | | | (s.u.) | | | (mg/L) | |
| RES-001C | 1639.00-1642.00 | 1s | 40 | 52 | -12 | 6.83 | 8.81 | 7.71 | 10 | 1070 |
| | 1745.00-1748.00 | 2 | 21 | 34 | -13 | 6.76 | 8.02 | 7.05 | 230 | 1860 |
| | 1771.75-1791.40 | 3 | 174 | 18 | 156 | 7.23 | 7.84 | 7.68 | 234 | 1150 |
| | 1855.00-1858.00 | 4s | 161 | 26 | 135 | 7.27 | 7.99 | 7.43 | 80 | 2390 |
| | 1855.00-1858.00 (dup) | 5 | 161 | 26 | 135 | 7.05 | 8.21 | 7.07 | 103 | 2380 |
| | 1873.00-1876.00 | 6 | 249 | 68 | 181 | 7.16 | 8.44 | 7.89 | 14 | 1720 |
| | 2041.00-2044.00 | 7 | 45 | 112 | -67 | 7 | 7.98 | 7.78 | 162 | 1680 |
| | 2041.00-2044.00 (dup) | 8 | 45 | 112 | -67 | 7.31 | 7.94 | 7.78 | 359 | 2210 |
| RES-002A | 888.00-891.00 | 9s | 1 | 2 | -1 | 6.59 | 8.19 | 6.59 | <5 | 24 |
| | 1154.00-1156.00 | 10s | 1 | 91 | -90 | 4.68 | 5.41 | 5.07 | <10 | 1310 |
| | 1414.60-1417.00 | 11 | <1 | 205 | -204 | 3.9 | 4.69 | 3.94 | 68 | 1080 |
| | 1454.00-1457.00 | 12 | 1 | 275 | -274 | 4.55 | 7.61 | 4.95 | <5 | 1160 |
| | 1454.00-1457.00 (dup) | 13 | 1 | 275 | -274 | 5.14 | 7.33 | 6.59 | <5 | 808 |
| | 1927.00-1930.00 | 14 | 60 | 81 | -21 | 5.53 | 7.44 | 5.77 | 807 | 1870 |
| RES-005I | 1317.28-1320.28 | 15 | 305 | <1 | 304 | 7.71 | 9.01 | 8.11 | 24 | 236 |
| | 1428.18-1431.18 | 16s | 3 | 1 | 2 | 6.89 | 7.97 | 7.17 | <5 | 406 |
| | 1428.18-1431.18 (dup) | 17s | 3 | 1 | 2 | 5.64 | 8.04 | 7.23 | <5 | 376 |
| | 1499.00-1502.00 | 18s | 3 | 2 | 1 | 6.61 | 8.16 | 6.61 | <5 | 44 |
| | 1586.46-1589.46 | 19s | 3 | 1 | 2 | 4.72 | 7.86 | 6.36 | <5 | 166 |
| | 1632.56-1635.56 | 20s | <1 | 131 | -130 | 4.64 | 6.7 | 4.92 | 17 | 1000 |
| | 1652.00-1654.93 | 21 | 2 | 146 | -144 | 3.52 | 5.86 | 3.63 | 14 | 436 |
| | 1654.93-1659.80 | 22s | <1 | 178 | -177 | 5.64 | 7.46 | 5.8 | <10 | 489 |
| | 1759.23-1761.23 | 23 | 5 | 152 | -147 | 3.66 | 5.01 | 3.68 | 55 | 997 |
| | 1892.81-1895.00 | 24 | 2 | 88 | -86 | 4.1 | 5.27 | 4.17 | 11 | 832 |
| | 1917.29-1920.90 | 25s | 17 | 110 | -93 | 4.78 | 6.43 | 4.82 | <10 | 1020 |
| RES-005J | 1660.40-1686.47 | 26 | 1 | 162 | -161 | 5.55 | 7.72 | 5.73 | <5 | 91 |

**Table 5.** Summary of acid base accounting data and selected chemical parameters from humidity cell testing (continued).

| Hole ID | Depth Interval (m) | Test ID | ANP | AGP | NNP | Min pH | Max pH | Final pH | Min Sulfate | Max Sulfate |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | (T $CaCO_3$/kT) | | | (s.u.) | | | (mg/L) | |
| RES-006D | 1750.40-1753.40 | 27 | <1 | 331 | -330 | 3.34 | 4.38 | 3.81 | 63 | 4610 |
| | 1898.21-1901.09 | 28 | 1 | 176 | -175 | 3.3 | 5.11 | 3.76 | 37 | 3480 |
| | 1952.56-1954.83 | 29s | 1 | 54 | -53 | 4.02 | 5.47 | 4.19 | <10 | 240 |
| | 1954.83-1972.00 | 30 | 1 | 99 | -98 | 4.6 | 6.51 | 4.6 | 80 | 290 |
| | 1980.60-1983.60 | 31s | <1 | 397 | -396 | 3.59 | 4.16 | 3.73 | 45 | 3330 |
| | 2091.13-2094.13 | 32s | 31 | 79 | -48 | 6.35 | 7.93 | 6.36 | <10 | 2970 |
| RES-008A | 1597-1600 | 33 | 209 | 0.3 | 209 | 7.84 | 8.72 | 8.14 | <5 | 40 |
| | 1717-1720 | 34 | 16 | 135 | -119 | 6.63 | 8.13 | 7.10 | 20.00 | 267 |
| | 1844.1-1846.6 | 35 | 56 | 307.5 | -252 | 7.25 | 8.23 | 7.85 | 46.00 | 769 |
| | 1979.95-1982.94 | 36 | 69 | 696.9 | -628 | 7.0 | 8.0 | 7.6 | 142.0 | 664 |
| | 2053.81-2056.81 | 37 | 24 | 371.9 | -348 | 3.3 | 8.0 | 7.0 | 14.0 | 1870 |
| RES-009 | 278.90-281.09 | 38 | 12 | <1 | 11 | 8.07 | 9.08 | 8.07 | <5 | <10 |
| | 645.59-647.52 | 39 | 91 | <1 | 90 | 8.72 | 9.53 | 8.72 | <5 | 27 |
| | 804.84-807.00 | 40 | 128 | <1 | 127 | 7.38 | 8.64 | 7.75 | 173 | 787 |
| | 804.84-807.00 (dup) | 41 | 128 | <1 | 127 | 6.82 | 8.26 | 7.58 | 159 | 878 |
| | 994.67-997.67 | 42 | 17 | <1 | 16 | 6.94 | 8.94 | 6.94 | <5 | 2260 |
| RES-009E | 1351.03-1354.03 | 43 | 1 | 151 | -150 | 3.59 | 4.94 | 3.59 | 63 | 2190 |
| | 1510.74-1527.19 | 44 | 2 | 309 | -307 | 2.56 | 4.56 | 2.7 | 244 | 1250 |
| | 1510.74-1527.19 (dup) | 45 | 2 | 309 | -307 | 3.61 | 4.47 | 3.64 | 94 | 597 |
| | 1510.74-1527.19 (trip) | 46 | 2 | 309 | -307 | 4 | 4.65 | 4.11 | 23 | 139 |
| | 1597.32-1599.88 | 47s | <1 | 453 | -452 | 3.43 | 3.87 | 3.43 | 96 | 4330 |
| | 1634.46-1637.47 | 48s | 2 | 218 | -216 | 4.11 | 5.04 | 4.13 | 45 | 2250 |
| | 1739.63-1742.63 | 49s | 4 | 76 | -72 | 5.06 | 4.02 | 4.54 | 31 | 1150 |
| | 1829.95-1832.48 | 50 | 28 | 240 | -212 | 4.11 | 4.63 | 4.19 | 318 | 3450 |
| | 1867.87-1884.35 | 51 | 396 | 227 | 169 | 7.42 | 8.04 | 7.63 | 172 | 601 |
| | 1899.00-1901.88 | 52s | 85 | 215 | -130 | 6.87 | 8.35 | 7.22 | 63 | 2250 |
| | 1984.74-1987.74 | 53 | 9 | 76 | -67 | 4.19 | 5.89 | 5.37 | 626 | 2090 |
| | 2056.38-2075.00 | 54 | 21 | 68 | -47 | 5.45 | 7.64 | 6.16 | 603 | 1120 |

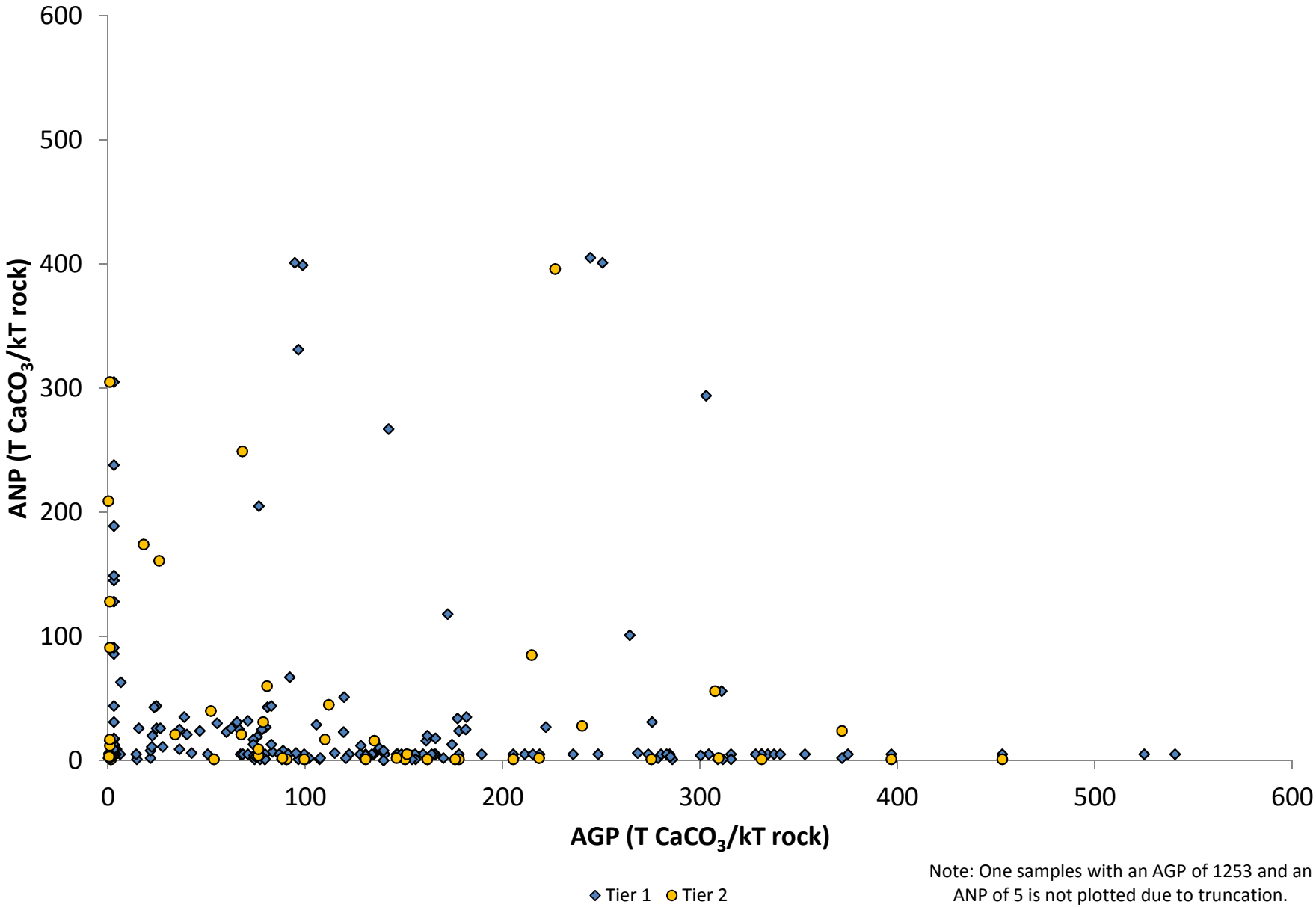
Note: A Test ID with a "s" indicates that the column was converted to a shoebox during humidity cell testing. AGP calculated from total-sulfur minus sulfate-sulfur.

**Table 6.** Summary of leachate chemistry (pH, alkalinity, acidity, and sulfate) for the final week of humidity cell testing, first week of saturated column testing, and final week of saturated column testing.

| Test ID | HCT Final Week | SCT Week 1 | SCT Week 12 | HCT Final Week | SCT Week 1 | SCT Week 12 | HCT Final Week | SCT Week 1 | SCT Week 12 | HCT Final Week | SCT Week 1 | SCT Week 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | pH | | | Total Alkalinity | | | Total Acidity | | | Sulfate | | |
| | (s.u.) | | | (mg/L as $CaCO_3$) | | | (mg/L as $CaCO_3$) | | | (mg/L) | | |
| SC2 | 7.05 | 7.18 | 6.77 | 16 | 29 | 11.6 | <5 | <5 | <5 | 615 | 1470 | 1020 |
| SC11 | 3.74 | 3.09 | 3.64 | <5 | <5 | <5 | 137 | 5183 | 66 | 158 | 6750 | 77 |
| SC12 | 4.92 | 4.58 | 5.06 | <5 | <5 | <5 | 329 | 2190 | 71 | 376 | 3310 | 85 |
| SC14 | 5.77 | 5.03 | 5.56 | <5 | <5 | <5 | 65 | 411 | 15 | 807 | 1750 | 1580 |
| SC21 | 3.63 | 3.08 | 4.46 | <5 | <5 | <5 | 108 | 1544 | 9 | 105 | 1530 | <10 |
| SC28 | 3.76 | 2.94 | 4.61 | <5 | <5 | <5 | 237 | 7280 | 27 | 225 | 11000 | 20 |
| SC34 | 7.10 | 7.44 | 7.55 | 8 | 51 | 26 | <5 | <5 | <5 | 33 | 299 | <10 |
| SC38 | 8.58 | 7.95 | 8.02 | 23 | 86 | 23 | <5 | <5 | <5 | <10 | 10 | <10 |
| SC39 | 8.78 | 8.34 | 8.86 | 57 | 148 | 48 | <5 | <5 | <5 | <10 | 151 | <10 |
| SC44 | 2.7 | 2.43 | 3.80 | <5 | <5 | <5 | 482 | 2180 | 60 | 567 | 2790 | 63 |
| SC49 | 4.57 | 3.17 | 4.09 | <5 | <5 | <5 | 49 | 14980 | 40 | 50 | 17400 | 34 |
| SC50 | 4.21 | 3.81 | 4.72 | <5 | <5 | <5 | 345 | 1750 | 33 | 496 | 2660 | 49 |
| SC52 | 7.32 | 7.57 | 7.79 | 14 | 130 | 42 | <5 | <5 | <5 | 77 | 1340 | 10 |
| SC54 | 6.30 | 6.37 | 7.53 | <5 | 12 | 35 | 10 | 28 | <5 | 603 | 1600 | 1350 |

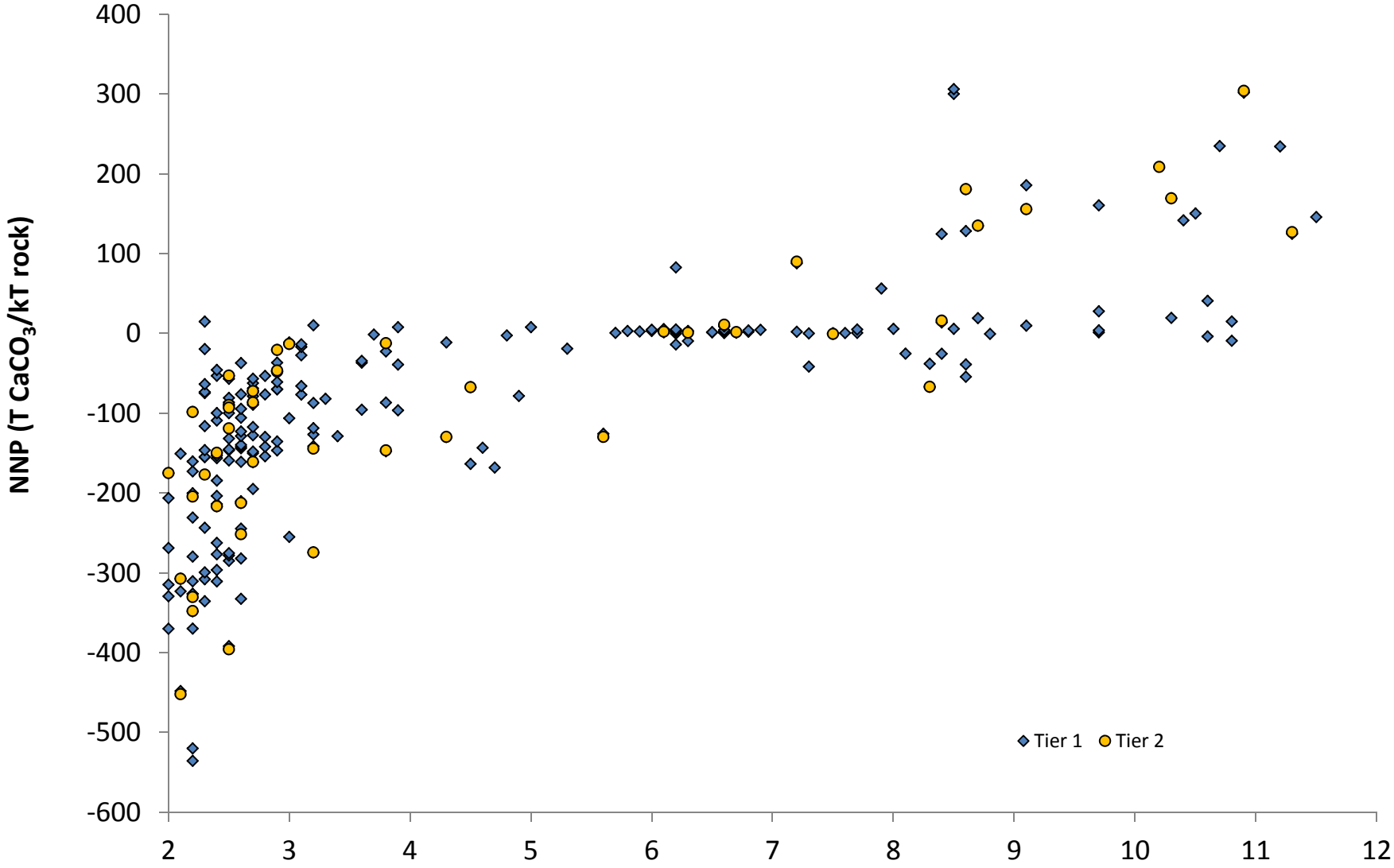
Note: A week 1 water sample was not collected in Test SC14 due to insufficient volume; week 2 data are presented.

Figure 1. Acid generation potential (AGP) versus acid neutralization potential (ANP)



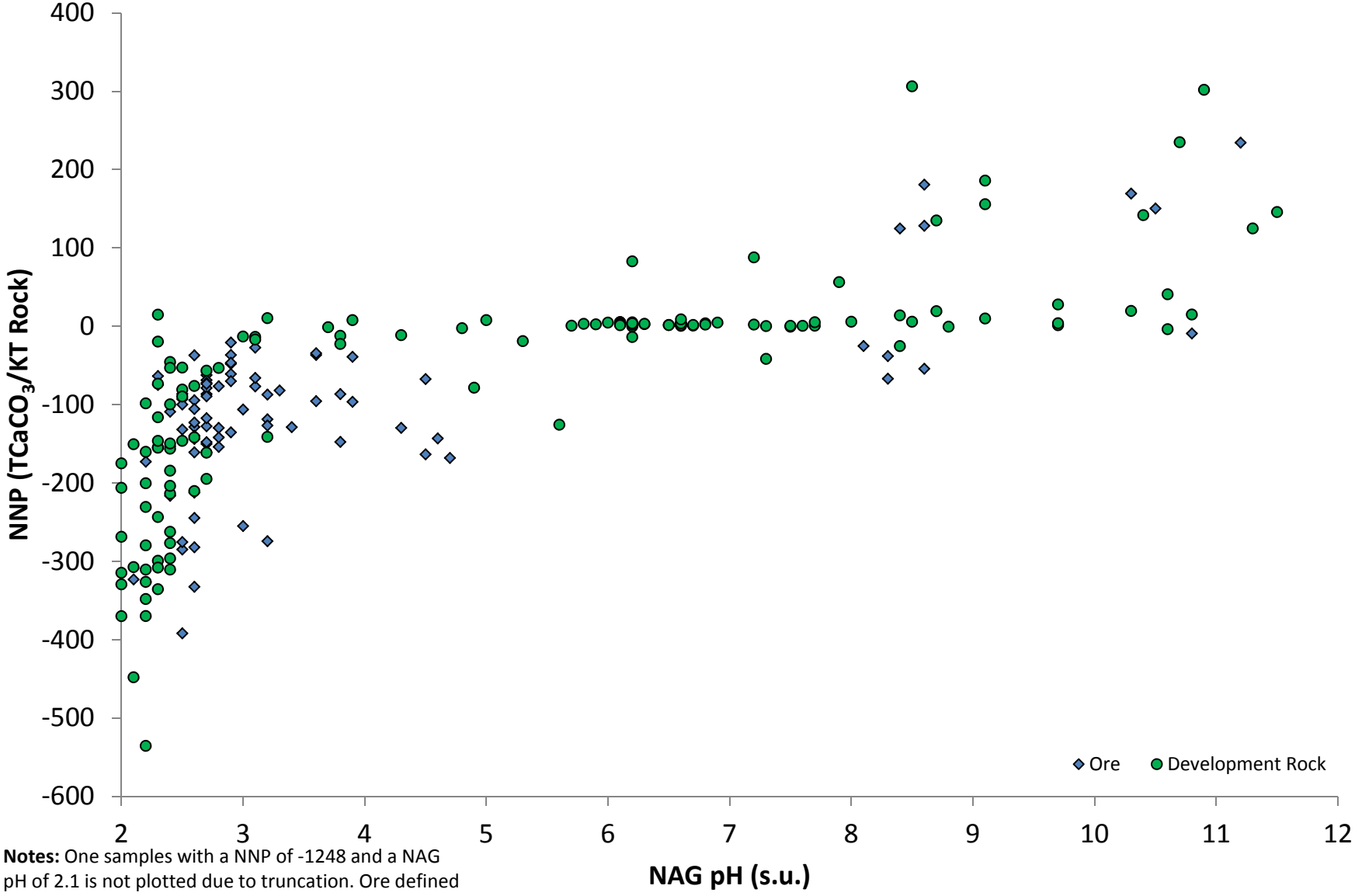

Note: One samples with an AGP of 1253 and an ANP of 5 is not plotted due to truncation.

Figure 2. Net acid generation (NAG) solution pH after oxidation versus net neutralization potential (NNP).



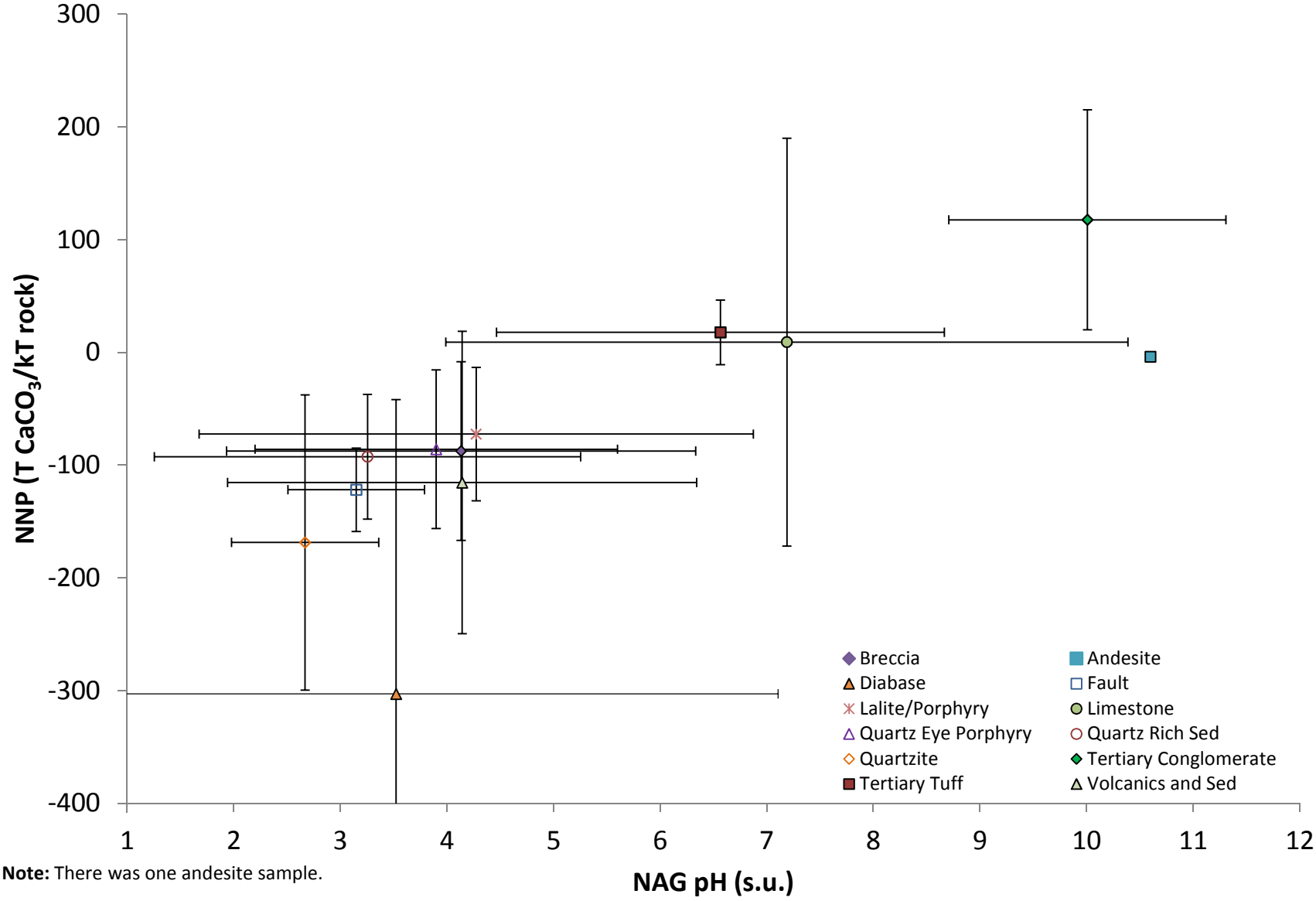

Note: One samples with a NNP of -1248 and a NAG pH of 2.1 is not plotted due to truncation.

**Figure 3.** Net acid generation (NAG) pH versus net neutralization potential (NNP) for ore and development rock.




**Notes:** One samples with a NNP of -1248 and a NAG pH of 2.1 is not plotted due to truncation. Ore defined as material located within the 1% copper shell.

**Figure 4.** Average net acid generation (NAG) pH versus average net neutralization potential (NNP) for each rock type.




**Note:** There was one andesite sample.

# 4.0 QUALITY ASSURANCE/QUALITY CONTROL

The following quality assurance items were reviewed as part of the data verification and compared with acceptance criteria documented in the project quality assurance project plan (QAPP) (MWH, 2008) and based on the Arizona Department of Health Services (ADHS) lab data qualifiers (ADHS, 2003):

- Sample collection and sample extract holding times
- Internal standard (IS)
- Continuing calibration blank (CCB) sample results
- Laboratory method blank (MB) sample results
- Laboratory fortified blank (LFB) percent recoveries
- Laboratory replicate (LR)
- Matrix spike/matrix spike duplicate (MS/MSD) sample percent recoveries (where applicable)
- MS/MSD relative percent differences (RPDs) (where applicable)
- Serial dilutions
- Inductively coupled plasma (ICP) interference check standard (ICS)
- Post-digestion spike
- Field duplicate sample RPDs
- Laboratory observations are also taken into account.

Data verification results are summarized in Appendix M.

# 5.0 CONCLUSIONS

The samples selected for testing cover the probable range of sulfide mineral contents, acid generation potentials, acid neutralization potentials, and the major rock/alteration types of the ore body and major rock/alteration types that will remain following ore extraction within the block cave. Thus, the Tier 1 and Tier 2 test results for the samples summarized here provide the basis for the prediction of acid drainage and metal leaching used in the predictive geochemical model of the block cave.

The results of Tier 1 testing showed that the majority of the rocks tested had the potential to generate acidic conditions. Leachate test results were compared to U.S. drinking water standards, and several samples had elevated levels of aluminum with a lesser number of samples having elevated concentrations of iron, manganese, chloride, fluoride, and sulfate. Whole rock chemical analysis results indicate that the samples are elevated in most metals and metalloids when compared to the crustal averages.

Tier 2 samples selected for HCTs were representative of the Tier 1 ABA sample results and weighted toward the abundance of the rock types expected to occur within and above the ore body. The HCTs were used to evaluate whether samples with an uncertain potential to generate acid will produce acidic leachate under accelerated laboratory conditions. The HCTs were also used to determine sulfide oxidation rates and masses of leachable constituents of the potentially acid generating and not-potentially acid generating rocks for use in the predictive geochemical model of the block cave.

The HCT results demonstrate that most of the samples with strongly negative NNP values produced acidic leachates; however, skarns and dolomites tended to produce circumneutral pH values regardless of their NNP Values. Samples with NNP values that had uncertain potential to generate acid typically did not generate acidic leachate.

Saturated column tests provided information regarding the quality of water that would be expected to occur within reflooded portions of the block cave. For SCTs with acidic pH, acidity showed a rapid rinse-out; however, for SCTs with alkaline pH, alkalinity showed a less rapid rinse-out.

Mineralogical testing was included in the Tier 2 analyses. Thin sections showed that typically 30 to 50 percent of the sulfides (pyrite) were encapsulated in silicates; therefore, the oxidation of the portion of sulfides is many orders of magnitude slower than with exposed pyrite. XRD results showed that secondary mineral phases that precipitated during humidity cell testing generally could not be detected, suggesting that HCTs operated as designed by rinsing out nearly all of the reaction products on a weekly basis.

## 6.0 REFERENCES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**APPENDIX A**
**ACID BASE ACCOUNTING RESULTS**

# APPENDIX A
# ACID/BASE ACCOUNTING RESULTS

| Hole ID | Sample ID | Type | ACZS M600 1. Acid Generation Potential T CACO3/KT | ACZS M600 1. Acid Neutralization Potential T CACO3/KT | M600 3. Total Sulfur PERCENT | Sulfur Residual PERCENT | Sulfur Pyritic Sulfide PERCENT | Sulfur Sulfate PERCENT | Total Sulfur minus Sulfate PERCENT |
|---|---|---|---|---|---|---|---|---|---|
| RES-001C | RES-001C 1502-1505 | N | 77 | 1 F | 2.74 | 0.65 | 1.82 | 0.27 | 2.47 |
| | RES-001C 1530-1533 | N | 89 | 8 | 3.3 | 0.71 | 2.13 | 0.46 | 2.84 |
| | RES-001C 1557-1560 | N | 128 | 12 | 4.6 | 1 | 3.1 | 0.5 | 4.1 |
| | RES-001C 1584-1587 | N | 74 | 17 | 2.56 | 0.54 | 1.82 | 0.2 | 2.36 |
| | | FD | 76 | 19 | 2.72 | 0.59 | 1.83 | 0.3 | 2.42 |
| | RES-001C 1611-1614 | N | 67 | 25 | 2.45 | 0.65 | 1.48 | 0.32 | 2.13 |
| | RES-001C 1639-1642 | N | 52 | 40 | 1.85 | 0.41 | 1.26 | 0.18 | 1.67 |
| | RES-001C 1666-1669 | N | 55 | 30 | 2.06 | 0.43 | 1.34 | 0.29 | 1.77 |
| | RES-001C 1693-1696 | N | 47 | 24 | 1.73 | 0.38 | 1.11 | 0.24 | 1.49 |
| | RES-001C 1711-1714.96 | N | 39 | 35 | 1.81 | 0.31 | 0.93 | 0.57 R1 | 1.24 |
| | RES-001C 1745-1748 | N | 34 | 21 | 2.59 | 0.23 | 0.86 | 1.5 | 1.09 |
| | RES-001C 1771.75-1791.4 | N | 18 | 174 | 1.59 | 0.28 | 0.3 | 1.01 | 0.58 |
| | RES-001C 1781-1784 | N | 6.56 | 63 | 2.09 | 0.1 | 0.11 | 1.88 | 0.21 |
| | RES-001C 1799-1802 | N | 99 | 399 | 3.36 | 1.06 | 2.1 | 0.2 | 3.16 |
| | | FD | 95 | 401 | 3.3 | 1.05 | 1.98 | 0.27 | 3.03 |
| | RES-001C 1814-1817 | N | 25 | 44 | 1.54 | 0.33 | 0.46 | 0.75 | 0.79 |
| | RES-001C 1837-1840 | N | 23 | 43 | 2.11 | 0.32 | 0.43 | 1.36 | 0.75 |
| | RES-001C 1855-1858 | N | 26 | 161 | 1.04 | 0.4 | 0.43 | 0.21 | 0.83 |
| | RES-001C 1873-1876 | N | 68 | 249 | 2.31 | 1.49 | 0.69 | 0.13 | 2.18 |
| | RES-001C 1892.5-1895 | N | 77 | 205 | 2.52 | 1.33 | 1.12 | 0.07 F | 2.45 |
| | RES-001C 1934-1937 | N | 83 | 7 | 3.3 | 0.5 | 2.17 | 0.63 | 2.67 |
| | RES-001C 1987-1990 | N | 106 | 29 | 3.78 | 1.53 | 1.85 | 0.4 | 3.38 |
| | RES-001C 2007-2010 | N | 83 | 44 | 3.09 | 1.28 | 1.37 | 0.44 | 2.65 |
| | | FD | 81 | 43 | 2.97 | 1.29 | 1.3 | 0.38 | 2.59 |
| | RES-001C 2041-2044 | N | 112 | 45 | 4.13 | 1.9 | 1.68 | 0.55 | 3.58 |
| | RES-001C 2115-2118 | N | 142 | 267 | 5.11 | 1.93 | 2.62 | 0.56 | 4.55 |
| | RES-001C 2164.4-2166.3 | N | 1253 | 5 | 41.9 | 7.88 | 32.2 | 1.76 | 40.1 |
| | RES-001C 2214-2215 | N | 138 | 10 | 6.76 | 1.9 | 2.5 | 2.36 | 4.4 |
| | RES-001C 2242-2244 | N | 178 | 24 | 8.24 | 1.93 | 3.76 | 2.55 | 5.69 |

T CaCO3/KT = tons calcium carbonate per kiloton

F = Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit

FD = field duplicate

N = normal

R1 - Relative percent difference exceeded the method control limit

## APPENDIX A
## ACID/BASE ACCOUNTING RESULTS

| Hole ID | Sample ID | Type | ACZS M600 1. Acid Generation Potential T CACO3/KT | ACZS M600 1. Acid Neutralization Potential T CACO3/KT | M600 3. Total Sulfur PERCENT | Sulfur Residual PERCENT | Sulfur Pyritic Sulfide PERCENT | Sulfur Sulfate PERCENT | Total Sulfur minus Sulfate PERCENT |
|---|---|---|---|---|---|---|---|---|---|
| RES-002A | RES-002A 1007-1010 | N | 6.25 | <1 | 0.24 | 0.16 | 0.04 F | 0.04 F | 0.2 |
| | RES-002A 1058-1061 | N | 51 | <1 | 1.73 | 0.23 | 1.39 | 0.11 | 1.62 |
| | RES-002A 1109-1112 | N | 74 | 1 F | 2.52 | 0.4 | 1.98 | 0.14 | 2.38 |
| | RES-002A 1154-1156 | N | 91 | 1 F | 3.21 | 0.34 | 2.56 | 0.31 | 2.9 |
| | RES-002A 1201-1203 | N | 525 | <1 | 17.7 | 3.27 | 13.5 | 0.84 | 16.8 |
| | | FD | 541 | <1 | 18.2 | 3.85 | 13.4 | 0.96 | 17.3 |
| | RES-002A 1246-1249 | N | 189 | <1 | 6.44 | 1.23 | 4.83 | 0.38 | 6.06 |
| | RES-002A 1291-1292 | N | 236 | <1 | 7.88 | 2.53 | 5.01 | 0.34 | 7.54 |
| | RES-002A 1325-1328 | N | 316 | <1 | 10.5 | 1.64 | 8.42 | 0.44 | 10.1 |
| | RES-002A 1363-1366 | N | 219 | <1 | 7.26 | 1.42 | 5.58 | 0.26 | 7 |
| | RES-002A 1395-1397 | N | 353 | <1 | 11.8 | 1.64 | 9.65 | 0.5 | 11.3 |
| | RES-002A 1414.6-1417 | N | 205 | <1 | 7.32 | 0.57 | 6 | 0.75 | 6.57 |
| | RES-002A 1454-1457 | N | 275 | 1 F | 9.21 | 1.26 | 7.55 | 0.4 | 8.81 |
| | RES-002A 1538-1541 | N | 122 | <1 | 4.43 | 1.37 | 2.54 | 0.52 | 3.91 |
| | RES-002A 1583-1586 | N | 99 | <1 | 4.26 | 1.99 | 1.19 | 1.08 | 3.18 |
| | RES-002A 1627-1630 | N | 67 | <1 | 2.71 | 1.03 | 1.12 | 0.56 | 2.15 |
| | RES-002A 1732-1735 | N | 83 | 13 | 3.21 | 1.19 | 1.46 | 0.56 | 2.65 |
| | | FD | 74 | 13 | 2.97 | 1.11 | 1.25 | 0.61 | 2.36 |
| | RES-002A 1781-1784 | N | 80 | <1 | 3.28 | 0.51 | 2.04 | 0.73 | 2.55 |
| | RES-002A 1814-1817 | N | 68 | <1 | 2.8 | 0.46 | 1.73 | 0.61 | 2.19 |
| | RES-002A 1876-1879 | N | 166 | <1 | 8.7 | 2.61 | 2.7 | 3.39 | 5.31 |
| | RES-002A 1927-1930 | N | 81 | 60 | 5.39 | 1.08 | 1.5 | 2.81 | 2.58 |
| | RES-002A 1981-1984 | N | 71 | <1 | 4.84 | 1.11 | 1.16 | 2.57 | 2.27 |
| | RES-002A 858-861 | N | <1 | 2 F | 0.02 F | 0.02 F | <0.1 | 0.01 F | 0.01 F |
| | RES-002A 888-891 | N | <1 | 1 F | 0.06 F | 0.04 F | 0.01 F | 0.01 F | 0.05 F |
| | RES-002A 927-930 | N | <1 | 2 F | 0.05 F | 0.03 F | 0.01 F | 0.01 F | 0.04 F |
| | RES-002A 965-968 | N | 79 | 1 F | 2.77 | 0.58 | 1.96 | 0.23 | 2.54 |
| | RES-002A 992-995 | N | 14 | <1 | 0.49 | 0.46 | <0.1 | 0.03 F | 0.46 |
| | | FD | 15 | 1 F | 0.5 | 0.46 | <0.1 | 0.03 F | 0.47 |

T CaCO3/KT = tons calcium carbonate per kiloton

F = Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit

FD = field duplicate

N = normal

R1 - Relative percent difference exceeded the method control limit

# APPENDIX A
# ACID/BASE ACCOUNTING RESULTS

| Hole ID | Sample ID | Type | ACZS M600 1. Acid Generation Potential T CACO3/KT | ACZS M600 1. Acid Neutralization Potential T CACO3/KT | M600 3. Total Sulfur PERCENT | Sulfur Residual PERCENT | Sulfur Pyritic Sulfide PERCENT | Sulfur Sulfate PERCENT | Total Sulfur minus Sulfate PERCENT |
|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1011.88-1012.45 | N | <1 | 44 | 0.01 F | <0.1 | <0.1 | 0.01 F | <0.1 |
| | RES-005I 1322.73-1323.23 | N | <1 | 305 | 0.02 F | <0.1 | <0.1 | 0.02 F | <0.1 |
| | RES-005I 1353-1353.49 | N | <1 | 238 | 0.02 F | <0.1 | <0.1 | 0.02 F | <0.1 |
| | RES-005I 1360.5-1361.51 | N | <1 | 145 | 0.01 F | <0.1 | <0.1 | 0.01 F | <0.1 |
| | RES-005I 1370.93-1374 | N | <1 | 4 F | 0.09 F | 0.07 F | <0.1 | 0.02 F | 0.07 F |
| | RES-005I 1380-1383 | N | 4.06 | 5 | 0.16 | 0.13 | <0.1 | 0.03 F | 0.13 |
| | RES-005I 1389-1391.57 | N | 3.44 | 4 F | 0.13 | 0.1 | 0.01 F | 0.02 F | 0.11 |
| | RES-005I 1396.3-1399.3 | N | <1 | 7 | 0.07 F | 0.06 F | <0.1 | 0.01 F | 0.06 F |
| | RES-005I 1405-1406.67 | N | 4 | 9 | 0.17 | 0.14 | <0.1 | 0.03 F | 0.14 |
| | RES-005I 1410.18-1413.18 | N | <1 | 3 F | 0.14 | 0.08 F | 0.01 F | 0.05 F | 0.09 F |
| | RES-005I 1419.18-1422.18 | N | <1 | 5 | 0.13 | 0.07 F | 0.02 F | 0.04 F | 0.09 F |
| | RES-005I 1425.5-1426.51 | N | <1 | 3 F | 0.13 | 0.06 F | 0.02 F | 0.05 F | 0.08 F |
| | RES-005I 1428.18-1431.18 | N | <1 | 3 F | 0.07 F | 0.03 F | 0.01 F | 0.03 F | 0.04 F |
| | RES-005I 1437.13-1440.13 | N | <1 | 5 | 0.07 F | 0.05 F | <0.1 | 0.03 F | 0.04 F |
| | RES-005I 1446.13-1449.13 | N | 3.44 | 4 F | 0.13 | 0.1 | 0.01 F | 0.02 F | 0.11 |
| | RES-005I 1455.13-1458.13 | N | <1 | 4 F | 0.08 F | 0.06 F | <0.1 | 0.02 F | 0.06 F |
| | RES-005I 1464.13-1467.13 | N | <1 | 5 | 0.06 F | 0.05 F | <0.1 | 0.01 F | 0.05 F |
| | RES-005I 1473.13-1476.13 | N | <1 | 2 F | 0.05 F | 0.02 F | <0.1 | 0.03 F | 0.02 F |
| | RES-005I 1481-1482.66 | N | <1 | 3 F | 0.05 F | 0.04 F | 0.01 F | <0.1 | 0.05 F |
| | RES-005I 1485.5-1486.51 | N | <1 | 1 F | 0.05 F | 0.04 F | <0.1 | 0.01 F | 0.04 F |
| | RES-005I 1487.1-1490.1 | N | <1 | 5 | 0.12 | 0.04 F | 0.03 F | 0.05 F | 0.07 F |
| | RES-005I 1490.1-1493.1 | N | <1 | 5 | 0.05 F | 0.03 F | 0.01 F | 0.01 F | 0.04 F |
| | RES-005I 1499-1502 | N | <1 | 5 | 0.07 F | 0.06 F | <0.1 | 0.01 F | 0.06 F |
| | RES-005I 1506.56-1509.47 | N | <1 | 5 | 0.1 | 0.08 F | 0.01 F | 0.01 F | 0.09 F |
| | RES-005I 1515.47-1518.47 | N | <1 | 6 | 0.05 F | 0.04 F | <0.1 | 0.01 F | 0.04 F |
| | RES-005I 1524.47-1527.47 | N | <1 | 5 | 0.04 F | 0.02 F | <0.1 | 0.02 F | 0.02 F |
| | RES-005I 1532.98-1534.97 | N | <1 | 6 | 0.05 F | 0.03 F | <0.1 | 0.02 F | 0.03 F |
| | RES-005I 1544-1546.55 | N | <1 | 5 | 0.09 F | 0.08 F | <0.1 | 0.01 F | 0.08 F |
| | RES-005I 1552.55-1555.58 | N | <1 | 5 | 0.04 F | 0.03 F | 0.01 F | <0.1 | 0.04 F |
| | RES-005I 1559.46-1562.46 | N | <1 | 6 | 0.04 F | 0.02 F | 0.01 F | 0.01 F | 0.03 F |

T CaCO3/KT = tons calcium carbonate per kiloton

F = Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit

FD = field duplicate

N = normal

R1 - Relative percent difference exceeded the method control limit

# APPENDIX A
# ACID/BASE ACCOUNTING RESULTS

| Hole ID | Sample ID | Type | ACZS M600 1. Acid Generation Potential T CACO3/KT | ACZS M600 1. Acid Neutralization Potential T CACO3/KT | M600 3. Total Sulfur PERCENT | Sulfur Residual PERCENT | Sulfur Pyritic Sulfide PERCENT | Sulfur Sulfate PERCENT | Total Sulfur minus Sulfate PERCENT |
|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1568.46-1571.46 | N | <1 | 6 | 0.04 F | 0.03 F | <0.1 | 0.01 F | 0.03 F |
| | RES-005I 1577.46-1580.46 | N | <1 | 4 F | 0.04 F | 0.03 F | <0.1 | 0.01 F | 0.03 F |
| | | FD | <1 | 4 F | 0.04 F | 0.03 F | <0.1 | 0.01 F | 0.03 F |
| | RES-005I 1586.46-1589.46 | N | <1 | 6 | 0.04 F | 0.02 F | <0.1 | 0.02 F | 0.02 F |
| | RES-005I 1595.46-1598.46 | N | <1 | 5 | 0.04 F | 0.03 F | <0.1 | 0.01 F | 0.03 F |
| | RES-005I 1604.46-1607.46 | N | <1 | 4 F | 0.05 F | 0.03 F | 0.01 F | 0.01 F | 0.04 F |
| | RES-005I 1613.46-1616.46 | N | <1 | 2 F | 0.05 F | 0.04 F | <0.1 | 0.01 F | 0.04 F |
| | RES-005I 1616.46-1619 | N | <1 | 4 F | 0.06 F | 0.05 F | <0.1 | 0.01 F | 0.05 F |
| | RES-005I 1626.54-1627.16 | N | <1 | 5 | 0.05 F | 0.03 F | 0.01 F | 0.01 F | 0.04 F |
| | RES-005I 1627.16-1630 | N | <1 | 2 F | 0.03 F | 0.01 F | 0.01 F | 0.01 F | 0.02 F |
| | RES-005I 1630.5-1631.5 | N | <1 | <1 | 0.02 F | 0.01 F | 0.01 F | <0.1 | 0.02 F |
| | RES-005I 1632.56-1635.56 | N | 131 | <1 | 4.53 | 1.17 | 3.01 | 0.35 | 4.18 |
| | RES-005I 1638.37-1641 | N | 160 | <1 | 5.42 | 1.44 | 3.67 | 0.31 | 5.11 |
| | RES-005I 1645.84-1648.08 | N | 22 | 2 F | 1.14 | 0.19 | 0.5 | 0.45 | 0.69 |
| | RES-005I 1652-1654.93 | N | 146 | <1 | 5.08 | 1.42 | 3.26 | 0.4 | 4.68 |
| | RES-005I 1654.93-1657.3 | N | 178 | <1 | 5.97 | 3.61 | 2.08 | 0.28 | 5.69 |
| | RES-005I 1677.8-1680.8 | N | 135 | <1 | 4.87 | 1.52 | 2.79 | 0.56 R1 | 4.31 |
| | RES-005I 1695.23-1697.23 | N | 107 | 1 F | 3.61 | 1.58 | 1.85 | 0.18 | 3.43 |
| | RES-005I 1711.23-1713.23 | N | 170 | 2 F | 5.44 | 1.74 | 3.76 | <0.1 | 5.44 |
| | RES-005I 1727.23-1729.23 | N | 92 | <1 | 3.19 | 1.19 | 1.74 | 0.26 | 2.93 |
| | RES-005I 1730.5-1731.5 | N | 87 | <1 | 3.16 | 1.15 | 1.63 | 0.38 | 2.78 |
| | RES-005I 1743.23-1745.23 | N | 134 | 5 | 4.72 | 1.37 | 2.91 | 0.44 | 4.28 |
| | RES-005I 1759.23-1761.23 | N | 152 | 4 F | 5.01 | 1.07 | 3.78 | 0.16 | 4.85 |
| | RES-005I 1775.23-1778.23 | N | 121 | 2 F | 4.04 | 0.68 | 3.18 | 0.18 | 3.86 |
| | RES-005I 1794.36-1796.3 | N | 147 | <1 | 4.79 | 0.99 | 3.71 | 0.09 F | 4.7 |
| | RES-005I 1811.3-1814.3 | N | 140 | <1 | 5.1 | 1.78 | 2.71 | 0.61 | 4.49 |
| | RES-005I 1830.5-1831.5 | N | 149 | <1 | 5.17 | 1.75 | 3.01 | 0.41 | 4.76 |
| | RES-005I 1835.3-1838.3 | N | 132 | 3 F | 4.28 | 0.93 | 3.28 | 0.07 F | 4.21 |
| | RES-005I 1855.91-1858.91 | N | 91 | <1 | 3.24 | 0.86 | 2.06 | 0.32 | 2.92 |
| | RES-005I 1872.9-1875.38 | N | 108 | 2 F | 3.64 | 1.06 | 2.38 | 0.2 | 3.44 |

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# APPENDIX A
# ACID/BASE ACCOUNTING RESULTS

| Hole ID | Sample ID | Type | ACZS M600 1. Acid Generation Potential T CACO3/KT | ACZS M600 1. Acid Neutralization Potential T CACO3/KT | M600 3. Total Sulfur PERCENT | Sulfur Residual PERCENT | Sulfur Pyritic Sulfide PERCENT | Sulfur Sulfate PERCENT | Total Sulfur minus Sulfate PERCENT |
|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1875.38-1878.2 | N | 140 | <1 | 4.8 | 2.1 | 2.37 | 0.33 | 4.47 |
| | RES-005I 1884-1887 | N | 161 | 16 | 5.23 | 1.85 | 3.31 | 0.07 F | 5.16 |
| | RES-005I 1895-1897.06 | N | 88 | 2 F | 3.18 | 1.16 | 1.67 | 0.35 | 2.83 |
| | RES-005I 1901.49-1902.36 | N | 154 | 4 F | 5.08 | 1.5 | 3.43 | 0.15 | 4.93 |
| | RES-005I 1917.29-1919.1 | N | 110 | 17 | 3.69 | 1.5 | 2.02 | 0.17 | 3.52 |
| | RES-005I 1923.1-1925.3 | N | 166 | 18 | 6.32 | 2.3 | 3.01 | 1.01 | 5.31 |
| | RES-005I 1955.06-1958.06 | N | 60 | 23 | 2 | 1.01 | 0.91 | 0.08 F | 1.92 |
| | RES-005I 1960.5-1961.5 | N | 63 | 26 | 2.08 | 1.11 | 0.89 | 0.08 F | 2 |
| | RES-005I 1979.06-1982.06 | N | 65 | 31 | 2.23 | 1.21 | 0.88 | 0.14 | 2.09 |
| | RES-005I 2008.11-2011.11 | N | 71 | 32 | 2.36 | 1.41 | 0.86 | 0.09 F | 2.27 |
| | RES-005I 2032.11-2035.11 | N | 119 | 23 | 3.86 | 2.38 | 1.44 | 0.04 F | 3.82 |
| | RES-005I 2049.84-2052.84 | N | 43 | 6 | 1.89 | 0.6 | 0.76 | 0.53 | 1.36 |
| | RES-005I 2061.84-2064.84 | N | 74 | 4 F | 2.75 | 0.47 | 1.9 | 0.38 | 2.37 |
| RES-005J | RES-005J 1660.4-1668.47 | N | 162 | 1 F | 5.18 | 1.51 | 3.66 | <0.1 | 5.18 |
| RES-006D | RES-006D 1247.48-1250.48 | N | 16 | 26 | 0.59 | 0.13 | 0.37 | 0.09 F | 0.5 |
| | RES-006D 1405.47-1408.44 | N | 40 | 21 | 1.48 | 0.29 | 0.99 | 0.2 | 1.28 |
| | RES-006D 1450.44-1453.44 | N | 222 | 27 | 7.57 | 1.09 | 6.01 | 0.47 | 7.1 |
| | RES-006D 1495.44-1498.44 | N | 181 | 25 | 6.11 | 1.27 | 4.53 | 0.31 | 5.8 |
| | RES-006D 1532.81-1535.81 | N | 162 | 20 | 5.48 | 0.65 | 4.53 | 0.3 | 5.18 |
| | RES-006D 1577.43-1580.43 | N | 80 | 27 | 2.56 | 0.7 | 1.88 | <0.1 | 2.56 |
| | RES-006D 1600.5-1601.5 | N | 78 | 25 | 2.69 | 0.71 | 1.79 | 0.19 | 2.5 |
| | RES-006D 1622.43-1625.43 | N | 174 | 13 | 6.01 | 0.83 | 4.75 | 0.43 | 5.58 |
| | RES-006D 1667.43-1670.43 | N | 150 | 4 F | 5.51 | 0.62 | 4.19 | 0.7 | 4.81 |
| | RES-006D 1705.4-1708.4 | N | 372 | 2 F | 12.1 | 2.61 | 9.28 | 0.25 | 11.9 |
| | RES-006D 1750.4-1753.4 | N | 331 | <1 | 11.2 | 2.24 | 8.38 | 0.54 | 10.6 |
| | RES-006D 1798.4-1801.4 | N | 316 | 1 F | 10.5 | 1.9 | 8.17 | 0.42 | 10.1 |
| | RES-006D 1843.4-1846.4 | N | 334 | <1 | 11.2 | 2.42 | 8.28 | 0.45 | 10.7 |
| | RES-006D 1898.21-1901.09 | N | 176 | 1 F | 6.15 | 0.76 | 4.87 | 0.52 | 5.63 |
| | RES-006D 1927.23-1930.23 | N | 164 | <1 | 5.62 | 1.07 | 4.18 | 0.37 | 5.25 |
| | | FD | 165 | <1 | 5.58 | 1.11 | 4.18 | 0.29 | 5.29 |

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FD = field duplicate

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R1 - Relative percent difference exceeded the method control limit

# APPENDIX A
# ACID/BASE ACCOUNTING RESULTS

| Hole ID | Sample ID | Type | ACZS M600 1. Acid Generation Potential T CACO3/KT | ACZS M600 1. Acid Neutralization Potential T CACO3/KT | M600 3. Total Sulfur PERCENT | Sulfur Residual PERCENT | Sulfur Pyritic Sulfide PERCENT | Sulfur Sulfate PERCENT | Total Sulfur minus Sulfate PERCENT |
|---|---|---|---|---|---|---|---|---|---|
| RES-006D | RES-006D 1952.56-1954.83 | N | 54 | 1 F | 1.99 | 0.28 | 1.44 | 0.27 | 1.72 |
| | RES-006D 1954.83-1972 | N | 99 | 1 F | 3.64 | 1.01 | 2.17 | 0.46 | 3.18 |
| | RES-006D 1980.6-1983.6 | N | 397 | <1 | 13.1 | 2.18 | 10.6 | 0.35 | 12.7 |
| | RES-006D 1995.6-1998.6 | N | 331 | <1 | 11.1 | 3.32 | 7.23 | 0.58 | 10.6 |
| | RES-006D 2022.66-2025.66 | N | 286 | 1 F | 10.1 | 2.27 | 6.88 | 0.96 | 9.15 |
| | RES-006D 2040.66-2043.66 | N | 140 | 8 | 5.29 | 1.59 | 2.88 | 0.82 | 4.47 |
| | RES-006D 2058.16-2061.16 | N | 120 | 51 | 4.1 | 1.85 | 1.98 | 0.27 | 3.83 |
| | RES-006D 2073.13-2076.13 | N | 182 | 35 | 6.91 | 3 | 2.81 | 1.1 | 5.81 |
| | | FD | 177 | 34 | 6.81 | 3.11 | 2.56 | 1.14 | 5.67 |
| | RES-006D 2091.13-2094.13 | N | 79 | 31 | 2.9 | 1.99 | 0.53 | 0.38 | 2.52 |
| | RES-006D 2115.47-2118.47 | N | 97 | 1 F | 4.34 | 1.06 | 2.03 | 1.25 | 3.09 |
| | RES-006D 2125.45-2128.42 | N | 80 | 1 F | 3.39 | 0.64 | 1.91 | 0.84 | 2.55 |
| | RES-006D 2137.08-2138.5 | N | 338 | <1 | 11.5 | 2.22 | 8.54 | 0.69 | 10.8 |
| RES-009 | RES-009 1012.16-1014.16 | N | <1 | 18 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 1027.38-1030.3 | N | <1 | 31 | 0.02 F | <0.1 | <0.1 | 0.02 F | <0.1 |
| | RES-009 1045.3-1048.3 | N | 25 | 26 | 0.94 | 0.08 F | 0.71 | 0.15 | 0.79 |
| | RES-009 105.16-105.73 | N | <1 | 11 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 1063.3-1066.3 | N | 27 | 26 | 0.95 | 0.1 | 0.75 | 0.1 | 0.85 |
| | RES-009 1081.3-1084.3 | N | 23 | 20 | 0.82 | 0.06 F | 0.66 | 0.1 | 0.72 |
| | RES-009 1098.34-1100.96 | N | 36 | 25 | 1.22 | 0.08 F | 1.08 | 0.06 F | 1.16 |
| | RES-009 199.18-199.78 | N | <1 | 11 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 199.78-200.3 | N | <1 | 11 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 281.14-281.64 | N | <1 | 12 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 348.3-348.83 | N | <1 | 9 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 447.23-447.8 | N | <1 | 86 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 485.12-485.71 | N | <1 | 189 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 557.06-557.56 | N | <1 | 13 | 0.02 F | <0.1 | <0.1 | 0.02 F | <0.1 |
| | RES-009 647.52-648.1 | N | <1 | 91 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 7.43-7.96 | N | <1 | 7 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| | RES-009 718-718.58 | N | <1 | 9 | 0.03 F | <0.1 | <0.1 | 0.01 F | <0.1 |

T CaCO3/KT = tons calcium carbonate per kiloton

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# APPENDIX A
# ACID/BASE ACCOUNTING RESULTS

| Hole ID | Sample ID | Type | ACZS M600 1. Acid Generation Potential T CACO3/KT | ACZS M600 1. Acid Neutralization Potential T CACO3/KT | M600 3. Total Sulfur PERCENT | Sulfur Residual PERCENT | Sulfur Pyritic Sulfide PERCENT | Sulfur Sulfate PERCENT | Total Sulfur minus Sulfate PERCENT |
|---|---|---|---|---|---|---|---|---|---|
| RES-009 | RES-009 810.42-810.98 | N | <1 | 128 | 0.02 F | <0.1 | <0.1 | 0.02 F | <0.1 |
| | RES-009 906.08-906.58 | N | <1 | 149 | 0.02 F | <0.1 | <0.1 | 0.02 F | <0.1 |
| | RES-009 987.9-988.45 | N | <1 | 16 | 0.05 F | 0.03 F | <0.1 | 0.02 F | 0.03 F |
| | RES-009 994.67-997.67 | N | <1 | 17 | 0.02 F | <0.1 | <0.1 | 0.02 F | <0.1 |
| RES-009D | RES-009D 1119.32-1122.42 | N | 22 | 11 | 0.78 | 0.09 F | 0.62 | 0.07 F | 0.71 |
| | | FD | 22 | 8 | 0.8 | 0.13 | 0.56 | 0.11 | 0.69 |
| | RES-009D 1128.62-1131.72 | N | 28 | 11 | 1.03 | 0.16 | 0.73 | 0.14 | 0.89 |
| RES-009E | RES-009E 1307.1-1310.1 | N | 341 | <1 | 11.3 | 1.5 | 9.35 | 0.49 | 10.9 |
| | RES-009E 1319.1-1322.1 | N | 101 | 1 F | 3.42 | 0.38 | 2.84 | 0.2 | 3.22 |
| | RES-009E 1335.41-1338.16 | N | 156 | <1 | 5.29 | 0.49 | 4.49 | 0.31 | 4.98 |
| | RES-009E 1351.03-1354.03 | N | 151 | 1 F | 5.09 | 0.58 | 4.24 | 0.27 | 4.82 |
| | RES-009E 1368.07-1370.69 | N | 274 | <1 | 9.19 | 1.18 | 7.58 | 0.43 | 8.76 |
| | RES-009E 1385.61-1388.61 | N | 211 | <1 | 7.07 | 0.74 | 6.02 | 0.31 | 6.76 |
| | RES-009E 1402.22-1404.53 | N | 156 | 1 F | 5.3 | 0.66 | 4.33 | 0.31 | 4.99 |
| | RES-009E 1410.5-1411.5 | N | 151 | <1 | 5.25 | 0.72 | 4.12 | 0.41 | 4.84 |
| | RES-009E 1418.16-1419.8 | N | 206 | 2 F | 6.99 | 0.87 | 5.71 | 0.41 | 6.58 |
| | RES-009E 1431.42-1433.8 | N | 215 | <1 | 7.27 | 1.15 | 5.74 | 0.38 | 6.89 |
| | RES-009E 1446.41-1449.41 | N | 304 | <1 | 10.2 | 1.26 | 8.48 | 0.5 | 9.74 |
| | RES-009E 1464.41-1467.41 | N | 248 | <1 | 8.38 | 1.16 | 6.79 | 0.43 | 7.95 |
| | RES-009E 1478.13-1481.13 | N | 279 | 2 F | 9.38 | 1.35 | 7.57 | 0.46 | 8.92 |
| | RES-009E 1496.13-1499.13 | N | 300 | 4 F | 9.93 | 1.53 | 8.08 | 0.32 | 9.61 |
| | RES-009E 1510.74-1527.19 | N | 309 | 2 F | 10.4 | 2.05 | 7.85 | 0.52 | 9.9 |
| | RES-009E 1514.13-1517.13 | N | 285 | <1 | 9.47 | 1.16 | 7.95 | 0.36 | 9.11 |
| | RES-009E 1532.4-1534.49 | N | 312 | 1 F | 10.5 | 2 | 7.97 | 0.49 | 9.97 |
| | RES-009E 1540.5-1541.5 | N | 309 | 1 F | 10.4 | 2.15 | 7.74 | 0.48 | 9.89 |
| | RES-009E 1547.47-1550.47 | N | 268 | 6 | 9.19 | 1.62 | 6.97 | 0.6 | 8.59 |
| | RES-009E 1565.47-1568.47 | N | 375 | <1 | 12.4 | 1.58 | 10.4 | 0.46 | 12 |
| | RES-009E 1597.32-1599.88 | N | 453 | <1 | 15 | 2.43 | 12 | 0.48 | 14.5 |
| | RES-009E 1602.44-1605 | N | 328 | <1 | 10.9 | 1.56 | 8.96 | 0.35 | 10.5 |
| | RES-009E 1617.38-1619.14 | N | 115 | 6 | 3.91 | 0.73 | 2.95 | 0.23 | 3.68 |

T CaCO3/KT = tons calcium carbonate per kiloton

F = Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit

FD = field duplicate

N = normal

R1 - Relative percent difference exceeded the method control limit

# APPENDIX A
# ACID/BASE ACCOUNTING RESULTS

| Hole ID | Sample ID | Type | ACZS M600 1. Acid Generation Potential T CACO3/KT | ACZS M600 1. Acid Neutralization Potential T CACO3/KT | M600 3. Total Sulfur PERCENT | Sulfur Residual PERCENT | Sulfur Pyritic Sulfide PERCENT | Sulfur Sulfate PERCENT | Total Sulfur minus Sulfate PERCENT |
|---|---|---|---|---|---|---|---|---|---|
| RES-009E | RES-009E 1634.46-1637.47 | N | 218 | 2 F | 7.91 | 1.41 | 5.58 | 0.92 | 6.99 |
| | RES-009E 1650.14-1652.81 | N | 283 | <1 | 9.46 | 2.25 | 6.81 | 0.4 | 9.06 |
| | | FD | 280 | <1 | 9.53 | 2.08 | 6.89 | 0.56 | 8.97 |
| | RES-009E 1669.07-1672.07 | N | 128 | <1 | 4.33 | 1.31 | 2.78 | 0.24 | 4.09 |
| | RES-009E 1685.09-1687.47 | N | 88 | 1 F | 3.16 | 1.01 | 1.81 | 0.34 R1 | 2.82 |
| | RES-009E 1697.61-1700.61 | N | 154 | 1 F | 5.27 | 0.7 | 4.23 | 0.34 | 4.93 |
| | RES-009E 1718.61-1721.61 | N | 102 | 2 F | 3.49 | 0.61 | 2.65 | 0.23 | 3.26 |
| | RES-009E 1739.63-1742.63 | N | 76 | 4 F | 2.69 | 0.44 | 2 | 0.25 | 2.44 |
| | RES-009E 1760.86-1763.86 | N | 75 | 3 F | 2.62 | 0.6 | 1.8 | 0.22 | 2.4 |
| | | FD | 78 | 4 F | 2.64 | 0.67 | 1.81 | 0.16 | 2.48 |
| | RES-009E 1789.83-1792.31 | N | 95 | 6 | 3.42 | 0.58 | 2.47 | 0.37 | 3.05 |
| | RES-009E 1798.16-1799.79 | N | 131 | 4 F | 4.49 | 1.06 | 3.12 | 0.31 | 4.18 |
| | RES-009E 1801.42-1804.15 | N | 285 | 3 F | 9.51 | 2.12 | 7 | 0.39 | 9.12 |
| | RES-009E 1818.62-1821.62 | N | 276 | 31 | 9.3 | 2.01 | 6.81 | 0.48 | 8.82 |
| | RES-009E 1829.95-1832.48 | N | 240 | 28 | 7.98 | 3.48 | 4.21 | 0.29 | 7.69 |
| | RES-009E 1846.66-1849.66 | N | 311 | 56 | 10.1 | 2.62 | 7.33 | 0.17 | 9.95 |
| | RES-009E 1862.15-1865.15 | N | 303 | 294 | 9.93 | 2.65 | 7.05 | 0.23 | 9.7 |
| | RES-009E 1867.87-1884.35 | N | 227 | 396 | 7.25 | 3.38 | 3.9 | <0.1 | 7.25 |
| | RES-009E 1880.15-1882.37 | N | 244 | 405 | 8.22 | 4.4 | 3.42 | 0.4 | 7.82 |
| | | FD | 251 | 401 | 8.46 | 4.22 | 3.8 | 0.44 | 8.02 |
| | RES-009E 1899-1901.88 | N | 215 | 85 | 7.19 | 3.74 | 3.13 | 0.32 | 6.87 |
| | RES-009E 1929.76-1932.58 | N | 264 | 101 | 8.81 | 4.55 | 3.91 | 0.35 | 8.46 |
| | RES-009E 1947.67-1950.67 | N | 172 | 118 | 5.89 | 2.24 | 3.27 | 0.38 | 5.51 |
| | RES-009E 1954.6-1956 | N | 92 | 67 | 3.15 | 2.11 | 0.84 | 0.2 | 2.95 |
| | RES-009E 1967.76-1969.72 | N | 36 | 9 | 1.56 | 0.71 | 0.45 | 0.4 | 1.16 |
| | RES-009E 1974.78-1977.89 | N | 97 | 331 | 3.27 | 1.78 | 1.31 | 0.18 R1 | 3.09 |
| | RES-009E 1984.74-1987.74 | N | 76 | 9 | 3.37 | 0.85 | 1.59 | 0.93 | 2.44 |
| | RES-009E 2056.38-2075 | N | 68 | 21 | 4.9 | 0.81 | 1.35 | 2.74 | 2.16 |

T CaCO3/KT = tons calcium carbonate per kiloton

F = Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit

FD = field duplicate

N = normal

R1 - Relative percent difference exceeded the method control limit

**APPENDIX B**
**NET ACID GENERATION RESULTS**

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | ACZS Net Acid Generation KG H2SO4/T | Acidity as CaCO3 MG/L | pH after Oxidation PH UNITS | Sulfate (as SO4) MG/L | Conductivity at 25 degrees C UMHOS/CM | Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-001C | RES-001C 1502-1505 | N | 29 | 281 | 2.6 | 639 D3 | 1440 | 11.2 D3 | <0.002 | <0.001 | 0.09 D3 | <0.05 D3 | <0.3 D3 | 0.0096 | 7 D3 | <30 D1 |
| | RES-001C 1530-1533 | N | 35 | 402 | 2.5 | 888 D3 | 2310 | 10.3 D3 | <0.02 D3 | <0.01 D3 | 0.26 D3 | <0.05 D3 | <0.3 D3 | 0.003 FD3 | 21 D3 | <30 D1 |
| | RES-001C 1557-1560 | N | 56 | 543 | 2.3 | 1160 D3 | 2940 | 13.7 D3 | <0.002 | 0.0012 | 0.19 D3 | <0.05 D3 | <0.3 D3 | 0.0019 | 33 D3 | <30 D1 |
| | RES-001C 1584-1587 | N | 31 | 330 | 2.7 | 807 D3 | 1800 | 15.8 D3 | <0.002 | <0.001 | 0.32 D3 | <0.05 D3 | <0.3 D3 | 0.0013 | 29 D3 | <30 D1 |
| | | FD | 39 | 378 | 2.5 | 837 D3 | 1930 | 17.9 D3 | <0.002 | 0.0008 F | 0.31 D3 | <0.05 D3 | <0.3 D3 | 0.0014 | 30 D3 | <30 D1 |
| | RES-001C 1611-1614 | N | <1 | 161 | 7.3 | 544 D3 | 965 | 6 D3 | <0.002 | <0.001 | 0.28 D3 | <0.05 D3 | <0.3 D3 | 0.0113 | 55 D3 | <30 D1 |
| | RES-001C 1639-1642 | N | 15 | 68 | 3.8 | 284 D3 | 491 | 2 D3 | <0.002 | <0.001 | 0.2 D3 | <0.05 D3 | <0.3 D3 | 0.0053 | 38 D3 | <30 D1 |
| | RES-001C 1666-1669 | N | <1 | 20 | 8.4 | 185 D3 | 376 | <0.8 D3 | <0.002 | 0.0006 F | 0.04 FD3 | <0.05 D3 | <0.3 D3 | <0.0005 | 39 D3 | <30 D1 |
| | RES-001C 1693-1696 | N | 11 | 105 | 3.8 | 348 D3 | 704 | 4 D3 | <0.002 | <0.001 | 0.13 D3 | <0.05 D3 | <0.3 D3 | 0.0058 | 39 D3 | <30 D1 |
| | RES-001C 1711-1714.96 | N | <1 | 48 | 10.6 | 157 D3M2 | 499 | 1.2 D3M1 | 0.0006 F | <0.001 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.0005 | 86 D3 | <30 D1M2 |
| | RES-001C 1745-1748 | N | 19 | 141 | 3 | 859 D3 | 1490 | 7.2 D3 | <0.002 | 0.0007 F | 0.09 D3 | <0.05 D3 | 0.11 FD3 | 0.0013 | 198 D3 | <30 D1 |
| | RES-001C 1771.75-1791.4 | N | <1 | 4 F | 9.1 | 438 D1 | 984 | <0.8 D3 | <0.01 D3 | <0.01 D3 | 0.02 FD3 | <0.05 D3 | 1.52 D3 | 0.0009 FD3 | 212 D3 | 30 D1 |
| | RES-001C 1781-1784 | N | <1 | <10 | 7.9 | 585 D3 | 1170 | <0.8 D3 | <0.01 D3 | <0.005 D3 | 0.03 FD3 | <0.05 D3 | 0.15 FD3 | <0.003 D3 | 269 D3 | <30 D1 |
| | RES-001C 1799-1802 | N | <1 | <10 | 8.5 | 165D3 | 492 | <0.8 D3 | <0.002 | <0.001 | <0.08 D3 | <0.05 D3 | 0.16 FD3 | 0.0004 F | 79 D3 | <30 D1 |
| | | FD | <1 | <10 | 8.5 | 168 D3 | 481 | <0.8 D3 | <0.002 | 0.0018 | <0.08 D3 | <0.05 D3 | 0.07 FD3 | 0.0004 F | 76 D3 | <30 D1 |
| | RES-001C 1814-1817 | N | <1 | 4 F | 8.7 | 265 D3 | 622 | <0.8 D3 | <0.002 | <0.001 | <0.08 D3 | <0.05 D3 | 0.07 FD3 | <0.0005 | 113 D3 | <30 D1 |
| | RES-001C 1837-1840 | N | <1 | <10 | 10.3 | 431 D3 | 889 | 0.2 FD3 | <0.002 | <0.001 | 0.02 FD3 | <0.05 D3 | 0.09 FD3 | 0.0001 F | 191 D3 | <30 D1 |
| | RES-001C 1855-1858 | N | <1 | <10 | 8.7 | 116 D3 | 349 | <0.8 D3 | 0.0005 F | <0.001 | 0.09 D3 | <0.05 D3 | 0.19 FD3 | <0.0005 | 52 D3 | <30 D1 |
| | RES-001C 1873-1876 | N | <1 | <10 | 8.6 | 139 D3 | 411 | <0.8 D3 | <0.002 | <0.001 | 0.03 FD3 | <0.05 D3 | 0.06 FD3 | <0.0005 | 57 D3 | <30 D1 |
| | RES-001C 1892.5-1895 | N | <1 | <10 | 8.6 | 158 D3 | 473 | <0.8 D3 | <0.002 | <0.001 | 0.04 FD3 | <0.05 D3 | 0.08 FD3 | 0.0002 F | 64 D3 | <30 D1 |
| | RES-001C 1934-1937 | N | 33 | 289 | 2.8 | 548 D3 | 1140 | 2.3 D3 | <0.002 | 0.0009 F | 0.03 FD3 | <0.05 D3 | 0.06 D3 | 0.0003 F | 5 D3 | <30 D1 |
| | RES-001C 1987-1990 | N | 30 | 277 | 3.1 | 654 D3 | 1090 | 4.4 D3 | <0.002 | 0.0012 | 0.11 D3 | <0.05 D3 | 0.08 FD3 | 0.0046 | 45 D3 | <30 D1 |
| | RES-001C 2007-2010 | N | <1 | <10 | 8.3 | 207 D3 | 525 | <0.8 D3 | <0.01 D3 | <0.005 D3 | 0.1 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 89 D3 | <30 D1 |
| | | FD | <1 | <10 | 8.6 | 202 D3 | 502 | 0.2 FD3 | <0.002 | 0.0006 F | 0.11 D3 | <0.05 D3 | <0.3 D3 | 0.0002 F | 83 D3 | <30 D1 |
| | RES-001C 2041-2044 | N | <1 | <10 | 8.3 | 303 D3 | 660 | <0.8 D3 | <0.002 | <0.001 | 0.07 FD3 | <0.05 D3 | 0.05 FD3 | <0.0005 | 116 D3 | <30 D1 |
| | RES-001C 2115-2118 | N | <1 | <10 | 8.4 | 199 D3 | 578 | <0.8 D3 | <0.002 | 0.0005 F | 0.07 FD3 | <0.05 D3 | <0.3 D3 | 0.0004 F | 98 D3 | <30 D1 |
| | RES-001C 2164.4-2166.3 | N | 145 | 1770 | 2.1 | 3320 D3 | 5050 | 21.3 D3 | 0.0075 | 0.0352 | 0.04 FD3 | <0.05 D3 | 0.09 FD3 | 0.0011 | 13 D3 | <30 D1 |
| | RES-001C 2214-2215 | N | 55 | 519 | 2.7 | 2140 D3 | 2590 | 2.1 D3 | <0.002 | 0.0012 | 0.02 FD3 | <0.05 D3 | <0.3 D3 | 0.0222 | 287 D3 | <30 D1 |
| | RES-001C 2242-2244 | N | 52 | 494 | 2.8 | 2000 D3 | 2370 | 11.7 D3 | <0.002 | 0.001 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.0006 | 251 D3 | <30 D1 |
| RES-002A | RES-002A 1007-1010 | N | 2 | 20 B4 | 3.7 | 93 D4 | 156 | 0.7 FD4 | 0.0005 F | 0.0013 | 0.33 D4 | <0.05 D4 | 0.06 FD4 | 0.0003 F | 1 FD4 | <30 D4 |
| | RES-002A 1058-1061 | N | 29 | 283 B7 | 2.4 | 566 D4 | 1620 | 4 D4 | <0.002 | 0.0012 | 0.11 D4 | 0.01 FD4 | 0.07 FD4 | 0.0002 F | 4 FD4 | <30 D4 |
| | RES-002A 1109-1112 | N | 36 | 374 B7 | 2.3 | 667 D4M2 | 1970 | 4.7 D4 | 0.0014 F | 0.0011 | 0.17 D4 | <0.05 D4 | 0.07 FD4 | 0.0005 | 2 FD4 | <30 D4M1 |
| | RES-002A 1154-1156 | N | 33 | 374 B7 | 2.5 | 675 D4 | 2080 | 4.9 D4 | <0.002 | <0.001 | 0.06 FD4 | <0.05 D4 | 0.06 FD4 | 0.0002 F | <5 D4 | <30 D4 |
| | RES-002A 1201-1203 | N | 76 | 748 B7 | 2.2 | 1490 D4 | 3300 | 6.5 D4 | 0.0006 F | 0.0775 | <0.08 D4 | <0.05 D4 | 0.07 FD4 | 0.0016 | <5 D4 | <30 D4 |
| | | FD | 72 | 695 B7 | 2.2 | 1360 D4 | 2940 | 4 D4 | 0.0016 F | 0.0101 | <0.08 D4 | <0.05 D4 | <0.3 D4 | 0.0012 | <5 D4 | <30 D4 |
| | RES-002A 1246-1249 | N | 41 | 406 B7 | 2.4 | 757 D4 | 1880 | 9.6 D4 | 0.0005 F | 0.0048 | 0.07 FD4 | <0.05 D4 | 0.05 FD4 | 0.0003 F | <5 D4 | <30 D4 |
| | RES-002A 1291-1292 | N | 56 | 543 B7 | 2.2 | 943 D4 | 2760 | 7.2 D4 | <0.002 | 0.0039 | 0.07 FD4 | <0.05 D4 | 0.05 FD4 | 0.0001 F | <5 D4 | <30 D4 |
| | RES-002A 1325-1328 | N | 58 | 458 B7 | 2.4 | 860 D4 | 2220 | 6.4 D4 | <0.002 | 0.0024 | 0.03 FD4 | <0.05 D4 | 0.05 FD4 | 0.0004 F | <5 D4 | <30 D4 |
| | RES-002A 1363-1366 | N | 43 | 466 B7 | 2.4 | 783 D4 | 2060 | 6.4 D4 | <0.002 | 0.0066 | 0.05 FD4 | <0.05 D4 | 0.06 FD4 | 0.0003 F | 1 FD4 | <30 D4 |
| | RES-002A 1395-1397 | N | 71 | 716 B7 | 2.2 | 1380 D4 | 3120 | 5.6 D4 | 0.0005 F | 0.0033 | <0.08 D4 | <0.05 D4 | 0.07 FD4 | 0.0002 F | <5 D4 | <30 D4 |
| | RES-002A 1414.6-1417 | N | 60 | 575 B7 | 2.2 | 1070 D4 | 2870 | 5.5 D4 | 0.0004 F | <0.001 | <0.08 D4 | <0.05 D4 | 0.06 FD4 | <0.0005 | <5 D4 | <30 D4 |
| | RES-002A 1454-1457 | N | 33 | 374 B7 | 3.2 | 671 D4 | 1220 | 3.3 D4 | <0.002 | 0.0007 F | 0.04 FD4 | <0.05 D4 | 0.05 FD4 | 0.0004 F | <5 D4 | <30 D4 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | ACZS Net Acid Generation KG H2SO4/T | Acidity as CaCO3 MG/L | pH after Oxidation PH UNITS | Sulfate (as SO4) MG/L | Conductivity at 25 degrees C UMHOS/CM | Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A | RES-002A 1538-1541 | N | 41 | 434 B7 | 2.7 | 713 D4 | 1410 | 5.3 D4 | <0.002 | 0.0039 | 0.08 D4 | <0.05 D4 | <0.3 D4 | 0.0166 | 3 FD4 | <30 D4 |
| | RES-002A 1583-1586 | N | 54 | 579 | 2.6 | 901 D3 | 1650 | 4.5 D3 | 0.0006 F | 0.0064 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0054 | <5 D3 | <30 D1 |
| | RES-002A 1627-1630 | N | 43 | 306 | 2.7 | 589 D3 | 1130 | 4.9 D3 | <0.02 D3 | 0.007 FD3 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.015 D3 | 1 FD3 | <30 D1 |
| | RES-002A 1732-1735 | N | 41 | 318 | 2.9 | 638 D3 | 1150 | 6.9 D3 | <0.002 | 0.0025 | 0.03 FD3 | <0.05 D3 | <0.3 D3 | 0.0017 | 6 D3 | <30 D1 |
| | RES-002A 1755-1756 | N | 33 | 302 | 2.9 | 635 D3 | 1160 | 7.7 D3 | <0.002 | 0.0023 | 0.03 FD3 | <0.05 D3 | <0.3 D3 | 0.0019 | 7 D3 | <30 D1 |
| | RES-002A 1781-1784 | N | 42 | 430 | 2.3 | 858 D3 | 2040 | 4.9 D3 | <0.002 | 0.0012 | 0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0078 | 1 FD3 | <30 D1 |
| | RES-002A 1814-1817 | N | 42 | 406 | 2.3 | 786 D3 | 2200 | 4.4 D3 | <0.002 | 0.0014 | 0.06 FD3 | <0.05 D3 | <0.3 D3 | 0.0013 | 2 FD3 | <30 D1 |
| | RES-002A 1876-1879 | N | 59 | 559 | 2.6 | 1750 D3 | 2690 | 5 D3 | <0.002 | 0.0018 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0021 | 234 D3 | <30 D1 |
| | RES-002A 1927-1930 | N | 34 | 370 | 2.9 | 1390 D3 | 2310 | 7.7 D3 | <0.002 | 0.0019 | 0.08 D3 | <0.05 D3 | <0.3 D3 | 0.003 | 280 D3 | <30 D1 |
| | RES-002A 1981-1984 | N | 32 | 314 | 3.1 | 1410 D3 | 1970 | 5.1 D3 | <0.002 | <0.001 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.0022 | 253 D3 | <30 D1 |
| | RES-002A 858-861 | N | 2 | 562 B7 | 6.5 | <30 D4 | 31 | 0.2 FD4 | 0.0007 F | 0.006 | <0.08 D4 | <0.05 D4 | 0.07 FD4 | <0.0005 | <5 D4 | <30 D4 |
| | RES-002A 888-891 | N | <1 | 20 B4 | 7.5 | <30 D4 | 42 | 0.3 FD4 | 0.0009 F | 0.04 | 0.6 D4 | <0.05 D4 | <0.3 D4 | <0.0005 | <5 D4 | <30 D4 |
| | RES-002A 927-930 | N | <1 | 12 B4 | 7.7 | <30 D4 | 45 | 0.4 FD4 | 0.0011 F | 0.0254 | 0.45 D4 | <0.05 D4 | <0.3 D4 | <0.0005 | <5 D4 | <30 D4 |
| | RES-002A 965-968 | N | 10 | 141 B7 | 4.9 | 221 D4 | 394 | 0.2 FD4 | <0.002 | <0.001 | 0.08 D4 | <0.05 D4 | 0.05 FD4 | 0.0004 F | <5 D4 | <30 D4 |
| | RES-002A 992-995 | N | 2 | 243 B7 | 6.2 | <30 D4 | 35 | <0.8 D4 | 0.0058 | 0.0069 | 0.04 FD4 | <0.05 D4 | 0.06 FD4 | <0.0005 | <5 D4 | <30 D4 |
| | | FD | 1 | 267 B7 | 6.3 | <30 D4 | 37 | <0.8 D4 | 0.0061 | 0.0065 | 0.04 FD4 | <0.05 D4 | 0.06 FD4 | <0.0005 | <5 D4 | <30 D4 |
| RES-005I | RES-005I 1011.88-1012.45 | N | <1 | <10 | 10.6 | <30 D1 | 262 | 1.6 D3 | 0.002 FD3 | <0.005 D3 | <0.08 D3 | <0.05 D3 | 0.21 FD3 | <0.003 D3 | 34 D3 | <30 D1 |
| | RES-005I 1322.73-1323.23 | N | <1 | <10 | 10.9 | -- | 207 | 1.1 D3 | <0.01 D3 | <0.005 D3 | <0.08 D3 | <0.05 D3 | 0.71 D3 | <0.003 D3 | 30 D3 | -- |
| | RES-005I 1353-1353.49 | N | <1 | <10 | 10.7 | <30 D1 | 293 | 0.8 D3 | <0.01 D3 | 0.006 D3 | <0.08 D3 | <0.05 D3 | 1.26 D3 | <0.003 D3 | 46 D3 | <30 D1 |
| | | FD | <1 | <10 | 10.4 | <30 D1 | 143 | 1.1 D3 | <0.01 D3 | 0.005 D3 | <0.08 D3 | <0.05 D3 | 0.45 D3 | <0.003 D3 | 17 D3 | <30 D1 |
| | RES-005I 1370.93-1374 | N | 2 | 495 B7 | 6.6 | <30 D1 | 35 | <0.8 D3 | <0.01 D3 | 0.005 D3 | 0.16 D3 | <0.05 D3 | 0.14 FD3 | <0.003 D3 | 5 D3 | <30 D1 |
| | RES-005I 1380-1383 | N | <1 | 217 B7 | 6.7 | <30 D1 | 49 | <0.8 D3 | <0.01 D3 | 0.009 D3 | 0.09 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 4 FD3 | <30 D1 |
| | RES-005I 1389-1391.57 | N | <1 | 117 B7 | 6.6 | <30 D1 | 42 | <0.8 D3 | <0.01 D3 | 0.016 D3 | <0.08 D3 | <0.05 D3 | 0.37 D3 | <0.003 D3 | 3 FD3 | <30 D1 |
| | RES-005I 1396.3-1399.3 | N | <1 | 8 FB7 | 7.7 | <30 D1 | 42 | <0.8 D3 | <0.01 D3 | 0.009 D3 | <0.08 D3 | <0.05 D3 | 0.1 FD3 | <0.003 D3 | 4 FD3 | <30 D1 |
| | RES-005I 1405-1406.67 | N | <1 | 165 B7 | 6.9 | <30 D1 | 44 | <0.8 D3 | <0.01 D3 | 0.008 D3 | 0.42 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 4 FD3 | <30 D1 |
| | RES-005I 1410.18-1413.18 | N | <1 | 20 B4 | 7.3 | <30 D1 | 30 | <0.8 D3 | <0.01 D3 | 0.01 D3 | 0.76 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | <5 D3 | <30 D1 |
| | RES-005I 1419.18-1422.18 | N | <1 | 12 B4 | 7.2 | <30 D1 | 31 | <0.8 D3 | 0.003 FD3 | 0.015 D3 | 0.63 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | <5 D3 | <30 D1 |
| | | FD | <1 | 8 FB4 | 7.5 | -- | 28 | <0.8 D3 | 0.003 FD3 | 0.015 D3 | 0.61 D3 | <0.05 D3 | 0.14 FD3 | <0.003 D3 | <5 D3 | -- |
| | RES-005I 1428.18-1431.18 | N | 1 | 117 B7 | 6.7 | <30 D1 | 23 | <0.8 D3 | <0.01 D3 | 0.008 D3 | 0.67 D3 | <0.05 D3 | 0.08 FD3 | <0.003 D3 | <5 D3 | <30 D1 |
| | RES-005I 1437.13-1440.13 | N | 2 | 165 B7 | 6.8 | <30 D1 | 32 | <0.8 D3 | <0.01 D3 | 0.005 D3 | 0.59 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | <5 D3 | <30 D1 |
| | RES-005I 1446.13-1449.13 | N | <1 | 595 B7 | 7.6 | <30 D1 | 22 | <0.8 D3 | <0.01 D3 | 0.004 FD3 | 0.74 D3 | <0.05 D3 | 0.09 FD3 | <0.003 D3 | <5 D3 | <30 D1 |
| | RES-005I 1455.13-1458.13 | N | <1 | 81 B4 | 6.8 | <30 D1 | 42 | <0.8 D3 | <0.01 D3 | 0.009 D3 | <0.08 D3 | <0.05 D3 | 0.06 FD3 | <0.003 D3 | <5 D3 | <30 D1 |
| | RES-005I 1464.13-1467.13 | N | 1 | 551 B7 | 6.6 | <3 | 30 | <0.8 D3 | <0.01 D3 | 0.004 FD3 | 0.03 FD3 | <0.05 D3 | 0.33 D | <0.003 D3 | 2 FD3 | <3 |
| | RES-005I 1473.13-1476.13 | N | 2 | 350 B7 | 6.6 | <30 D1 | 40 | <0.8 D3 | <0.01 D3 | 0.005 D3 | 1.24 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 2 FD3 | <30 D1 |
| | RES-005I 1481-1482.66 | N | 2 | 245 B7 | 6.5 | <30 D1 | 24 | <0.8 D3 | <0.01 D3 | 0.009 D3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | <5 D3 | <30 D1 |
| | | FD | 2 | 503 B7 | 6.2 | <30 D1 | 20 | <0.8 D3 | <0.01 D3 | 0.009 D3 | <0.08 D3 | <0.05 D3 | 0.15 FD3 | <0.003 D3 | <5 D3 | <30 D1 |
| | RES-005I 1487.1-1490.1 | N | 3 | 740 B7 | 6.3 | <30 D2 | 23 | <0.8 D2 | 0.002 FD2 | <0.005 D2 | 1.08 D2 | <0.05 D2 | 0.05 FD2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1490.1-1493.1 | N | 4 | 766 B7 | 6.2 | <30 D2 | 10 | <0.8 D2 | <0.01 D2 | 0.004 FD2 | 0.51 D2 | <0.05 D2 | 0.07 FD2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1499-1502 | N | 4 | 766 B7 | 6.3 | <30 D2 | 21 | <0.8 D2 | <0.01 D2 | 0.004 FD2 | <0.08 D2 | <0.05 D2 | 0.07 FD2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1506.56-1509.47 | N | 6 | 828 B7 | 6.2 | <30 D2 | 13 | <0.8 D2 | <0.01 D2 | 0.004 FD2 | <0.08 D2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1515.47-1518.47 | N | 7 | 822 B7 | 6 | <30 D2 | 24 | <0.8 D2 | <0.01 D2 | <0.005 D2 | 0.08 D2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | 1 FD2 | <30 D2 |
| | RES-005I 1524.47-1527.47 | N | <1 | 603 B7 | 6.6 | <30 D2 | 16 | <0.8 D2 | <0.01 D2 | 0.005 D2 | 0.18 D2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | ACZS Net Acid Generation KG H2SO4/T | Acidity as CaCO3 MG/L | pH after Oxidation PH UNITS | Sulfate (as SO4) MG/L | Conductivity at 25 degrees C UMHOS/CM | Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1532.98-1534.97 | N | 4 | 374 B7 | 6.2 | <30 D2 | 23 | <0.8 D2 | <0.01 D2 | 0.004 FD2 | 0.05 FD2 | <0.05 D2 | 0.15 FD2 | <0.003 D2 | 1 FD2 | <30 D2 |
| | RES-005I 1544-1546.55 | N | 6 | 585 B7 | 5.9 | <30 D2 | 17 | <0.8 D2 | <0.01 D2 | 0.004 FD2 | 0.05 FD2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1552.55-1555.58 | N | 4 | 601 B7 | 6.2 | <30 D2 | 5 F | <0.8 D2 | <0.01 D2 | 0.003 FD2 | 0.02 FD2 | <0.05 D2 | 0.11 FD2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1559.46-1562.46 | N | 5 | 820 B7 | 6.1 | <30 D2 | 8 F | <0.8 D2 | <0.01 D2 | 0.005 D2 | <0.08 D2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1568.46-1571.46 | N | 6 | 844 B7 | 6.1 | <30 D2 | 11 | <0.8 D2 | <0.01 D3 | 0.003 FD2 | <0.08 D2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1577.46-1580.46 | N | 6 | 686 B7 | 5.8 | <30 D2 | 12 | <0.8 D2 | <0.01 D2 | 0.005 D2 | 0.02 FD2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | | FD | 4 | 599 B7 | 6 | <30 D2 | 12 | 0.2 FD2 | <0.01 D2 | 0.005 D2 | 0.03 FD2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1586.46-1589.46 | N | 6 | 706 B7 | 6.1 | <30 D2 | 23 | <0.8 D2 | <0.01 D2 | <0.005 D2 | 0.08 D2 | <0.05 D2 | 0.12 FD2 | <0.003 D2 | 1 FD2 | <30 D2 |
| | RES-005I 1595.46-1598.46 | N | 6 | 862 B7 | 6.1 | <30 D2 | 18 | <0.8 D2 | <0.01 D2 | 0.003 FD2 | <0.08 D2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1604.46-1607.46 | N | 6 | 659 B7 | 6.1 | <30 D2 | 24 | <0.8 D2 | <0.01 D2 | <0.005 D2 | 0.05 FD2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | 2 FD2 | <30 D2 |
| | RES-005I 1613.46-1616.46 | N | 7 | 710 B7 | 5.7 | <50 D2 | 15 | <0.8 D2 | <0.01 D2 | <0.005 D2 | 0.08 D2 | <0.05 D2 | 0.11 FD2 | <0.003 D2 | <5 D2 | <50 D2 |
| | RES-005I 1616.46-1619 | N | 7 | 848 B7 | 6.1 | <30 D2 | 10 | <0.8 D2 | <0.01 D2 | <0.005 D2 | <0.08 D2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1626.54-1627.16 | N | 1 | 99 B7 | 6.6 | <30 D2 | 21 | <0.8 D2 | <0.01 D2 | 0.013 D2 | 0.42 D2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1627.16-1630 | N | 3 | 219 B7 | 6.1 | <30 D2 | 17 | <0.8 D2 | <0.01 D2 | 0.008 D2 | 0.2 D2 | <0.05 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <30 D2 |
| | RES-005I 1632.56-1635.56 | N | 7 | 446 | 5.6 | 778 D1 | 2040 | 9.8 D3 | <0.02 D2 | <0.02 D2 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.002 FD2 | 1 FD3 | <30 D1 |
| | RES-005I 1638.37-1641 | N | 47 | 442 | 2.3 | 793 D1 | 2110 | 10.3 D3 | <0.002 | 0.0017 F | 0.06 FD3 | <0.05 D3 | 0.06 FD3 | 0.0028 | 2 FD3 | <30 D1 |
| | RES-005I 1645.84-1648.08 | N | 49 | 80 | 2.3 | 183 D1 | 385 | 6.1 D3 | <0.002 | 0.015 | 0.09 D3 | <0.05 D3 | <0.3 D3 | 0.0017 | 2 FD3 | <30 D1 |
| | RES-005I 1652-1654.93 | N | 9 | 523 | 3.2 | 875 D1 | 2500 | 10.1 D3 | <0.002 | 0.0058 | 0.06 FD3 | <0.05 D3 | <0.3 D3 | 0.001 | 2 FD3 | <30 D1 |
| | RES-005I 1654.93-1657.3 | N | 56 | 297 | 2.2 | 505 D1 | 1070 | 7 D3 | <0.002 | 0.0101 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.0023 | 4 FD3 | <30 D1 |
| | RES-005I 1677.8-1680.8 | N | 34 | 189 | 2.8 | 391 D1 | 698 | 4 D3 | <0.002 | 0.0023 | 0.06 FD3 | <0.05 D3 | <0.3 D3 | 0.0046 | <5 D3 | <30 D1 |
| | RES-005I 1695.23-1697.23 | N | 21 | 137 | 3 | 205 D1 | 375 | 1.7 D3 | <0.002 | 0.0009 F | 0.06 FD3 | <0.05 D3 | <0.3 D3 | 0.0043 | 1 FD3 | <30 D1 |
| | RES-005I 1711.23-1713.23 | N | 14 | 233 | 4.7 | 378 D1 | 583 | 5.5 D3 | <0.002 | 0.0013 F | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.0007 | 4 FD3 | <30 D1 |
| | RES-005I 1727.23-1729.23 | N | 25 | 157 | 3.8 | 277 D1 | 499 | 5 D3 | <0.002 | 0.0062 | 0.06 FD3 | <0.05 D3 | <0.3 D3 | 0.0008 | 5 D3 | <30 D1 |
| | | FD | 8 | 145 | 3.3 | 269 D1 | 489 | 4.8 D3 | <0.02 D2 | 0.006 FD2 | 0.06 FD3 | <0.05 D3 | <0.3 D3 | <0.005 D2 | 4 FD3 | <30 D1 |
| | RES-005I 1743.23-1745.23 | N | 16 | 237 | 3.4 | 428 D1 | 657 | 16.9 D3 | <0.02 D2 | <0.02 D2 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | <0.005 D2 | <5 D3 | <30 D1 |
| | RES-005I 1759.23-1761.23 | N | 26 | 410 | 3.8 | 706 D1 | 1060 | 34.7 D3 | <0.002 | 0.0021 | 0.07 FD3 | <0.05 D3 | <0.3 D3 | 0.002 | 1 FD3 | <30 D1 |
| | RES-005I 1775.23-1778.23 | N | 56 | 277 | 3.2 | 503 D1 | 1020 | 11.6 D3 | <0.002 | 0.0017 F | 0.03 FD3 | <0.05 D3 | <0.3 D3 | 0.0013 | 2 FD3 | <30 D1 |
| | RES-005I 1794.36-1796.3 | N | 32 | 273 | 2.8 | 466 D1 | 882 | 9 D3 | <0.002 | 0.0016 F | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0017 | <5 D3 | <30 D1 |
| | RES-005I 1811.3-1814.3 | N | 32 | 362 | 2.9 | 645 D1 | 1370 | 6.1 D3 | <0.002 | 0.0048 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0154 | 1 FD3 | <30 D1 |
| | RES-005I 1830.5-1831.5 | N | 41 | 362 | 2.6 | 625 D1 | 1420 | 5.8 D3 | <0.002 | 0.0048 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0143 | 1 FD3 | <30 D1 |
| | RES-005I 1835.3-1838.3 | N | 41 | 378 | 2.6 | 642 D1 | 1520 | 10.9 D3 | <0.002 | 0.0019 F | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0149 | 1 FD3 | <30 D1 |
| | RES-005I 1855.91-1858.91 | N | 44 | 322 | 2.5 | 559 D1 | 1280 | 11.6 D3 | <0.002 | 0.0012 F | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0225 | 3 FD3 | <30 D1 |
| | RES-005I 1872.9-1875.38 | N | 35 | 358 | 2.6 | 655 D1 | 1440 | 9.1 D3 | <0.002 | 0.0016 F | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.011 | 2 FD3 | <30 D1 |
| | RES-005I 1875.38-1878.2 | N | 39 | 509 B7 | 2.6 | 676 D1 | 1750 | 5.4 D3 | <0.01 D3 | <0.01 D3 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0167 D3 | 2 FD3 | <30 D1 |
| | RES-005I 1884-1887 | N | 44 | 395 | 2.5 | 674 D1 | 1500 | 9.8 D3 | <0.02 D3 | <0.02 D3 | 0.44 D3 | <0.05 D3 | <0.3 D3 | 0.001 FD3 | 9 D3 | <30 D1 |
| | RES-005I 1895-1897.06 | N | 42 | 342 B7 | 2.7 | 555 D1 | 1410 | 7.7 D3 | <0.01 D3 | <0.01 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.021 D3 | 4 FD3 | <30 D1 |
| | RES-005I 1901.49-1902.36 | N | 34 | 429 B7 | 2.7 | 691 D1 | 1860 | 8.2 D3 | <0.01 D3 | <0.01 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.0026 FD3 | 4 FD3 | <30 D1 |
| | RES-005I 1917.29-1919.1 | N | 45 | 348 B7 | 2.5 | 614 D1 | 1430 | 10.9 D3 | <0.01 D3 | <0.01 D3 | 0.07 FD3 | <0.05 D3 | <0.3 D3 | 0.0019 FD3 | 8 D3 | <30 D1 |
| | RES-005I 1923.1-1925.3 | N | 36 | 576 B7 | 2.7 | 868 D1 | 1970 | 14 D3 | <0.01 D3 | <0.01 D3 | 0.09 D3 | <0.05 D3 | <0.3 D3 | 0.0105 D3 | 8 D3 | <30 D1 |
| | RES-005I 1955.06-1958.06 | N | 52 | 131 B4 | 2.6 | 359 D1 | 649 | 3.5 D3 | <0.01 D3 | <0.01 D3 | 0.15 D3 | <0.05 D3 | <0.3 D3 | 0.0027 FD3 | 10 D3 | <30 D1 |
| | | FD | 13 | 134 B4 | 3.6 | 333 D1 | 660 | 3.3 D3 | <0.01 D3 | <0.01 D3 | 0.15 D3 | <0.05 D3 | <0.3 D3 | 0.0023 FD3 | 10 D3 | <30 D1 |
| | RES-005I 1979.06-1982.06 | N | 16 | 107 B4 | 3.6 | 338 D1 | 670 | 3.3 D3 | <0.01 D3 | <0.01 D3 | 0.18 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 18 D3 | <30 D1 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | ACZS Net Acid Generation KG H2SO4/T | Acidity as CaCO3 MG/L | pH after Oxidation PH UNITS | Sulfate (as SO4) MG/L | Conductivity at 25 degrees C UMHOS/CM | Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 2008.11-2011.11 | N | 9 | 221 B4 | 3.9 | 533 D1 | 1110 | 1.5 D3 | <0.01 D3 | <0.01 D3 | 0.23 D3 | <0.05 D3 | <0.3 D3 | 0.0011 FD3 | 38 D3 | <30 D1 |
| | RES-005I 2032.11-2035.11 | N | 10 | 452 B7 | 3.9 | 775 D1 | 1400 | 11 D3 | <0.02 D3 | <0.02 D3 | 0.18 D3 | <0.05 D3 | <0.3 D3 | 0.002 FD3 | 17 D3 | <30 D1 |
| | RES-005I 2049.84-2052.84 | N | 47 | 281 B4 | 2.9 | 459 D1 | 1060 | 8.5 D3 | <0.01 D3 | <0.01 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.0017 FD3 | 3 FD3 | <30 D1 |
| | RES-005I 2061.84-2064.84 | N | 29 | 308 B7 | 2.9 | 551 D1 | 1360 | 9.9 D3 | <0.01 D3 | <0.01 D3 | 0.45 D3 | <0.05 D3 | <0.3 D3 | 0.0019 FD3 | 4 FD3 | <30 D1 |
| RES-005J | RES-005J 1660.4-1668.47 | N | 31 | 312 B7 | 2.7 | 423 D1 | 823 | 5.2 D3 | <0.01 D3 | 0.003 FD3 | 0.73 D3 | <0.05 D3 | <0.3 D3 | 0.0063 D3 | 2 FD3 | <30 D1 |
| RES-006D | RES-006D 1247.48-1250.48 | N | 22 | 16 B4 | 3.2 | 178 D1 | 298 | <0.8 D3 | <0.02 D3 | <0.02 D3 | 0.03 FD3 | <0.05 D3 | <0.3 D3 | 0.012 D3 | 32 D3 | <30 D1 |
| | RES-006D 1405.47-1408.44 | N | 7 | 197 B4 | 5.3 | 429 D1 | 885 | 15.1 D3 | <0.01 D3 | <0.01 D3 | 0.09 D3 | <0.05 D3 | <0.3 D3 | 0.0013 FD3 | 17 D3 | <30 D1 |
| | RES-006D 1450.44-1453.44 | N | 16 | 784 B7 | 2.7 | 1470 D1 | 2560 | 28 D3 | <0.01 D3 | <0.01 D3 | 0.1 D3 | <0.05 D3 | <0.3 D3 | 0.0011 FD3 | 68 D3 | <30 D1 |
| | RES-006D 1495.44-1498.44 | N | 66 | 503 B7 | 2.4 | 955 D1 | 1600 | 26.5 D3 | <0.01 D3 | <0.01 D3 | 0.07 FD3 | <0.05 D3 | <0.3 D3 | 0.0211 D3 | 9 D3 | <30 D1 |
| | RES-006D 1532.81-1535.81 | N | 55 | 631 B7 | 2.6 | 985 D1 | 2080 | 28.7 D3 | <0.01 D3 | <0.01 D3 | 0.11 D3 | <0.05 D3 | <0.3 D3 | 0.0005 FD3 | 25 D3 | <30 D1 |
| | RES-006D 1577.43-1580.43 | N | 65 | 354 B7 | 2.4 | 727 D1 | 1290 | 21.1 D3 | <0.01 D3 | <0.01 D3 | 0.16 D3 | 0.01 FD3 | 0.24 FD3 | 0.0009 FD3 | 48 D3 | <30 D1 |
| | | FD | 33 | 338 B7 | 2.8 | 684 D1 | 1230 | 19.8 D3 | <0.01 D3 | <0.01 D3 | 0.17 D3 | <0.05 D3 | <0.3 D3 | 0.0006 FD3 | 33 D3 | <30 D1 |
| | RES-006D 1622.43-1625.43 | N | 39 | 543 B7 | 2.7 | 902 D1 | 1960 | 19.2 D3 | <0.01 D3 | <0.01 D3 | 0.11 D3 | <0.05 D3 | 0.12 FD3 | 0.0005 FD3 | 14 D3 | <30 D1 |
| | RES-006D 1667.43-1670.43 | N | 54 | 683 B7 | 2.5 | 1310 D1 | 2900 | 15.3 D3 | <0.01 D3 | <0.01 D3 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 21 D3 | <30 D1 |
| | RES-006D 1705.4-1708.4 | N | 66 | 1050 B7 | 2.2 | 1870 D1 | 4060 | 17.5 D3 | <0.01 D3 | 0.003 FD3 | <0.08 D3 | <0.05 D3 | 0.36 D3 | <0.003 D3 | 17 D3 | <50 D1 |
| | RES-006D 1750.4-1753.4 | N | 90 | 1620 | 2.2 | 2650 D1 | 5020 | 8.7 D3 | <0.01 D3 | 0.004 FD3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0005 FD3 | 5 D3 | 20 FD1 |
| | RES-006D 1798.4-1801.4 | N | 156 | 1130 | 2 | 1980 D1 | 4080 | 10.4 D3 | <0.02 D3 | <0.02 D3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.005 D3 | 11 D3 | 30 FD1 |
| | RES-006D 1843.4-1846.4 | N | 113 | 1480 | 2 | 2860 D1 | 5170 | 8.5 D3 | <0.01 D3 | 0.003 FD3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0006 FD3 | 4 FD3 | 20 FD1 |
| | RES-006D 1898.21-1901.09 | N | 143 | 695 | 2 | 1100 D1 | 2850 | 12.8 D3 | <0.01 D3 | <0.01 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 14 D3 | 24 FD1 |
| | RES-006D 1927.23-1930.23 | N | 71 | 426 | 2.2 | 690 D1 | 1610 | 8.6 D3 | <0.01 D3 | <0.01 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.0268 D3 | 6 D3 | 23 FD1 |
| | | FD | 51 | 438 | 2.5 | 708 D1 | 1760 | 9.1 D3 | <0.01 D3 | 0.004 FD3 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0289 D3 | 8 D3 | 24 FD1 |
| | RES-006D 1952.56-1954.83 | N | 44 | 434 | 2.5 | 759 D1 | 2230 | 4 D3 | <0.01 D3 | <0.01 D3 | 0.03 FD3 | <0.05 D3 | 0.1 FD3 | <0.003 D3 | 2 FD3 | 26 FD1 |
| | RES-006D 1954.83-197 | N | 45 | 432 B7 | 2.2 | 678 D1 | 1960 | 8.7 D3 | <0.01 D3 | <0.01 D3 | 0.06 FD3 | <0.05 D3 | 0.11 FD3 | 0.0012 FD3 | 5 D3 | <30 D1 |
| | RES-006D 1980.6-1983.6 | N | 34 | 909 | 2.5 | 1520 D1 | 3240 | 7.7 D3 | <0.01 D3 | <0.01 D3 | 0.03 FD3 | <0.05 D3 | 0.07 FD3 | 0.0295 D3 | 8 D3 | 20 FD1 |
| | RES-006D 1995.6-1998.6 | N | 84 | 864 | 2.2 | 1300 D1 | 2390 | 14.1 D3 | <0.01 D3 | <0.01 D3 | <0.08 D3 | <0.05 D3 | 0.21 FD3 | 0.0024 FD3 | 19 D3 | 25 FD1 |
| | RES-006D 2022.66-2025.66 | N | 89 | 603 | 2.5 | 894 D1 | 1870 | 8.7 D3 | <0.01 D3 | 0.004 FD3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0023 FD3 | 13 D3 | 23 FD1 |
| | RES-006D 2040.66-2043.66 | N | 65 | 503 | 2.5 | 782 D1 | 1490 | 10.2 D3 | <0.02 D3 | <0.02 D3 | <0.08 D3 | <0.05 D3 | 0.09 FD3 | 0.005 D3 | 17 D3 | 24 FD1 |
| | RES-006D 2058.16-2061.16 | N | 53 | 221 | 2.7 | 695 D1 | 1110 | 4.5 D3 | <0.01 D3 | 0.003 FD3 | 0.07 FD3 | <0.05 D3 | <0.3 D3 | 0.0012 FD3 | 34 D3 | 23 FD1 |
| | RES-006D 2073.13-2076.13 | N | 19 | 478 | 4.6 | 918 D1 | <10 | 7.2 D3 | <0.01 D3 | <0.01 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.0044 D3 | 22 D3 | 23 FD1 |
| | | FD | 51 | 458 | 2.9 | 926 D1 | 1410 | 6.4 D3 | <0.01 D3 | 0.004 FD3 | 0.07 FD3 | <0.05 D3 | 0.08 FD3 | 0.0044 D3 | 20 D3 | 25 FD1 |
| | RES-006D 2091.13-2094.13 | N | 48 | 342 | 2.9 | 710 D1 | 1030 | 5.4 D3 | <0.01 D3 | <0.01 D3 | 0.06 FD3 | <0.05 D3 | 0.09 FD3 | 0.0019 FD3 | 22 D3 | 26 FD1 |
| | RES-006D 2115.47-2118.47 | N | 32 | 474 | 3.6 | 578 D1 | 1350 | 7.6 D3 | <0.01 D3 | <0.01 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | 0.0098 D3 | 17 D3 | 23 FD1 |
| | RES-006D 2125.45-2128.42 | N | 36 | 398 | 2.7 | 666 D1 | 1420 | 21.3 D3 | <0.01 D3 | <0.01 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 34 D3 | 25 FD1 |
| | RES-006D 2137.08-2138.5 | N | 39 | 736 | 2.6 | 1160 D1 | 2840 | 11.7 D3 | <0.01 D3 | <0.01 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 9 D3 | 23 FD1 |
| RES-009 | RES-009 1012.16-1014.16 | N | 73 | 77 B4 | 2.3 | <30 D1 | 108 | <0.8 D3 | <0.002 | 0.008 | <0.08 D3 | <0.05 D3 | 0.06 FD3 | <0.0005 | 9 D3 | <30 D1 |
| | RES-009 1027.38-1030.3 | N | <1 | <10 B4 | 9.7 | <30 D1 | 121 | 0.9 D3 | <0.002 | 0.0077 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.0005 | 13 D3 | <30 D1 |
| | RES-009 1045.3-1048.3 | N | <1 | 44 B4 | 9.7 | 222 D1 | 451 | 1.1 D3 | <0.002 | <0.001 | 0.06 FD3 | <0.05 D3 | <0.3 D3 | 0.0003 F | 11 D3 | <30 D1 |
| | RES-009 105.16-105.73 | N | 3 | 4 F | 5 | <30 D3 | 48 | 0.4 FD3 | <0.002 | 0.0007 F | <0.08 D3 | <0.05 D3 | 0.06 FD3 | <0.0005 | 2 FD3 | <30 D1 |
| | RES-009 1063.3-1066.3 | N | <1 | 44 B4 | 8.8 | 231 D1 | 464 | 1 D3 | <0.002 | <0.001 | 0.04 FD3 | <0.05 D3 | 0.07 FD3 | 0.0007 | 14 D3 | <30 D1 |
| | RES-009 1081.3-1084.3 | N | 5 | 52 B4 | 4.8 | 246 D1 | 451 | 3.3 D3 | <0.002 | <0.001 | 0.26 D3 | <0.05 D3 | 0.06 FD3 | 0.0748 | 14 D3 | <30 D1 |
| | RES-009 1098.34-1100.96 | N | 6 | 97 B4 | 4.3 | 352 D1 | 535 | 12.7 D3 | <0.002 | <0.001 | 0.07 FD3 | <0.05 D3 | <0.3 D3 | 0.0138 | 19 D3 | <30 D1 |
| | RES-009 199.18-199.78 | N | 17 | 157 | 3.9 | <30 D3 | 58 | <0.8 D3 | 0.0004 F | <0.001 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.0005 | 2 FD3 | <30 D1 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | ACZS Net Acid Generation KG H2SO4/T | Acidity as CaCO3 MG/L | pH after Oxidation PH UNITS | Sulfate (as SO4) MG/L | Conductivity at 25 degrees C UMHOS/CM | Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009 | | FD | <1 | 193 | 7.6 | <30 D1 | 53 | <0.8 D3 | 0.006 F | 0.009 F | <0.08 D3 | <0.05 D3 | 0.06 FD3 | <0.0005 | 3 FD3 | <30 D1 |
| | RES-009 281.14-281.64 | N | 2 | 4 FB4 | 6.6 | <30 D1 | 76 | <0.8 D3 | <0.002 | 0.0008 F | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.0005 | 5 D3 | <30 D1 |
| | RES-009 348.3-348.83 | N | <1 | 410 B4 | 8 | <30 D1 | 48 | <0.8 D3 | <0.02 D3 | <0.01 D3 | <0.08 D3 | <0.05 D3 | 0.07 FD3 | <0.005 D3 | 2 FD3 | <30 D1 |
| | RES-009 447.23-447.8 | N | 6 | <10 B4 | 6.2 | <30 D1 | 411 | <0.8 D3 | <0.002 | 0.0018 | <0.08 D3 | <0.05 D3 | 0.07 FD3 | <0.0005 | 69 D3 | <30 D1 |
| | RES-009 485.12-485.71 | N | <1 | <10 B4 | 9.1 | <30 D1M2 | 461 | <0.8 D3M1 | <0.002 | 0.0018 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | <0.0005 | 86 D3 | <30 D1 |
| | RES-009 557.06-557.56 | N | <1 | 157 B4 | 9.1 | <30 D1 | 79 | <0.8 D3 | 0.0006 F | 0.005 | <0.08 D3 | <0.05 D3 | 0.14 FD3 | <0.0005 | <5 D3 | <30 D1 |
| | RES-009 647.52-648.1 | N | <1 | <10 B4 | 7.2 | <30 D1 | 479 | 1.4 D3 | 0.0005 F | 0.0006 F | <0.08 D3 | <0.05 D3 | 0.25 FD3 | <0.0005 | 50 D3 | <30 D1 |
| | RES-009 7.43-7.96 | N | <1 | 8 F | 9.7 | <30 D3 | 46 | 0.3 FD3 | <0.002 | <0.001 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.0005 | <5 D3 | <30 D1 |
| | RES-009 718-718.58 | N | <1 | 422 B4 | 8.5 | <30 D1 | 35 | <0.8 D3 | <0.002 | 0.0014 | <0.08 D3 | <0.05 D3 | 0.07 FD3 | <0.0005 | <5 D3 | <30 D1 |
| | | FD | 4 | 507 B4 | 6.7 | <30 D1 | 32 | <0.8 D3 | <0.002 | <0.001 | <0.08 D3 | <0.05 D3 | 0.12 FD3 | <0.0005 | 1 FD3 | <30 D1 |
| | RES-009 810.42-810.98 | N | <1 | <10 B4 | 11.3 | <30 D1 | 417 | 1.3 D3 | <0.002 | <0.001 | <0.08 D3 | <0.05 D3 | 0.19 FD3 | <0.0005 | 52 D3 | <30 D1 |
| | RES-009 906.08-906.58 | N | <1 | <10 B4 | 11.5 | <30 D1 | 553 | 1.6 D3 | <0.02 D3 | <0.01 D3 | 0.03 FD3 | <0.05 D3 | 0.13 FD3 | <0.005 D3 | 59 D3 | <30 D1 |
| | RES-009 987.9-988.45 | N | <1 | <10 B4 | 10.8 | <30 D1 | 145 | 0.8 D3 | 0.0006 F | 0.0145 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.0005 | 17 D3 | <30 D1 |
| | RES-009 994.67-997.67 | N | <1 | 161 B4 | 8.4 | <30 D1 | 130 | 0.8 D3 | <0.002 | 0.0071 | 0.07 FD3 | <0.05 D3 | <0.3 D3 | <0.0005 | 7 D3 | <30 D1 |
| RES-009D | RES-009D 1119.32-1122.42 | N | 13 | 92 B4 | 3.1 | 334 D1 | 686 | 4.4 D3 | <0.002 | 0.0017 | 0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0315 | 16 D3 | <30 D1 |
| | | FD | 16 | 113 | 3 | 550 D2 | 872 | 5.3 D3 | <0.002 | 0.0019 | 0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0428 | 23 D3 | <300 D1 |
| | RES-009D 1128.62-1131.72 | N | 14 | 173 | 3.1 | 440 D2 | 975 | 7.4 D3 | <0.002 | 0.0019 | 0.07 FD3 | <0.05 D3 | 0.25 FD3 | 0.0203 | 19 D3 | <300 D1 |
| RES-009E | RES-009E 1307.1-1310.1 | N | 71 | 732 | 2.3 | 1590 D2 | 2710 | 11.2 D3 | <0.02 D2 | <0.01 D2 | 0.05 FD3 | <0.05 D3 | 0.32 D3 | 0.002 FD2 | 4 FD3 | <300 D1 |
| | RES-009E 1319.1-1322.1 | N | 47 | 430 | 2.4 | 1260 D2 | 2140 | 12 D3 | <0.002 | 0.0014 | 0.05 FD3 | <0.05 D3 | 0.29 FD3 | 0.0048 | 2 FD3 | <300 D1 |
| | RES-009E 1335.41-1338.16 | N | 88 | 896 | 2.1 | 2150 D2 | 4400 | 15 D3 | 0.0006 F | 0.0023 | 0.06 FD3 | <0.05 D3 | <0.3 D3 | 0.0007 | 5 D3 | <300 D1 |
| | RES-009E 1351.03-1354.03 | N | 57 | 511 | 2.4 | 1600 D2 | 2330 | 14 D3 | <0.002 | 0.0012 | 0.04 FD3 | <0.05 D3 | <0.05 D3 | 0.0011 | <5 D3 | <300 D1 |
| | RES-009E 1368.07-1370.69 | N | 146 | 1460 | 2 | 3220 D2 | 4820 | 11.5 D3 | <0.002 | 0.0025 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0002 F | 1 FD3 | <300 D1 |
| | RES-009E 1385.61-1388.61 | N | 176 | 1250 | 2 | 3430 D2 | 4820 | 10.3 D3 | <0.002 | 0.0017 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0043 | 2 FD3 | <300 D1 |
| | RES-009E 1402.22-1404.53 | N | 64 | 623 | 2.3 | 2470 D2 | 2900 | 9.6 D3 | <0.002 | 0.0021 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0005 | <5 D3 | <300 D1 |
| | | FD | 61 | 583 | 2.3 | 1290 D2 | 2750 | 8.4 D3 | <0.002 | 0.0014 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0005 | 3 FD3 | <300 D1 |
| | RES-009E 1418.16-1419.8 | N | 65 | 647 | 2.4 | 1430 D2 | 2770 | 14.5 D3 | <0.02 D2 | <0.01 D2 | 0.04 FD3 | <0.05 D3 | 0.12 FD3 | <0.005 D2 | 2 FD3 | <300 D1 |
| | RES-009E 1431.42-1433.8 | N | 45 | 434 | 2.6 | 860 D2 | 1710 | 9.2 D3 | <0.002 | 0.0028 | 0.04 FD3 | <0.05 D3 | 0.07 FD3 | 0.0022 | 3 FD3 | <300 D1 |
| | RES-009E 1446.41-1449.41 | N | 79 | 776 | 2.3 | 1740 D2 | 3040 | 17 D3 | <0.002 | 0.0039 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0068 | 1 FD3 | <300 D1 |
| | RES-009E 1464.41-1467.41 | N | 79 | 748 | 2.3 | 1820 D2 | 3210 | 14.9 D3 | <0.002 | 0.0013 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0028 | 3 FD3 | <300 D1 |
| | RES-009E 1478.13-1481.13 | N | 68 | 659 | 2.4 | 1620 D2 | 2500 | 16.1 D3 | <0.002 | 0.0047 | 0.02 FD3 | <0.05 D3 | <0.3 D3 | 0.0048 | 2 FD3 | <300 D1 |
| | RES-009E 1496.13-1499.13 | N | 68 | 752 | 2.4 | 1480 D2 | 2760 | 16.7 D3 | <0.002 | 0.0008 F | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.002 | 4 FD3 | <300 D1 |
| | RES-009E 1510.74-1527.19 | N | 97 | 1010 | 2.1 | 1460 D1 | 4180 | 12.6 D3 | <0.01 D3 | <0.01 D3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0022 FD3 | 8 D3 | 20 FD1 |
| | RES-009E 1514.13-1517.13 | N | 91 | 917 | 2.2 | 2100 D2 | 3370 | 16.8 D3 | <0.002 | 0.001 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0005 | 2 FD3 | <300 D1 |
| | RES-009E 1532.4-1534.49 | N | 74 | 812 | 2.2 | 1810 D2 | 3330 | 9.4 D3 | <0.002 | 0.0013 | <0.08 D3 | <0.05 D3 | 0.06 FD3 | 0.0039 | 4 FD3 | <300 D1 |
| | | FD | 72 | 792 | 2.3 | 1790 D2 | 3360 | 9.7 D3 | <0.002 | 0.0012 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0041 | 5 D3 | <300 D1 |
| | RES-009E 1547.47-1550.47 | N | 59 | 611 | 2.4 | 1560 D2 | 2440 | 10.6 D3 | <0.002 | 0.0017 | <0.08 D3 | <0.05 D3 | 0.09 FD3 | 0.0693 | 8 D3 | <300 D1 |
| | RES-009E 1565.47-1568-47 | N | 147 | 1450 | 2 | 2690 D1 | 4840 | 10.5 D3 | <0.002 | 0.0025 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0038 | 1 FD3 | <50 D1 |
| | RES-009E 1597.32-1599.88 | N | 143 | 1420 | 2.1 | 2900 D1 | 4860 | 7.6 D3 | 0.0004 F | 0.0095 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0005 | 6 D3 | <100 D1 |
| | RES-009E 1602.44-1605 | N | 117 | 1170 | 2.1 | 2210 D1 | 4200 | 11 D3 | <0.02 D3 | <0.01 D3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.005 D3 | <5 D3 | <50 D1 |
| | RES-009E 1617.38-1619-.14 | N | 46 | 426 | 2.4 | 800 D1 | 2070 | 11.8 D3 | <0.002 | 0.0006 F | 0.03 FD3 | <0.05 D3 | <0.3 D3 | 0.0033 | 14 D3 | <30 D1 |
| | RES-009E 1634.46-1637.47 | N | 50 | 490 | 2.4 | 858 D1 | 2180 | 7.7 D3 | <0.002 | 0.0007 F | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0014 | 5 D3 | <30 D1 |
| | RES-009E 1650.14-1652.81 | N | 59 | 527 | 2.5 | 996 D1 | 2130 | 6.9 D3 | <0.002 | 0.0014 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0009 | 5 D3 | <30 D1 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | ACZS Net Acid Generation KG H2SO4/T | Acidity as CaCO3 MG/L | pH after Oxidation PH UNITS | Sulfate (as SO4) MG/L | Conductivity at 25 degrees C UMHOS/CM | Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E | | FD | 59 | 551 | 2.5 | 931 D1 | 2100 | 7.2 D3 | <0.002 | 0.0011 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0009 | 5 D3 | <30 D1 |
| | RES-009E 1669.07-1672.07 | N | 43 | 410 | 2.6 | 749 D1 | 1620 | 8 D3 | <0.002 | 0.0018 | 0.03 FD3 | <0.05 D3 | <0.3 D3 | 0.0077 | 2 FD3 | <30 D1 |
| | RES-009E 1685.09-1687-47 | N | 19 | 173 | 3.2 | 315 D1M1 | 591 | 5 D3 | <0.002 | 0.0029 | 0.04 FD3 | <0.05 D3 | <0.3 D3 | 0.0017 | <5 D3 | <30 D1 |
| | RES-009E 1697.61-1700.61 | N | 55 | 470 | 2.4 | 771 D1 | 2060 | 16 D3 | <0.002 | 0.0009 F | 0.03 FD3 | <0.05 D3 | <0.3 D3 | 0.0011 | 2 FD3 | <30 D1 |
| | RES-009E 1718.61-1721.61 | N | 42 | 390 | 2.5 | 604 D1 | 1770 | 11.1 D3 | <0.02 D3 | 0.009 FD3 | 0.06 FD3 | <0.05 D3 | <0.3 D3 | 0.008 D3 | <5 D3 | <30 D1 |
| | RES-009E 1739.63-1742.63 | N | 31 | 285 | 2.7 | 531 D1 | 1320 | 7.3 D3 | <0.002 | 0.0011 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0017 | 5 D3 | <30 D1 |
| | RES-009E 1760.86-1763.86 | N | 29 | 241 | 2.7 | 433 D1 | 1140 | 5.7 D3 | <0.002 | 0.0043 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0077 | 3 FD3 | <30 D1 |
| | | FD | 26 | 245 | 2.7 | 503 D1 | 1240 | 5.8 D3 | <0.002 | 0.0051 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0077 | 4 FD3 | <30 D1 |
| | RES-009E 1789.83-1792.31 | N | 36 | 334 | 2.7 | 578 D1 | 1340 | 12.2 D3 | <0.002 | 0.0023 | 0.02 FD3 | <0.05 D3 | <0.3 D3 | 0.0084 | 24 D3 | <30 D1 |
| | RES-009E 1798.16-1799.79 | N | 43 | 310 | 3.2 | 492 D1 | 868 | 9.4 D3 | <0.002 | 0.002 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.115 | 7 D3 | <30 D1 |
| | RES-009E 1801.42-1804.15 | N | 68 | 619 | 2.6 | 978 D1 | 2180 | 9.7 D3 | <0.002 | 0.0021 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0063 | 7 D3 | <30 D1 |
| | RES-009E 1818.62-1821.62 | N | 71 | 639 | 2.6 | 954 D1 | 2090 | 28.1 D3 | <0.002 | 0.0015 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0011 | 54 D3 | <30 D1 |
| | RES-009E 1829.95-1832.48 | N | 95 | 872 | 2.6 | 1740 D1 | 2600 | 14.7 D3 | <0.002 | 0.0042 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.005 | 31 D3 | <30 D1 |
| | RES-009E 1846.66-1849.66 | N | 71 | 704 | 3 | 1640 D1 | 2200 | 31.5 D3 | <0.002 | 0.003 | 0.03 FD3 | 0.01 FD3 | <0.3 D3 | 0.0455 | 162 D3 | <30 D1 |
| | RES-009E 1862.15-1865.15 | N | <1 | <10 | 10.8 | 350 D1 | 697 | 1.4 D3 | <0.01 D3 | 0.003 FD3 | <0.08 D3 | <0.05 D3 | 0.19 FD3 | 0.0006 FD3 | 168 D3 | <30 D1 |
| | RES-009E 1867.87-1884.35 | N | <1 | 27 B4 | 10.3 | 434 D1 | 842 | 0.8 D3 | <0.01 D3 | <0.01 D3 | 0.96 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 163 D3 | <30 D1 |
| | RES-009E 1880.15-1882.37 | N | <1 | <10 | 10.5 | 417 D1 | <10 | <0.8 D3 | <0.01 D3 | 0.003 FD3 | 0.02 FD3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 163 D3 | <30 D1 |
| | | FD | <1 | 16 B4 | 9.7 | 529 D1 | 779 | 0.5 FD3 | <0.01 D3 | 0.004 FD3 | <0.08 D3 | <0.05 D3 | 0.08 FD3 | <0.003 D3 | 182 D3 | <30 D1 |
| | RES-009E 1899-1901.88 | N | 33 | 270 B7 | 4.3 | 990 D1 | 1340 | 6.2 D3 | <0.01 D3 | 0.005 FD3 | 0.1 D3 | <0.05 D3 | <0.3 D3 | 0.0042 D3 | 254 D3 | <30 D1 |
| | RES-009E 1929.76-1932.58 | N | 40 | 265 B7 | 4.5 | 1180 D1 | 1460 | 1.7 D3 | <0.01 D3 | 0.004 FD3 | 0.03 FD3 | <0.05 D3 | <0.3 D3 | 0.0298 D3 | 299 D3 | <30 D1 |
| | RES-009E 1947.67-1950.67 | N | <1 | 12 B4 | 8.6 | 335 D1 | 691 | 0.3 FD3 | <0.01 D3 | <0.01 D3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 133 D3 | 22 FD1 |
| | RES-009E 1954.6-1956 | N | <1 | <10 | 8.1 | 387 D1 | 618 | 0.3 FD3 | <0.01 D3 | <0.01 D3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 136 D3 | <30 D1 |
| | RES-009E 1967.76-1969.72 | N | 26 | 245 B7 | 3.1 | 433 D1 | 771 | 6.1 D3 | <0.01 D3 | <0.01 D3 | 0.1 D3 | <0.05 D3 | <0.3 D3 | 0.0006 FD3 | 12 D3 | <30 D1 |
| | RES-009E 1974.78-1977.89 | N | <1 | <10 | 11.2 | 235 D1 | 705 | 0.3 FD3 | <0.01 D3 | <0.01 D3 | <0.08 D3 | <0.05 D3 | 0.18 FD3 | <0.003 D3 | 130 D3 | <30 D1 |
| | RES-009E 1984.74-1987.74 | N | 25 | 237 B4 | 4.5 | 529 D1 | 725 | 0.8 D3 | <0.01 D3 | <0.01 D3 | <0.08 D3 | <0.05 D3 | <0.3 D3 | 0.0022 FD3 | 88 D3 | <30 D1 |
| | RES-009E 2056.38-2075 | N | 28 | 305 B7 | 2.9 | 1340 D1 | 2330 | 6.8 D3 | <0.01 D3 | <0.01 D3 | 0.06 FD3 | <0.05 D3 | <0.3 D3 | <0.003 D3 | 250 D3 | <50 D1 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-001C | RES-001C 1502-1505 | N | 0.08 FD3 | 0.09 FD3 | 23.6 D3 | <5 D1 | 20.7 D3 | 0.0129 | 1 FD3 | 0.13 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.0115 | 23 D3 | <0.1 D3 |
| | RES-001C 1530-1533 | N | 0.07 FD3 | 0.09 FD3 | 16.1 D3 | 4 FD1 | 35.4 D3 | 0.057 D3 | 4 FD3 | 0.74 D3 | <0.01 D3 | <0.3 D3 | 0.07 FD3 | 13 D3 | 0.016 D3 | 29 D3 | <0.1 D3 |
| | RES-001C 1557-1560 | N | 0.14 FD3 | 0.12 FD3 | 8.86 D3 | 6 D1 | 59.1 D3 | 0.0185 | 4 FD3 | 2.12 D3 | <0.01 D3 | <0.3 D3 | 0.09 FD3 | 12 D3 | 0.0274 | 31 D3 | <0.1 D3 |
| | RES-001C 1584-1587 | N | <0.3 D3 | 0.14 FD3 | 6.36 D3 | 4 FD1 | 31 D3 | 0.0134 | 6 D3 | 2.55 D3 | <0.01 D3 | <0.3 D3 | 0.11 FD3 | 16 D3 | 0.0215 | 44 D3 | <0.1 D3 |
| | | FD | 0.07 FD3 | 0.15 FD3 | 6.7 D3 | 4 FD1 | 36.1 D3 | 0.0142 | 6 D3 | 2.76 D3 | <0.01 D3 | <0.3 D3 | 0.1 FD3 | 17 D3 | 0.0239 | 49 D3 | <0.1 D3 |
| | RES-001C 1611-1614 | N | <0.3 D3 | 0.13 FD3 | 27.1 D3 | 2 FD1 | 11.8 D3 | 0.369 | 3 FD3 | 4.03 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 13 D3 | 0.0208 | 27 D3 | <0.1 D3 |
| | RES-001C 1639-1642 | N | <0.3 D3 | 0.08 FD3 | 8.8 D3 | <5 D1 | 0.1 FD3 | 0.303 | 2 FD3 | 8.88 D3 | <0.01 D3 | 0.09 FD3 | <0.3 D3 | 9 D3 | 0.0115 | 17 D3 | 0.13 D3 |
| | RES-001C 1666-1669 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | 1 FD1 | <0.3 D3 | 0.0006 | <5 D3 | 0.96 D3 | <0.01 D3 | 0.42 D3 | <0.3 D3 | 7 FD3 | 0.0095 | 8 FD3 | <0.1 D3 |
| | RES-001C 1693-1696 | N | <0.3 D3 | 0.07 FD3 | 15.1 D3 | 5 D1 | <0.3 D3 | 0.197 | 2 FD3 | 4.8 D3 | <0.01 D3 | 0.25 FD3 | 0.05 FD3 | 10 D3 | 0.0143 | 19 D3 | <0.1 D3 |
| | RES-001C 1711-1714.96 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0015 | <5 D3 | <0.1 D3 | <0.01 D3 | 0.34 D3 | <0.3 D3 | 8 D3 | 0.0083 | 13 D3 | <0.1 D3 |
| | RES-001C 1745-1748 | N | <0.3 D3 | 0.11 FD3 | 8.51 D3 | 7 D1 | 2.5 D3 | 0.0059 | 5 D3 | 1.08 D3 | <0.01 D3 | 0.12 FD3 | <0.3 D3 | 20 D3 | 0.0165 | 28 D3 | <0.1 D3 |
| | RES-001C 1771.75-1791.4 | N | <0.3 D3 | <0.3 D3 | 0.3 D3 | <5 D1 | 0.3 D3 | 0.0016 FD3 | <5 D3 | 0.42 D3 | <0.001 | 1.81 D3 | <0.3 D3 | 6 FD3 | 0.0144 D3 | 32 D3 | <0.1 D3 |
| | RES-001C 1781-1784 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | 10 D3 | <0.1 D3 | <0.005 D3 | 0.55 D3 | <0.3 D3 | 8 D3 | 0.0183 D3 | 24 D3 | <0.1 D3 |
| | RES-001C 1799-1802 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0003 F | 5 D3 | <0.1 D3 | <0.005 D3 | 3.33 D3 | <0.3 D3 | 2 FD3 | 0.0252 | 4 FD3 | <0.1 D3 |
| | | FD | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0007 | 5 D3 | <0.1 D3 | <0.005 D3 | 3.37 D3 | <0.3 D3 | <8 D3 | 0.025 | 4 FD3 | <0.1 D3 |
| | RES-001C 1814-1817 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0004 F | 3 FD3 | <0.1 D3 | <0.005 D3 | 0.98 D3 | <0.3 D3 | 10 D3 | 0.0182 | 19 D3 | <0.1 D3M2 |
| | RES-001C 1837-1840 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0003 F | <5 D3 | <0.1 D3 | <0.005 D3 | 0.88 D3 | <0.3 D3 | 9 D3 | 0.0218 | 12 D3 | <0.1 D3 |
| | RES-001C 1855-1858 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0011 | 1 FD3 | <0.1 D3 | <0.005 D3 | 0.33 D3 | <0.3 D3 | 2 FD3 | 0.0143 | 10 D3 | <0.1 D3 |
| | RES-001C 1873-1876 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0002 F | 4 FD3 | <0.1 D3 | <0.005 D3 | 0.55 D3 | <0.3 D3 | 13 D3 | 0.0258 | 8 FD3 | <0.1 D3 |
| | RES-001C 1892.5-1895 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0002 F | 7 D3 | <0.1 D3 | <0.005 D3 | 0.98 D3 | <0.3 D3 | 13 D3 | 0.0222 | 8 FD3 | <0.1 D3 |
| | RES-001C 1934-1937 | N | 0.06 FD3 | <0.3 D3 | 77.3 D3 | <5 D1 | 41.7 D3 | 0.0131 | <5 D3 | 0.36 D3 | <0.005 D3 | 0.09 FD3 | 0.07 FD3 | 2 FD3 | 0.0551 | 6 FD3 | <0.1 D3 |
| | RES-001C 1987-1990 | N | <0.3 D3 | 0.08 FD3 | 120 D3 | <5 D1 | 21 D3 | 0.0028 | 8 D3 | 1.83 D3 | <0.005 D3 | 0.09 FD3 | 0.07 FD3 | 20 D3 | 0.0619 | 25 D3 | <0.1 D3 |
| | RES-001C 2007-2010 | N | <0.3 D3 | <0.3 D3 | 0.08 FD3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.005 D3 | 1.51 D3 | <0.3 D3 | 18 D3 | 0.0348 D3 | 4 FD3 | <0.1 D3 |
| | | FD | <0.3 D3 | <0.3 D3 | 0.07 FD3 | <5 D1 | <0.3 D3 | 0.0002 F | 1 FD3 | <0.1 D3 | <0.005 D3 | 1.59 D3 | <0.3 D3 | 18 D3 | 0.0325 | 3 FD3 | <0.1 D3 |
| | RES-001C 2041-2044 | N | <0.3 D3 | <0.3 D3 | 0.07 FD3 | <5 D1 | <0.3 D3 | 0.0003 F | 2 FD3 | <0.1 D3 | <0.005 D3 | 1.42 D3 | <0.3 D3 | 21 D3 | 0.0302 | 4 FD3 | <0.1 D3 |
| | RES-001C 2115-2118 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.0005 | 6 D3 | <0.1 D3 | <0.005 D3 | 4.99 D3 | <0.3 D3 | 13 D3 | 0.0331 | 5 FD3 | <0.1 D3 |
| | RES-001C 2164.4-2166.3 | N | 1.07 D3 | 0.44 D3 | 101 D3 | 9 D1 | 571 D3 | 0.0023 | 3 FD3 | 0.42 D3 | <0.005 D3 | <0.3 D3 | 0.1 FD3 | <8 D3 | 0.0496 | 28 D3 | <0.1 D3 |
| | RES-001C 2214-2215 | N | <0.3 D3 | <0.3 D3 | 213 D3 | <5 D1 | 37.5 D3 | 0.0018 | 6 D3 | 0.79 D3 | <0.005 D3 | <0.3 D3 | <0.3 D3 | <8 D3 | 0.063 | 14 D3 | <0.1 D3M2 |
| | RES-001C 2242-2244 | N | <0.3 D3 | 0.1 FD3 | 163 D3 | 15 D1 | 46.3 D3 | 0.0029 | 7 D3 | 0.52 D3 | <0.005 D3 | <0.3 D3 | <0.3 D3 | 8 D3 | 0.0705 | 22 D3 | <0.1 D3 |
| RES-002A | RES-002A 1007-1010 | N | <0.3 D4 | <0.3 D4 | 0.11 FD4 | <5 D4 | <0.3 D4 | 0.0008 | <5 D4 | <0.1 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 5 FD4 | 0.0601 B7 | 12 D4 | <0.1 D4 |
| | RES-002A 1058-1061 | N | <0.3 D4 | 0.06 FD4 | 13.5 D4 | <5 D4 | 15.2 D4 | 0.0006 | <5 D4 | 0.05 FD4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 7 FD4 | 0.0466 B7 | 8 FD4 | <0.1 D4 |
| | RES-002A 1109-1112 | N | <0.3 D4 | <0.3 D4 | 15.4 D4M3 | <5 D4M1 | 24.9 D4M3 | 0.0022 | <5 D4 | 0.04 FD4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 8 D4 | 0.0351 D4B7 | 7 FD4 | <0.1 D4 |
| | RES-002A 1154-1156 | N | <0.3 D4 | <0.3 D4 | 27.5 D4 | <5 D4 | 32.6 D4 | 0.0011 | <5 D4 | 0.3 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 6 FD4 | 0.0332 B7 | 9 FD4 | <0.1 D4 |
| | RES-002A 1201-1203 | N | 0.14 FD4 | <0.3 D4 | 45.2 D4 | <5 D4 | 160 D4 | 0.0119 | <5 D4 | 0.11 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | <8 D4 | 0.0207 | 9 FD4 | 0.2 D4 |
| | | FD | 0.08 FD4 | <0.3 D4 | 43.3 D4 | <5 D4 | 131 D4M3 | 0.0062 | <5 D4 | 0.09 FD4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | <8 D4 | 0.0239 | 3 FD4 | 0.21 D4 |
| | RES-002A 1246-1249 | N | 0.18 FD4 | <0.3 D4 | 35.9 D4 | <5 D4 | 45.8 D4 | 0.0903 | <5 D4 | 0.09 FD4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 3 FD4 | 0.0156 | 12 D4 | <0.1 D4 |
| | RES-002A 1291-1292 | N | 0.39 D4 | <0.3 D4 | 14.8 D4 | <5 D4 | 63 D4 | 0.0024 | <5 D4 | 0.11 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | <8 D4 | 0.025 | 8 FD4 | <0.1 D4 |
| | RES-002A 1325-1328 | N | 0.17 FD4 | <0.3 D4 | 49.7 D4 | <5 D4 | 68.6 D4 | 0.002 | <5 D4 | 0.09 FD4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 2 FD4 | 0.0232 | 8 FD4 | <0.1 D4 |
| | RES-002A 1363-1366 | N | 0.14 FD4 | <0.3 D4 | 37.9 D4 | <5 D4 | 51 D4 | 0.0075 | <5 D4 | 0.09 FD4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 3 FD4 | 0.0235 | 11 D4 | <0.1 D4 |
| | RES-002A 1395-1397 | N | 0.51 D4 | <0.3 D4 | 26.8 D4 | <5 D4 | 134 D4 | 0.0025 | <5 D4 | 0.12 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | <8 D4 | 0.0375 | 5 FD4 | <0.1 D4 |
| | RES-002A 1414.6-1417 | N | 0.43 D4 | <0.3 D4 | 21.1 D4 | <5 D4 | 94.2 D4 | 0.0003 F | <5 D4 | 0.26 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 4 FD4 | 0.0286 | 7 FD4 | 0.13 D4 |
| | RES-002A 1454-1457 | N | <0.3 D4 | <0.3 D4 | 159 D4 | <5 D4 | 29.3 D4 | 0.0002 F | <5 D4 | 0.24 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 6 FD4 | 0.0295 | 11 D4 | <0.1 D4 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A | RES-002A 1538-1541 | N | <0.3 D4 | <0.3 D4 | 147 D4 | 3 FD4 | 30.1 D4 | 0.0003 F | <5 D4 | 0.04 FD4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 6 FD4 | 0.0892 | 8 FD4 | <0.1 D4 |
| | RES-002A 1583-1586 | N | <0.3 D3 | 0.05 FD3 | 190 D3M3 | <5 D1 | 41.6 D3 | 0.0005 | <5 D3 | 0.16 D3 | <0.01 D3 | 0.07 FD3 | 0.05 FD3 | 4 FD3 | 0.114 | 8 FD3 | <0.1 D3 |
| | RES-002A 1627-1630 | N | <0.3 D3 | 0.07 FD3 | 89 D3 | <5 D1 | 31.4 D3 | 0.001 FD3 | <5 D3 | 0.23 D3 | <0.01 D3 | 0.08 FD3 | <0.3 D3 | 5 FD3 | 0.051 D3 | 8 FD3 | <0.1 D3 |
| | RES-002A 1732-1735 | N | <0.3 D3 | 0.08 FD3 | 105 D3 | 5 D1 | 20.1 D3 | 0.0005 | 4 FD3 | 3.29 D3 | <0.01 D3 | <0.3 D3 | 0.07 FD3 | 17 D3 | 0.0622 | 15 D3 | <0.1 D3 |
| | RES-002A 1755-1756 | N | <0.3 D3 | 0.09 FD3 | 109 D3 | 5 D1 | 24.5 D3 | 0.0004 F | 4 FD3 | 3.36 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 19 D3 | 0.0647 | 17 D3 | 0.11 D3 |
| | RES-002A 1781-1784 | N | <0.3 D3 | 0.1 FD3 | 16.5 D3 | <5 D1 | 53.9 D3 | 0.0006 | <5 D3 | 0.28 D3 | <0.01 D3 | 0.08 FD3 | <0.3 D3 | 4 FD3 | 0.0292 | 7 FD3 | 0.11 D3 |
| | RES-002A 1814-1817 | N | 0.19 FD3 | 0.08 FD3 | 15.5 D3 | 3 FD1 | 50.9 D3 | 0.0002 F | <5 D3 | 0.19 D3 | <0.01 D3 | 0.08 FD3 | <0.3 D3 | 4 FD3 | 0.0247 | 7 FD3 | <0.1 D3 |
| | RES-002A 1876-1879 | N | <0.3 D3 | 0.08 FD3 | 184 D3 | 3 FD1 | 42.2 D3 | 0.0002 F | 7 D3 | 0.7 D3 | <0.01 D3 | <0.3 D3 | 0.12 FD3 | 13 D3 | 0.0791 | 12 D3 | <0.1 D3 |
| | RES-002A 1927-1930 | N | <0.3 D3 | 0.07 FD3 | 116 D3 | 5 D1 | 13.1 D3 | 0.0002 F | 6 D3 | 0.45 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 30 D3 | 0.0917 | 18 D3 | <0.1 D3 |
| | RES-002A 1981-1984 | N | <0.3 D3 | 0.06 FD3 | 132 D3 | <5 D1 | 13.6 D3 | 0.0006 | 7 D3 | 1.19 D3 | <0.01 D3 | <0.3 D3 | 0.06 FD3 | 27 D3 | 0.0467 | 18 D3 | <0.1 D3 |
| | RES-002A 858-861 | N | <0.3 D4 | <0.3 D4 | 0.07 FD4 | <5 D4M2 | 0.1 FD4 | <0.0005 | <5 D4 | <0.1 D4 | <0.05 D4 | <0.3 D4 | <0.3 D4 | 7 FD4 | 0.0032 | 17 D4 | 0.06 FD4 |
| | RES-002A 888-891 | N | 0.05 FD4 | <0.3 D4 | <0.3 D4 | <5 D4 | <0.3 D4 | <0.0005 | <5 D4 | <0.1 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 5 FD4 | 0.12 D4 | 10 D4 | <0.1 D4 |
| | RES-002A 927-930 | N | <0.3 D4 | <0.3 D4 | <0.3 D4 | <5 D4 | 0.1 FD4 | <0.0005 | <5 D4 | <0.1 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 7 FD4 | 0.012 D4 | 13 D4 | <0.1 D4 |
| | RES-002A 965-968 | N | <0.3 D4 | <0.3 D4 | 64.6 D4 | <5 D4 | <0.3 D4 | 0.0003 F | <5 D4 | <0.1 D4 | <0.01 D4 | <0.3 D4 | <0.3 D4 | 6 FD4 | 0.0096 B7 | 9 FD4 | <0.1 D4 |
| | RES-002A 992-995 | N | <0.3 D4 | <0.3 D4 | 0.05 FD4 | <5 D4 | <0.3 D4 | <0.0005 | <5 D4 | <0.1 D4 | <0.05 D4 | <0.3 D4 | <0.3 D4 | 3 FD4 | 0.084 B7 | 9 FD4 | <0.1 D4 |
| | | FD | <0.3 D4 | <0.3 D4 | 0.06 FD4 | <5 D4 | <0.3 D4 | 0.0002 F | <5 D4 | <0.1 D4 | <0.05 D4 | <0.3 D4 | <0.3 D4 | 4 FD4 | 0.0814 B7 | 9 FD4 | <0.1 D4 |
| RES-005I | RES-005I 1011.88-1012.45 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0008 FD3 | <5 D3 | <0.1 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.0017 FD3 | 29 D3 | 0.05 FD3 |
| | RES-005I 1322.73-1323.23 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | -- | <0.3 D3 | 0.0007 FD3 | <5 D3 | <0.1 D3 | <0.002 D3 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.0014 FD3 | 30 D3 | <0.1 D3 |
| | RES-005I 1353-1353.49 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0017 FD3 | <5 D3 | <0.1 D3 | <0.002 D3 | <0.3 D3 | <0.3 D3 | 14 D3 | 0.0025 FD3 | 41 D3 | <0.1 D3 |
| | | FD | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0011 FD3 | <5 D3 | <0.1 D3 | <0.002 D3 | <0.3 D3 | <0.3 D3 | 11 D3 | 0.0029 FD3 | 26 D3 | <0.1 D3 |
| | RES-005I 1370.93-1374 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.0603 D3 | 20 D3 | 0.06 FD3 |
| | RES-005I 1380-1383 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 6 FD3 | 0.142 D3 | 19 D3 | <0.1 D3 |
| | RES-005I 1389-1391.57 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | 2 FD1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 2 FD3 | 0.388 D3 | 16 D3 | <0.1 D3 |
| | RES-005I 1396.3-1399.3 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | 4 FD1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.002 D3 | <0.3 D3 | <0.3 D3 | <8 D3 | 0.124 D3 | 14 D3 | <0.1 D3 |
| | RES-005I 1405-1406.67 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0006 FD3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 3 FD3 | 0.158 D3 | 12 D3 | 0.07 FD3 |
| | RES-005I 1410.18-1413.18 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0007 FD3 | <5 D3 | <0.1 D3 | <0.02 D3 | <0.3 D3 | <0.3 D3 | 2 FD3 | 0.221 D3 | 11 D3 | <0.1 D3 |
| | RES-005I 1419.18-1422.18 | N | 0.08 FD3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.002 D3 | <0.3 D3 | <0.3 D3 | <8 D3 | 0.163 D3 | 8 FD3 | <0.1 D3 |
| | | FD | 0.08 FD3 | <0.3 D3 | <0.3 D3 | -- | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.02 D3 | <0.3 D3 | <0.3 D3 | <8 D3 | 0.172 D3 | 8 FD3 | <0.1 D3 |
| | RES-005I 1428.18-1431.18 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | <8 D3 | 0.059 D3 | 4 FD3 | <0.1 D3 |
| | RES-005I 1437.13-1440.13 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | 0.1 FD3 | 0.0016 FD3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 4 FD3 | 0.0616 D3 | 11 D3 | 0.08 FD3 |
| | RES-005I 1446.13-1449.13 | N | <0.3 D3M1 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3M1 | <0.05 D3M2 | <0.3 D3 | <0.3 D3 | 5 FD3 | 0.0752 D3 | 9 FD3 | 0.1 D3M2 |
| | RES-005I 1455.13-1458.13 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | 1 FD1 | <0.3 D3 | 0.0011 FD3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.138 D3 | 22 D3 | 0.13 D3 |
| | RES-005I 1464.13-1467.13 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <0.5 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 8 D3 | 0.0841 D3 | 23 D3 | 0.21 D3 |
| | RES-005I 1473.13-1476.13 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 7 FD3 | 0.0608 D3 | 19 D3 | <0.1 D3 |
| | RES-005I 1481-1482.66 | N | 0.11 FD3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 4 FD3 | 0.0525 D3 | 13 D3 | <0.1 D3 |
| | | FD | 0.11 FD3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 4 FD3 | 0.0631 D3 | 12 D3 | 0.07 FD3 |
| | RES-005I 1487.1-1490.1 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | 3 FD2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2M2 | <0.3 D2 | <0.3 D2 | 9 D2 | 0.0214 D2 | 10 D2 | 0.05 FD2 |
| | RES-005I 1490.1-1493.1 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 9 D2 | 0.0308 D2 | 12 D2 | <0.1 D2 |
| | RES-005I 1499-1502 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 9 D2 | 0.0267 D2 | 17 D2 | <0.1 D2 |
| | RES-005I 1506.56-1509.47 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | 1 FD2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 9 D2 | 0.0511 D2 | 17 D2 | <0.1 D2 |
| | RES-005I 1515.47-1518.47 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | 1 FD2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 10 D2 | 0.0353 D2 | 15 D2 | 0.13 D2 |
| | RES-005I 1524.47-1527.47 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | 1 FD2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 10 D2 | 0.0471 D2 | 12 D2 | <0.1 D2 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1532.98-1534.97 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | 1 FD2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 10 D2 | 0.0083 D2 | 22 D2 | <0.1 D2 |
| | RES-005I 1544-1546.55 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | 1 FD2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 6 FD2 | 0.0427 D2 | 14 D2 | 0.14 D2 |
| | RES-005I 1552.55-1555.58 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | 1 FD2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 7 FD2 | 0.0419 D2 | 19 D2 | <0.1 D2 |
| | RES-005I 1559.46-1562.46 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 9 D2 | 0.0547 D2 | 15 D2 | <0.1 D2 |
| | RES-005I 1568.46-1571.46 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2M2 | <0.3 D2 | <0.3 D2 | 8 D2 | 0.0776 D2 | 10 D2 | 0.09 FD2 |
| | RES-005I 1577.46-1580.46 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 4 FD2 | 0.0627 D2 | 6 FD2 | <0.1 D2 |
| | | FD | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 4 FD2 | 0.0679 D2 | 8 FD2 | <0.1 D2 |
| | RES-005I 1586.46-1589.46 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 11 D2 | 0.0395 D2 | 21 D2 | <0.1 D2 |
| | RES-005I 1595.46-1598.46 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 10 D2 | 0.0362 D2 | 13 D2 | <0.1 D2 |
| | RES-005I 1604.46-1607.46 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 11 D2 | 0.0466 D2 | 22 D2 | <0.1 D2 |
| | RES-005I 1613.46-1616.46 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <10 D2M2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 5 FD2 | 0.0373 D2 | 9 FD2 | <0.1 D2 |
| | RES-005I 1616.46-1619 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 10 D2 | 0.0326 D2 | 15 D2 | <0.1 D2 |
| | RES-005I 1626.54-1627.16 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 4 FD2 | 0.148 D2 | 9 FD2 | <0.1 D2 |
| | RES-005I 1627.16-1630 | N | <0.3 D2 | <0.3 D2 | <0.3 D2 | <5 D2 | <0.3 D2 | <0.003 D2 | <5 D2 | <0.1 D2 | <0.05 D2 | <0.3 D2 | <0.3 D2 | 5 FD2 | 0.0709 D2 | 11 D2 | <0.1 D2 |
| | RES-005I 1632.56-1635.56 | N | <0.3 D3 | 0.05 FD3 | 23.3 D3 | <5 D1 | 47.2 D3 | <0.005 D2 | <5 D3 | 0.12 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.054 D2 | 14 D3 | <0.1 D3 |
| | RES-005I 1638.37-1641 | N | <0.3 D3 | 0.1 FD3 | 30.2 D3 | <5 D1 | 55 D3 | 0.0001 F | <5 D3 | 0.1 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.0576 | 15 D3 | 0.12 D3 |
| | RES-005I 1645.84-1648.08 | N | <0.3 D3 | <0.3 D3 | 11 D3 | 1 FD1 | 2.1 D3 | 0.0006 | <5 D3 | 0.11 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.475 D2 | 11 D3 | <0.1 D3 |
| | RES-005I 1652-1654.93 | N | <0.3 D3 | 0.13 FD3 | 17.1 D3 | <5 D1 | 69.2 D3 | 0.0014 | <5 D3 | 0.19 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.211 | 14 D3 | <0.1 D3 |
| | RES-005I 1654.93-1657.3 | N | <0.3 D3 | 0.07 FD3 | 90.7 D3 | 3 FD1 | 29.8 D3 | 0.0016 | <5 D3 | 0.18 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 7 FD3 | 0.352 | 11 D3 | <0.1 D3 |
| | RES-005I 1677.8-1680.8 | N | <0.3 D3 | 0.06 FD3 | 80 D3M3 | <5 D1M1 | 7.8 D3M1 | 0.0006 | <5 D3 | 0.03 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 6 FD3 | 0.0503 | 10 D3 | <0.1 D3 |
| | RES-005I 1695.23-1697.23 | N | <0.3 D3 | <0.3 D3 | 79.4 D3 | <5 D1 | 1.7 D3 | 0.0002 F | <5 D3 | 0.06 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.019 | 12 D3 | <0.1 D3 |
| | RES-005I 1711.23-1713.23 | N | <0.3 D3 | 0.09 FD3 | 134 D3 | <5 D1 | 4.4 D3 | 0.0001 F | <5 D3 | 0.1 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 13 D3 | 0.034 | 16 D3 | <0.1 D3 |
| | RES-005I 1727.23-1729.23 | N | <0.3 D3 | 0.06 FD3 | 73.7 D3 | 4 FD1 | 4.7 D3 | 0.0003 F | <5 D3 | 0.03 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 7 FD3 | 0.0187 | 11 D3 | <0.1 D3 |
| | | FD | <0.3 D3 | <0.3 D3 | 70.5 D3M3 | 3 FD1 | 3.7 D3 | <0.005 D2 | <5 D3 | <0.1 D3 | <0.002 D1 | <0.3 D3 | <0.3 D3 | 7 FD3 | 0.02 FD2 | 10 D3 | <0.1 D3 |
| | RES-005I 1743.23-1745.23 | N | <0.3 D3 | 0.06 FD3 | 92 D3 | <5 D1 | 5.3 D3 | <0.005 D2 | 2 FD3 | 0.03 FD3 | <0.001 | 0.1 FD3 | <0.3 D3 | 39 D3 | 0.0328 D2 | 43 D3 | <0.1 D3 |
| | RES-005I 1759.23-1761.23 | N | <0.3 D3 | <0.3 D3 | 108 D3 | 3 FD1 | 21.7 D3 | 0.0002 F | 3 FD3 | 0.07 FD3 | <0.001 | <0.3 D3 | 0.08 FD3 | 44 D3 | 0.0548 | 66 D3 | <0.1 D3 |
| | RES-005I 1775.23-1778.23 | N | <0.3 D3 | <0.3 D3 | 58.9 D3 | <5 D1 | 29 D3 | 0.0016 | <5 D3 | 0.23 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 12 D3 | 0.0287 | 19 D3 | <0.1 D3 |
| | RES-005I 1794.36-1796.3 | N | <0.3 D3 | <0.3 D3 | 79.5 D3 | <5 D1 | 29.4 D3 | 0.168 | <5 D3 | 0.18 D3 | <0.001 | 0.07 FD3 | <0.3 D3 | 9 D3 | 0.0298 | 14 D3 | <0.1 D3 |
| | RES-005I 1811.3-1814.3 | N | <0.3 D3 | <0.3 D3 | 108 D3 | <5 D1 | 35.8 D3 | 0.0002 F | <5 D3 | <0.1 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 7 FD3 | 0.07 | 11 D3 | <0.1 D3 |
| | RES-005I 1830.5-1831.5 | N | <0.3 D3 | <0.3 D3 | 104 D3 | <5 D1 | 31.7 D3 | 0.0003 F | <5 D3 | <0.1 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 7 FD3 | 0.0668 | 11 D3 | <0.1 D3 |
| | RES-005I 1835.3-1838.3 | N | <0.3 D3 | <0.3 D3 | 68.3 D3 | <5 D1 | 42.2 D3 | 0.0002 F | <5 D3 | 0.31 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.0488 | 22 D3 | <0.1 D3 |
| | RES-005I 1855.91-1858.91 | N | <0.3 D3 | 0.06 FD3 | 50.8 D3 | <5 D1 | 22.8 D3 | 0.0001 F | <5 D3 | 0.2 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.0346 | 22 D3 | <0.1 D3 |
| | RES-005I 1872.9-1875.38 | N | <0.3 D3 | 0.08 FD3 | 77.2 D3 | <5 D1 | 36.7 D3 | 0.0028 | <5 D3 | 0.34 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.0465 | 22 D3 | <0.1 D3 |
| | RES-005I 1875.38-187 | N | <0.3 D3 | 0.11 FD3 | 108 D3M3 | <5 D1M1 | 30.7 D3M3 | 0.0007 FD3 | <5 D3 | 0.05 FD3 | <0.002 D1 | 0.09 FD3 | <0.3 D3 | 4 FD3 | 0.0527 D3 | 8 FD3 | <0.1 D3 |
| | RES-005I 1884-1887 | N | <0.3 D3 | 0.16 FD3 | 99.5 D3 | <5 D1 | 33.6 D3 | 0.001 FD3 | 3 FD3 | 0.26 D3 | <0.001 | 0.11 FD3 | 0.06 FD3 | 19 D3 | 0.051 D3 | 18 D3 | 0.37 D3 |
| | RES-005I 1895-1897.0 | N | <0.3 D3 | 0.27 FD3 | 60 D3 | <5 D1 | 21.8 D3 | 0.0019 FD3 | <5 D3 | 0.22 D3 | <0.001 | <0.3 D3 | 0.19 FD3 | 7 FD3 | 0.0386 D3 | 13 D3 | <0.1 D3 |
| | RES-005I 1901.49-190 | N | <0.3 D3 | 0.21 FD3 | 61.1 D3 | <5 D1 | 37.5 D3 | 0.0006 FD3 | <5 D3 | 0.26 D3 | <0.001 | 0.08 FD3 | 0.08 FD3 | 7 FD3 | 0.0414 D3 | 13 D3 | 0.13 D3 |
| | RES-005I 1917.29-191 | N | <0.3 D3 | 0.14 FD3 | 70.6 D3 | <5 D1 | 17.3 D3 | 0.001 FD3 | 6 D3 | 0.22 D3 | <0.001 | 0.09 FD3 | 0.07 FD3 | 28 D3 | 0.0545 D3 | 28 D3 | 0.17 D3 |
| | RES-005I 1923.1-1925 | N | <0.3 D3 | 0.16 FD3 | 109 D3 | <5 D1 | 37.9 D3 | 0.0216 D3 | 7 D3 | 0.48 D3 | <0.001 | 0.09 FD3 | 0.05 FD3 | 30 D3 | 0.0629 D3 | 31 D3 | <0.1 D3 |
| | RES-005I 1955.06-195 | N | <0.3 D3 | 0.11 FD3 | 47.7 D3 | <5 D1 | 1.1 D3 | 0.0039 D3 | 6 D3 | 1.13 D3 | <0.001 | 0.52 D3 | 0.05 FD3 | 37 D3 | 0.0333 D3 | 31 D3 | 0.09 FD3 |
| | | FD | <0.3 D3 | 0.11 FD3 | 46.4 D3 | <5 D1 | 3.1 D3 | 0.0043 D3 | 6 D3 | 1.18 D3 | <0.001 | 0.51 D3 | <0.3 D3 | 35 D3 | 0.0324 D3 | 30 D3 | <0.1 D3 |
| | RES-005I 1979.06-198 | N | <0.3 D3 | 0.14 FD3 | 35.6 D3 | <5 D1 | 1.3 D3 | 0.0006 FD3 | 8 D3 | 1.79 D3 | <0.001 | 0.34 D3 | <0.3 D3 | 38 D3 | 0.0292 D3 | 39 D3 | 0.16 D3 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above  acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 2008.11-201 | N | <0.3 D3 | 0.1 FD3 | 83.7 D3 | <5 D1 | 1.6 D3 | 0.0021 FD3 | 9 D3 | 1.86 D3 | <0.001 | 0.09 FD3 | <0.3 D3 | 31 D3 | 0.0493 D3 | 42 D3 | 0.08 FD3 |
| | RES-005I 2032.11-203 | N | <0.3 D3 | 0.09 FD3 | 161 D3M3 | <5 D1 | 25 D3 | 0.002 FD3 | 8 D3 | 1.96 D3 | <0.002 D1 | 0.09 FD3 | <0.3 D3 | 28 D3 | 0.072 D3 | 31 D3 | 0.27 D3M2 |
| | RES-005I 2049.84-205 | N | <0.3 D3 | 0.06 FD3 | 83.8 D3 | <5 D1 | 7.9 D3 | 0.0037 D3 | 1 FD3 | 0.17 D3 | <0.001 | 0.08 FD3 | <0.3 D3 | 15 D3 | 0.0499 D3 | 15 D3 | <0.1 D3 |
| | RES-005I 2061.84-206 | N | <0.3 D3 | 0.11 FD3 | 49.3 D3 | <5 D1 | 22.8 D3 | 0.0028 FD3 | 1 FD3 | 0.19 D3 | <0.001 | 0.09 FD3 | <0.3 D3 | 13 D3 | 0.0323 D3 | 16 D3 | <0.1 D3 |
| RES-005J | RES-005J 1660.4-1668 | N | <0.3 D3 | 0.13 FD3 | 87.6 D3 | <5 D1 | 9.5 D3 | <0.003 D3 | <5 D3 | 0.06 FD3 | <0.001 | 0.08 FD3 | <0.3 D3 | 9 D3 | 0.0256 D3 | 15 D3 | <0.1 D3 |
| RES-006D | RES-006D 1247.48-1250.48 | N | <0.3 D3 | 0.09 FD3 | 1.22 D3 | <5 D1 | <0.3 D3 | <0.005 D3 | 10 D3 | 3.25 D3 | <0.002 D2 | <0.3 D3 | <0.3 D3 | 6 FD3 | 0.003 FD3 | 37 D3 | 0.17 D3 |
| | RES-006D 1405.47-1408.44 | N | <0.3 D3 | 0.07 FD3 | 9.3 D3 | <5 D1 | 9 D3 | 0.0056 D3 | 8 D3 | 2.76 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 15 D3 | 0.0043 D3 | 33 D3 | <0.1 D3 |
| | RES-006D 1450.44-1453.44 | N | 0.06 FD3 | 0.17 FD3 | 55.6 D3 | 7 D1 | 165 D3 | 0.0118 D3 | 19 D3 | 8.08 D3 | <0.001 | 0.1 FD3 | 0.05 FD3 | 21 D3 | 0.0052 D3 | 107 D3 | <0.1 D3 |
| | RES-006D 1495.44-1498.44 | N | <0.3 D3 | 0.12 FD3 | 67.9 D3 | <5 D1 | 51.8 D3 | 0.0269 D3 | 22 D3 | 2.11 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 17 D3 | 0.0049 D3 | 64 D3 | <0.1 D3 |
| | RES-006D 1532.81-1535.81 | N | <0.3 D3 | 0.08 FD3 | 33.8 D3 | 9 D1 | 119 D3 | 0.0136 D3 | 13 D3 | 1.4 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 22 D3 | 0.0063 D3 | 94 D3 | <0.1 D3 |
| | RES-006D 1577.43-1580.43 | N | <0.3 D3 | 0.14 FD3 | 45.3 D3M3 | <5 D1M1 | 61.1 D3M3 | 0.006 D3 | 14 D3 | 6.9 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 29 D3 | 0.0076 D3 | 98 D3 | <0.1 D3 |
| | | FD | <0.3 D3 | 0.11 FD3 | 36.6 D3 | <5 D1 | 31.7 D3 | 0.0036 D3 | 10 D3 | 5.21 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 22 D3 | 0.0064 D3 | 57 D3 | <0.1 D3 |
| | RES-006D 1622.43-1625.43 | N | <0.3 D3 | 0.07 FD3 | 37 D3 | 1 FD1 | 92.3 D3 | 0.004 D3 | 11 D3 | 1.58 D3 | <0.001 | <0.3 D3 | 0.05 FD3 | 22 D3 | 0.0083 D3 | 71 D3 | 0.29 D3 |
| | RES-006D 1667.43-1670.43 | N | 0.33 D3 | 0.12 FD3 | 10.8 D3 | 3 FD1 | 102 D3M3 | <0.003 D3 | 3 FD3 | 0.14 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 12 D3 | 0.018 D3 | 41 D3 | 0.44 D3 |
| | RES-006D 1705.4-1708.4 | N | 1.03 D3 | 0.11 FD3 | 17.9 D3 | 4 FD1 | 275 D3 | <0.003 D3 | 6 D3 | 0.2 D3 | <0.001 | 0.11 FD3 | 0.05 FD3 | 7 FD3 | 0.0303 D3 | 42 D3 | <0.1 D3 |
| | RES-006D 1750.4-1753.4 | N | 0.36 D3 | 0.17 FD3 | 3.56 D3 | <10 D1 | 333 D3 | 0.0006 FD3 | 1 FD3 | 0.06 FD3 | <0.002 D2 | 0.17 FD3 | <0.3 D3 | <8 D3 | 0.0667 D3 | 10 D3 | <0.1 D3 |
| | RES-006D 1798.4-1801.4 | N | 0.53 D3 | 0.14 FD3 | 11.3 D3 | 5 FD1 | 227 D3 | 0.001 FD3 | 2 FD3 | 0.08 FD3 | <0.001 | 0.1 FD3 | 0.07 FD3 | 2 FD3 | 0.057 D3 | 16 D3 | <0.1 D3 |
| | RES-006D 1843.4-1846.4 | N | 0.68 D3 | 0.76 D3 | 5.76 D3 | <10 D1 | 301 D3 | 0.0006 FD3 | <5 D3 | 0.08 FD3 | <0.001 | 0.28 FD3 | 0.12 FD3 | <8 D3 | 0.0738 D3 | 12 D3 | <0.1 D3 |
| | RES-006D 1898.21-1901.09 | N | <0.3 D3 | 0.27 FD3 | 17 D3 | 12 D1 | 104 D3 | 0.0012 FD3 | <5 D3 | 0.32 D3 | <0.001 | <0.3 D3 | 0.05 FD3 | 6 FD3 | 0.0498 D3 | 19 D3 | <0.1 D3 |
| | RES-006D 1927.23-1930.23 | N | 0.13 FD3 | 0.1 FD3 | 59.9 D3 | 5 D1 | 45.8 D3 | 0.0123 D3 | <5 D3 | 0.05 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 3 FD3 | 0.0286 D3 | 11 D3 | <0.1 D3 |
| | | FD | 0.1 FD3 | 0.12 FD3 | 60.3 D3 | 5 D1 | 46.9 D3 | 0.0112 D3 | <5 D3 | 0.06 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 3 FD3 | 0.0281 D3 | 14 D3 | <0.1 D3 |
| | RES-006D 1952.56-1954.83 | N | <0.3 D3 | 0.11 FD3 | 5.14 D3 | <5 D1 | 48.2 D3 | 0.0953 D3 | <5 D3 | 0.37 D3 | <0.001 | <0.3 D3 | 0.07 FD3 | 3 FD3 | 0.0261 D3 | 10 D3 | <0.1 D3 |
| | RES-006D 1954.83-197 | N | 0.1 FD3 | 0.11 FD3 | 39.8 D3 | 2 FD1 | 49.6 D3 | 0.241 D3 | <5 D3 | 0.07 FD3 | <0.001 | 0.08 FD3 | <0.3 D3 | 6 FD3 | 0.032 D3 | 17 D3 | <0.1 D3 |
| | RES-006D 1980.6-1983.6 | N | <0.3 D3 | 0.26 FD3 | 33.9 D3 | 3 FD1 | 202 D3 | 0.0005 FD3 | <5 D3 | 0.59 D3 | <0.001 | <0.3 D3 | 0.09 FD3 | <8 D3 | 0.0498 D3 | 13 D3 | <0.1 D3 |
| | RES-006D 1995.6-1998.6 | N | <0.3 D3 | 0.25 FD3 | 249 D3 | 16 D1 | 122 D3 | 0.0007 FD3 | <5 D3 | 0.46 D3 | <0.001 | 0.07 FD3 | 0.11 FD3 | <8 D3 | 0.113 D3 | 27 D3 | <0.1 D3 |
| | RES-006D 2022.66-2025.66 | N | <0.3 D3 | 0.19 FD3 | 109 D3 | 7 D1 | 130 D3 | <0.003 D3 | <5 D3 | 0.41 D3 | <0.001 | 0.89 D3 | 0.14 FD3 | 4 FD3 | 0.104 D3 | 13 D3 | <0.1 D3 |
| | RES-006D 2040.66-2043.66 | N | <0.3 D3 | 0.15 FD3 | 151 D3 | 4 FD1 | 50.6 D3 | <0.005 D3 | 5 D3 | 0.82 D3 | <0.002 D2 | <0.3 D3 | 0.13 FD3 | 10 D3 | 0.098 D3 | 21 D3 | <0.1 D3 |
| | RES-006D 2058.16-2061.16 | N | <0.3 D3 | 0.11 FD3 | 114 D3 | 5 D1 | 5.9 D3 | 0.0018 FD3 | 68 D3 | 1.04 D3 | <0.001 | <0.3 D3 | 0.13 FD3 | 25 D3 | 0.0826 D3 | 30 D3 | <0.1 D3 |
| | RES-006D 2073.13-2076.13 | N | <0.3 D3 | 0.14 FD3 | 198 D3 | 7 D1 | 33.8 D3 | 0.0035 D3 | 48 D3 | 1.61 D3 | <0.001 | <0.3 D3 | 0.15 FD3 | 21 D3 | 0.12 D3 | 20 D3 | <0.1 D3 |
| | | FD | <0.3 D3 | 0.1 FD3 | 185 D3 | 7 D1 | 32.4 D3 | 0.0049 D3 | 40 D3 | 1.37 D3 | <0.001 | <0.3 D3 | 0.14 FD3 | 18 D3 | 0.107 D3 | 17 D3 | <0.1 D3 |
| | RES-006D 2091.13-2094.13 | N | <0.3 D3 | 0.07 FD3 | 184 D3 | <5 D1 | 13.6 D3 | 0.0118 D3 | 31 D3 | 1.01 D3 | <0.001 | <0.3 D3 | 0.09 FD3 | 31 D3 | 0.0992 D3 | 31 D3 | <0.1 D3 |
| | RES-006D 2115.47-2118.47 | N | 0.07 FD3 | <0.3 D3 | 69.7 D3 | 18 D1 | 48.6 D3 | 0.0294 D3 | <5 D3 | 0.09 FD3 | <0.001 | 0.09 FD3 | 0.07 FD3 | 6 FD3 | 0.0691 D3 | 12 D3 | <0.1 D3 |
| | RES-006D 2125.45-2128.42 | N | <0.3 D3 | 0.13 FD3 | 53 D3 | 9 D1 | 124 D3 | 0.007 D3 | <5 D3 | 0.22 D3 | <0.001 | 0.09 FD3 | 0.09 FD3 | <8 D3 | 0.0522 D3 | 27 D3 | <0.1 D3 |
| | RES-006D 2137.08-2138.5 | N | <0.3 D3 | 0.09 FD3 | 55.9 D3 | 33 D1 | 58.2 D3 | 0.028 D3 | <5 D3 | 0.27 D3 | <0.001 | 0.08 FD3 | 0.08 FD3 | 10 D3 | 0.0417 D3 | 16 D3 | <0.1 D3 |
| RES-009 | RES-009 1012.16-1014.16 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0002 F | <5 D3 | 0.13 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 16 D3 | <0.003 D3 | 19 D3 | <0.1 D3V1 |
| | RES-009 1027.38-1030.3 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.0005 | <5 D3 | <0.1 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 5 FD3 | <0.003 D3 | 8 FD3 | <0.1 D3V1 |
| | RES-009 1045.3-1048.3 | N | <0.3 D3 | <0.3 D3 | 11 D3 | <5 D1 | <0.3 D3 | 0.0006 | 13 D3 | 1.04 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 16 D3 | 0.0009 FD3 | 44 D3 | <0.1 D3V1 |
| | RES-009 105.16-105.73 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | 0.2 FD3 | <0.0005 | <5 D3 | 0.09 FD3 | <0.005 D3 | <0.3 D3 | <0.3 D3 | 2 FD3 | <0.0005 | 21 D3 | <0.1 D3 |
| | RES-009 1063.3-1066.3 | N | <0.3 D3 | 0.07 FD3 | 13.8 D3 | <5 D1 | <0.3 D3 | 0.0006 | 13 D3 | 0.65 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 12 D3 | 0.007 D3 | 46 D3 | <0.1 D3V1 |
| | RES-009 1081.3-1084.3 | N | <0.3 D3 | <0.3 D3 | 8.53 D3 | 1 FD1 | <0.3 D3 | 0.0011 | 11 D3 | 0.53 D3 | <0.01 D3 | <0.3 D3 | 0.07 FD3 | 15 D3 | 0.004 D3 | 61 D3 | <0.1 D3V1 |
| | RES-009 1098.34-1100.96 | N | <0.3 D3 | 0.05 FD3 | 3.93 D3 | 1 FD1 | <0.3 D3 | 0.0013 | 17 D3 | 0.6 D3 | <0.01 D3 | <0.3 D3 | 0.05 FD3 | 11 D3 | 0.004 D3 | 50 D3 | 0.1 D3V1 |
| | RES-009 199.18-199.78 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.0005 | <5 D3 | 0.53 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 3 FD3 | <0.0005 | 18 D3 | <0.1 D3 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009 | | FD | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.001 | <5 D3 | 0.55 D3 | <0.05 D1 | <0.3 D3 | <0.3 D3 | 3 FD3 | <0.0005 | 16 D3 | <0.1 D3 |
| | RES-009 281.14-281.64 | N | <0.3 D3 | 0.06 FD3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.0005 | <5 D3 | <0.1 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | <8 D3 | <0.003 D3 | 20 D3 | <0.1 D3 |
| | RES-009 348.3-348.83 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.005 D3 | <5 D3 | 0.46 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 3 FD3 | <0.003 D3 | 14 D3 | <0.1 D3 |
| | RES-009 447.23-447.8 | N | <0.3 D3 | <0.3 D3 | 0.08 FD3 | <5 D1 | 0.2 FD3 | 0.0005 | <5 D3 | 0.05 FD3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 3 FD3 | <0.003 D3 | 21 D3 | <0.1 D3 |
| | RES-009 485.12-485.71 | N | <0.3 D3 | <0.3 D3 | 0.11 FD3M2 | <5 D1M2 | <0.3 D3 | <0.0005 | 2 FD3 | 0.08 FD3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 3 FD3 | <0.003 D3 | 14 D3 | <0.1 D3M2 |
| | RES-009 557.06-557.56 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0001 F | <5 D3 | <0.1 D3 | 0.05 | 0.06 FD3 | <0.3 D3 | 3 FD3 | 0.0014 FD3 | 35 D3 | <0.1 D3 |
| | RES-009 647.52-648.1 | N | <0.3 D3 | <0.3 D3 | 0.06 FD3 | <5 D1 | <0.3 D3 | <0.0005 | <5 D3 | <0.1 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.0032 D3 | 30 D3 | <0.1 D3 |
| | RES-009 7.43-7.96 | N | <0.3 D3 | <0.3 D3 | 0.09 FD3 | <5 D1 | <0.3 D3 | <0.0005 | <5 D3 | 0.23 D3 | <0.005 D3 | <0.3 D3 | <0.3 D3 | 2 FD3 | 0.0002 F | 20 D3 | <0.1 D3 |
| | RES-009 718-718.58 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0002 F | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 4 FD3 | <0.003 D3 | 17 D3 | 0.07 FD3 |
| | | FD | <0.3 D3 | 0.05 FD3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0001 F | <5 D3 | <0.1 D3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 3 FD3 | 0.0007 FD3 | 12 D3 | <0.1 D3 |
| | RES-009 810.42-810.98 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0006 | <5 D3 | <0.1 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 8 D3 | 0.0021 FD3 | 23 D3 | <0.1 D3 |
| | RES-009 906.08-906.58 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.005 D3 | <5 D3 | <0.1 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 12 D3 | <0.005 D3 | 23 D3 | <0.1 D3V1 |
| | RES-009 987.9-988.45 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | 0.0002 F | <5 D3 | <0.1 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 6 FD3 | 0.021 D3 | 14 D3 | <0.1 D3V1 |
| | RES-009 994.67-997.67 | N | <0.3 D3 | <0.3 D3 | 0.06 FD3 | <5 D1 | <0.3 D3 | 0.0005 | 1 FD3 | 0.08 FD3 | <0.05 D3 | <0.3 D3 | <0.3 D3 | 22 D3 | <0.003 D3 | 25 D3 | <0.1 D3V1 |
| RES-009D | RES-009D 1119.32-1122.42 | N | <0.3 D3 | <0.3 D3 | 8 D3 | <5 D1 | 0.7 D3 | 0.0225 | 3 FD3 | 0.22 D3 | <0.01 D3 | <0.3 D3 | <0.3 D3 | 7 FD3 | 0.056 D3 | 18 D3 | <0.1 D3V1 |
| | | FD | <0.3 D3 | 0.05 FD3 | 8.93 D3 | <50 D1 | 8.4 D3 | 0.0305 | 6 D3 | 0.44 D3 | <0.005 D2 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.0647 | 53 D3 | <0.1 D3 |
| | RES-009D 1128.62-1131.72 | N | 0.05 FD3 | 0.07 FD3 | 5.89 D3 | <50 D1 | 10.6 D3 | 0.111 | 7 D3 | 0.8 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.0526 | 54 D3 | <0.1 D3 |
| RES-009E | RES-009E 1307.1-1310.1 | N | <0.3 D3 | <0.3 D3 | 48.4 D3 | <50 D1 | 174 D3 | 0.001 FD2 | <5 D3 | 0.33 D3 | <0.002 D2 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.007 D2 | 26 D3 | <0.1 D3 |
| | RES-009E 1319.1-1322.1 | N | <0.3 D3 | <0.3 D3 | 15.6 D3 | <50 D1 | 45 D3 | 0.0003 F | <5 D3 | 0.16 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 13 D3 | 0.0109 | 29 D3 | <0.1 D3 |
| | RES-009E 1335.41-1338.16 | N | <0.3 D3 | 0.06 FD3 | 5.45 D3 | <50 D1 | 99.2 D3 | 0.0124 | <5 D3 | 0.26 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 12 D3 | 0.0178 | 30 D3 | <0.1 D3 |
| | RES-009E 1351.03-1354.03 | N | <0.3 D3 | <0.3 D3 | 23.4 D3 | <50 D1 | 59.1 D3 | 0.0006 | <5 D3 | 0.14 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 13 D3 | 0.0183 | 19 D3 | <0.1 D3 |
| | RES-009E 1368.07-1370.69 | N | <0.3 D3 | 0.08 FD3 | 3.95 D3 | <50 D1 | 296 D3 | 0.0002 F | <5 D3 | 0.27 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 2 FD3 | 0.0569 | 13 D3 | <0.1 D3 |
| | RES-009E 1385.61-1388.61 | N | <0.3 D3 | 0.07 FD3 | 2.85 D3 | <50 D1 | 219 D3 | 0.0002 F | <5 D3 | 0.25 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 4 FD3 | 0.0451 | 14 D3 | <0.1 D3 |
| | RES-009E 1402.22-1404.53 | N | 0.36 D3 | <0.3 D3 | 12.7 D3 | <50 D1 | 82.5 D3 | 0.0007 | <5 D3 | 0.05 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.026 | 14 D3 | <0.1 D3 |
| | | FD | 0.32 D3 | <0.3 D3 | 12.5 D3 | <50 D1 | 78.3 D3 | 0.0008 | <5 D3 | 0.05 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.0251 | 11 D3 | <0.1 D3 |
| | RES-009E 1418.16-1419.8 | N | <0.3 D3 | <0.3 D3 | 22.7 D3 | <50 D1 | 86.6 D3 | <0.005 D2 | <5 D3 | 0.16 D3 | <0.005 D2 | <0.3 D3 | <0.3 D3 | 14 D3 | 0.017 D2 | 23 D3 | 0.15 D3 |
| | RES-009E 1431.42-1433.8 | N | 0.07 FD3 | <0.3 D3 | 66.8 D3M3 | <50 D1 | 57 D3M3 | 0.0002 F | <5 D3 | <0.1 D3 | <0.005 D2 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.0143 | 16 D3 | <0.1 D3 |
| | RES-009E 1446.41-1449.41 | N | <0.3 D3 | 0.08 FD3 | 26.4 D3 | <50 D1 | 136 D3 | <0.0005 | <5 D3 | 0.15 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.0252 | 22 D3 | <0.1 D3 |
| | RES-009E 1464.41-1467.41 | N | <0.3 D3 | 0.07 FD3 | 19.9 D3 | <50 D1 | 119 D3 | 0.0001 F | <5 D3 | 0.16 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.0216 | 23 D3 | <0.1 D3 |
| | RES-009E 1478.13-1481.13 | N | <0.3 D3 | <0.3 D3 | 50.8 D3 | <50 D1 | 111 D3 | 0.0002 F | <5 D3 | 0.2 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 12 D3 | 0.0235 | 27 D3 | <0.1 D3 |
| | RES-009E 1496.13-1499.13 | N | <0.3 D3 | <0.3 D3 | 39 D3 | <50 D1 | 126 D3 | <0.0005 | <5 D3 | 0.27 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 11 D3 | 0.0306 | 24 D3 | <0.1 D3 |
| | RES-009E 1510.74-1527.19 | N | 0.51 D3 | 0.09 FD3 | 19.6 D3 | <10 D1 | 185 D3 | <0.003 D3 | <5 D3 | 0.1 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 14 D3 | 0.0355 D3 | 23 D3 | <0.1 D3 |
| | RES-009E 1514.13-1517.13 | N | <0.3 D3 | 0.06 FD3 | 15.5 D3 | <50 D1 | 160 D3 | <0.0005 | <5 D3 | 0.25 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.0376 | 19 D3 | <0.1 D3 |
| | RES-009E 1532.4-1534.49 | N | 0.38 D3 | 0.09 FD3 | 19.5 D3 | <50 D1 | 147 D3 | 0.0002 F | <5 D3 | 0.04 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 4 FD3 | 0.0395 | 13 D3 | <0.1 D3 |
| | | FD | 0.36 D3 | 0.09 FD3 | 19.8 D3 | <50 D1 | 140 D3 | <0.0005 | <5 D3 | 0.04 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 3 FD3 | 0.0406 | 14 D3 | <0.1 D3 |
| | RES-009E 1547.47-1550.47 | N | <0.3 D3 | 0.07 FD3 | 43.1 D3 | <50 D1 | 104 D3 | 0.0022 | <5 D3 | 0.41 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 6 FD3 | 0.0521 | 15 D3 | 0.05 FD3 |
| | RES-009E 1565.47-1568-47 | N | <0.3 D3 | 0.13 FD3 | 9.47 D3 | <10 D1 | 298 D3 | 0.0003 F | <5 D3 | 0.47 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 3 FD3 | 0.0694 | 11 D3 | 0.13 D3 |
| | RES-009E 1597.32-1599.88 | N | <0.3 D3 | 0.14 FD3 | 10.8 D3 | <30 D1 | 287 D3 | 0.0015 | <5 D3 | 0.29 D3 | <0.001 | 0.07 FD3 | <0.3 D3 | <8 D3 | 0.044 | 7 FD3 | <0.1 D3 |
| | RES-009E 1602.44-1605 | N | <0.3 D3 | 0.22 FD3 | 9.73 D3 | <10 D1 | 213 D3 | 0.005 D3 | <5 D3 | 0.19 D3 | <0.002 D3 | <0.3 D3 | <0.3 D3 | <8 D3 | 0.037 D3 | 10 D3 | <0.1 D3 |
| | RES-009E 1617.38-1619-.14 | N | <0.3 D3 | <0.3 D3 | 16.6 D3 | 11 D1 | 33.8 D3 | 0.0003 F | 1 FD3 | 0.1 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 11 D3 | 0.0257 | 14 D3 | 0.06 FD3 |
| | RES-009E 1634.46-1637.47 | N | <0.3 D3 | 0.1 FD3 | 71.1 D3 | <5 D1 | 45.9 D3 | 0.0002 F | <5 D3 | 0.18 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 7 FD3 | 0.02 | 10 D3 | <0.1 D3 |
| | RES-009E 1650.14-1652.81 | N | <0.3 D3 | 0.28 FD3 | 118 D3 | 3 FD1 | 48.3 D3 | 0.0009 | <5 D3 | 0.14 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 2 FD3 | 0.0332 | 8 FD3 | <0.1 D3 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E | | FD | <0.3 D3 | 0.29 FD3 | 122 D3 | 2 FD1 | 56 D3 | 0.0007 | <5 D3 | 0.15 D3 | <0.001 | <0.3 D3 | <0.3 D3 | <8 D3 | 0.0355 | 7 FD3 | <0.1 D3 |
| | RES-009E 1669.07-1672.07 | N | <0.3 D3 | <0.3 D3 | 95.2 D3 | <5 D1 | 20.4 D3 | 0.0004 F | <5 D3 | 0.09 FD3 | <0.001 | <0.3 D3 | <0.3 D3 | 7 FD3 | 0.0524 | 13 D3 | 0.15 D3 |
| | RES-009E 1685.09-1687-47 | N | <0.3 D3 | <0.3 D3 | 70.7 D3M3 | <5 D1M1 | 6.5 D3 | 0.0009 | <5 D3 | <0.1 D3 | <0.005 D3 | 0.22 FD3 | <0.3 D3 | 8 D3 | 0.0201 | 8 FD3 | <0.1 D3M2 |
| | RES-009E 1697.61-1700.61 | N | <0.3 D3 | 0.15 FD3 | 35.2 D3 | 3 FD1 | 48.8 D3 | 0.0053 | 1 FD3 | 0.15 D3 | <0.001 | 0.08 FD3 | <0.3 D3 | 13 D3 | 0.0301 | 18 D3 | <0.1 D3 |
| | RES-009E 1718.61-1721.61 | N | <0.3 D3 | <0.3 D3 | 35 D3 | <5 D1 | 34.5 D3 | 0.104 D3 | <5 D3 | 0.22 D3 | <0.005 D3 | 0.05 FD3 | <0.3 D3 | 8 D3 | 0.023 D3 | 17 D3 | <0.1 D3 |
| | RES-009E 1739.63-1742.63 | N | <0.3 D3 | <0.3 D3 | 34.9 D3M3 | 3 FD1 | 27.4 D3 | 0.142 | <5 D3 | 0.31 D3 | <0.002 D3 | 0.3 D3 | <0.3 D3 | <8 D3 | 0.0125 | 6 FD3 | <0.1 D3M2 |
| | RES-009E 1760.86-1763.86 | N | <0.3 D3 | <0.3 D3 | 41.7 D3 | 4 FD1 | 18 D3 | 0.0033 | <5 D3 | 0.09 FD3 | <0.001 | 0.09 FD3 | <0.3 D3 | 5 FD3 | 0.0198 | 8 FD3 | <0.1 D3 |
| | | FD | <0.3 D3 | <0.3 D3 | 39.2 D3 | 4 FD1 | 20.4 D3 | 0.0037 | <5 D3 | 0.1 D3 | <0.001 | 0.1 FD3 | <0.3 D3 | 5 FD3 | 0.0197 | 9 FD3 | <0.1 D3 |
| | RES-009E 1789.83-1792.31 | N | <0.3 D3 | 0.06 FD3 | 55.4 D3 | 25 D1 | 36.4 D3 | 0.0069 | <5 D3 | 0.25 D3 | <0.001 | 0.06 FD3 | <0.3 D3 | 9 D3 | 0.0271 | 18 D3 | 0.09 FD3 |
| | RES-009E 1798.16-1799.79 | N | <0.3 D3 | 0.1 FD3 | 125 D3 | 8 D1 | 17.8 D3 | 0.0004 F | <5 D3 | 0.16 D3 | <0.001 | 0.2 FD3 | <0.3 D3 | 7 FD3 | 0.0448 | 12 D3 | <0.1 D3 |
| | RES-009E 1801.42-1804.15 | N | <0.3 D3 | 0.1 FD3 | 176 D3 | 6 D1 | 58.9 D3 | 0.0001 F | <5 D3 | 0.26 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 3 FD3 | 0.0728 | 15 D3 | <0.1 D3 |
| | RES-009E 1818.62-1821.62 | N | <0.3 D3 | 0.06 FD3 | 159 D3 | 49 D1 | 53.5 D3 | 0.0144 | 7 D3 | 0.69 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 9 D3 | 0.0699 | 52 D3 | <0.1 D3 |
| | RES-009E 1829.95-1832.48 | N | <0.3 D3 | <0.3 D3 | 362 D3 | 27 D1 | 50.8 D3M3 | 0.0042 | 14 D3 | 1.07 D3 | <0.002 D3 | <0.3 D3 | <0.3 D3 | 10 D3 | 0.158 | 26 D3 | 0.09 FD3 |
| | RES-009E 1846.66-1849.66 | N | <0.3 D3 | 0.08 FD3 | 225 D3 | 59 D1 | 61.6 D3 | 0.006 | 29 D3 | 5.1 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 13 D3 | 0.112 | 63 D3 | <0.1 D3 |
| | RES-009E 1862.15-1865.15 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.001 | 3.11 D3 | <0.3 D3 | 4 FD3 | 0.0466 D3 | 3 FD3 | <0.1 D3 |
| | RES-009E 1867.87-1884.35 | N | 0.05 FD3 | 0.05 FD3 | 0.05 FD3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.001 | 1.88 D3 | <0.3 D3 | 6 FD3 | 0.0518 D3 | <10 D3 | <0.1 D3 |
| | RES-009E 1880.15-1882.37 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | 4 FD3 | <0.1 D3 | <0.001 | 1.95 D3 | <0.3 D3 | 6 FD3 | 0.0497 D3 | <10 D3 | <0.1 D3 |
| | | FD | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.001 | 2.51 D3 | <0.3 D3 | 6 FD3 | 0.0542 D3 | <10 D3 | <0.1 D3 |
| | RES-009E 1899-1901.88 | N | <0.3 D3 | 0.09 FD3 | 166 D3 | 16 D1 | 0.8 D3 | <0.003 D3 | 6 D3 | 4.81 D3 | <0.001 | <0.3 D3 | 0.05 FD3 | 15 D3 | 0.175 D3 | 23 D3 | 0.13 D3 |
| | RES-009E 1929.76-1932.58 | N | <0.3 D3 | 0.09 FD3 | 177 D3 | 6 D1 | <0.3 D3 | <0.003 D3 | 4 FD3 | 3.73 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 6 FD3 | 0.136 D3 | 11 D3 | 0.24 D3 |
| | RES-009E 1947.67-1950.67 | N | <0.3 D3 | <0.3 D3 | 1.32 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | 4 FD3 | 0.05 FD3 | <0.001 | 0.89 D3 | <0.3 D3 | 7 FD3 | 0.036 D3 | 3 FD3 | 0.14 D3 |
| | RES-009E 1954.6-1956 | N | <0.3 D3 | <0.3 D3 | 1.1 D3 | <5 D1 | 0.2 FD3 | <0.003 D3 | <5 D3 | <0.1 D3 | <0.001 | 1.26 D3 | <0.3 D3 | 7 FD3 | 0.0835 D3 | 3 FD3 | <0.1 D3 |
| | RES-009E 1967.76-1969.72 | N | <0.3 D3 | 0.07 FD3 | 95.1 D3 | 3 FD1 | 19.6 D3 | 0.0006 FD3 | 2 FD3 | 0.36 D3 | <0.001 | <0.3 D3 | <0.3 D3 | 12 D3 | 0.0622 D3 | 18 D3 | 0.24 D3 |
| | RES-009E 1974.78-1977.89 | N | <0.3 D3 | <0.3 D3 | <0.3 D3 | <5 D1 | <0.3 D3 | <0.003 D3 | <5 D3 | <0.1 D3 | < 0.002 D2 | 0.34 D3 | <0.3 D3 | 5 FD3 | 0.039 D3 | 4 FD3 | 0.11 D3 |
| | RES-009E 1984.74-1987.74 | N | <0.3 D3 | <0.3 D3 | 166 D3 | 5 D1 | <0.3 D3 | 0.0029 D3 | <5 D3 | 0.33 D3 | <0.001 | 0.2 FD3 | <0.3 D3 | <8 D3 | 0.0123 D3 | 5 FD3 | 0.25 D3 |
| | RES-009E 2056.38-2075 | N | <0.3 D3 | 0.07 FD3 | 73.8 D3 | 6 FD1 | 12.8 D3 | 0.0014 FD3 | 14 D3 | 0.3 D3 | <0.001 | <0.3 D3 | 0.05 FD3 | 19 D3 | 0.0603 D3 | 19 D3 | <0.1 D3 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
|---|---|---|---|---|---|---|---|
| RES-001C | RES-001C 1502-1505 | N | 4 FD3 | 0.0002 F | 0.0032 | <0.1 D3 | 5.8 D3 |
| | RES-001C 1530-1533 | N | 5 FD3 | <0.005 D3 | 0.002 FD3 | <0.1 D3 | 3.26 D3 |
| | RES-001C 1557-1560 | N | 4 FD3 | 0.0005 | 0.0027 | <0.1 D3 | 1.33 D3 |
| | RES-001C 1584-1587 | N | 5 FD3 | 0.0003 F | 0.002 | <0.1 D3 | 2.85 D3 |
| | | FD | 5 FD3 | 0.0003 F | 0.0021 | <0.1 D3 | 3.06 D3 |
| | RES-001C 1611-1614 | N | 5 FD3 | 0.0002 F | 0.006 | <0.1 D3 | 8.31 D3 |
| | RES-001C 1639-1642 | N | 4 FD3 | 0.0001 F | 0.0011 | <0.1 D3 | 5.44 D3 |
| | RES-001C 1666-1669 | N | 3 FD3 | <0.0005 | <0.0005 | <0.1 D3 | 0.12 FD3 |
| | RES-001C 1693-1696 | N | 4 FD3 | 0.0001 F | 0.0015 | <0.1 D3 | 4.3 D3 |
| | RES-001C 1711-1714.96 | N | 4 FD3 | <0.0005 | <0.0005 | <0.1 D3 | 0.11 FD3 |
| | RES-001C 1745-1748 | N | 5 FD3 | 0.0005 | 0.0022 | <0.1 D3 | 0.55 D3 |
| | RES-001C 1771.75-1791.4 | N | 22 D3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.15 FD3 |
| | RES-001C 1781-1784 | N | 5 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.13 FD3 |
| | RES-001C 1799-1802 | N | 5 FD3 | <0.0005 | 0.0001 F | <0.1 D3 | 0.22 FD3 |
| | | FD | 4 FD3 | <0.0005 | <0.0005 | <0.1 D3 | 0.11 FD3 |
| | RES-001C 1814-1817 | N | 6 FD3 | <0.0005 | <0.0005 | <0.1 D3 | 0.06 FD3 |
| | RES-001C 1837-1840 | N | 4 FD3 | <0.0005 | <0.0005 | <0.1 D3 | 0.14 FD3 |
| | RES-001C 1855-1858 | N | 4 FD3 | <0.0005 | <0.0005 | <0.1 D3 | 0.1 FD3 |
| | RES-001C 1873-1876 | N | 5 FD3 | <0.0005 | <0.0005 | <0.1 D3 | 0.08 FD3 |
| | RES-001C 1892.5-1895 | N | 9 D3 | 0.0002 F | <0.0005 | <0.1 D3 | 0.17 FD3 |
| | RES-001C 1934-1937 | N | 3 FD3 | <0.0005 | 0.001 | <0.1 D3 | 0.15 FD3 |
| | RES-001C 1987-1990 | N | 4 FD3 | 0.0003 F | 0.0027 | <0.1 D3 | 1.17 D3 |
| | RES-001C 2007-2010 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.09 FD3 |
| | | FD | 4 FD3 | <0.0005 | <0.0005 | <0.1 D3 | 0.1 FD3 |
| | RES-001C 2041-2044 | N | 3 FD3 | 0.0001 F | <0.0005 | <0.1 D3 | 0.11 FD3 |
| | RES-001C 2115-2118 | N | 4 FD3 | <0.0005 | <0.0005 | <0.1 D3 | 0.1 FD3 |
| | RES-001C 2164.4-2166.3 | N | 3 FD3 | 0.0003 F | 0.0021 | 0.08 FD3 | 0.77 D3 |
| | RES-001C 2214-2215 | N | 3 FD3 | 0.0001 F | 0.0107 | <0.1 D3 | 5.7 D3 |
| | RES-001C 2242-2244 | N | 3 FD3 | 0.0001 F | 0.0041 | <0.1 D3 | 0.2 FD3 |
| RES-002A | RES-002A 1007-1010 | N | 4 FD4 | <0.0005 V5 | 0.0005 | <0.1 D4 | 0.1 FD4 |
| | RES-002A 1058-1061 | N | 5 FD4 | 0.0001 F | 0.0008 | <0.1 D4 | 0.34 D4 |
| | RES-002A 1109-1112 | N | 14 D4 | <0.0005 V5 | 0.0011 | <0.1 D4 | 0.35 D4 |
| | RES-002A 1154-1156 | N | 4 FD4 | 0.0002 F | 0.0005 | <0.1 D4 | 0.15 FD4 |
| | RES-002A 1201-1203 | N | 3 FD4 | <0.0005 V5 | 0.0104 | <0.1 D4 | 0.47 D4 |
| | | FD | 3 FD4 | <0.0005 V5 | 0.0085 | <0.1 D4 | 0.41 D4 |
| | RES-002A 1246-1249 | N | 3 FD4 | <0.0005 V5 | 0.0008 | <0.1 D4 | 0.23 FD4 |
| | RES-002A 1291-1292 | N | 3 FD4 | <0.0005 | 0.0005 | <0.1 D4 | 0.2 FD4 |
| | RES-002A 1325-1328 | N | 3 FD4 | <0.0005 | 0.0009 | <0.1 D4 | 0.1 FD4 |
| | RES-002A 1363-1366 | N | 3 FD4 | <0.0005 V5 | 0.0006 | <0.1 D4 | 0.3 D4 |
| | RES-002A 1395-1397 | N | 3 FD4 | <0.0005 | 0.0011 | <0.1 D4 | 0.16 FD4 |
| | RES-002A 1414.6-1417 | N | 3 FD4 | <0.0005 V5 | 0.0005 | <0.1 D4 | 0.06 FD4 |
| | RES-002A 1454-1457 | N | 3 FD4 | 0.0003 F | 0.001 | <0.1 D4 | 0.16 FD4 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
|---|---|---|---|---|---|---|---|
| RES-002A | RES-002A 1538-1541 | N | 3 FD4 | 0.0008 | 0.0007 | <0.1 D4 | 0.12 FD4 |
| | RES-002A 1583-1586 | N | 3 FD3 | 0.0001 F | 0.0013 | <0.1 D3 | 0.21 FD3 |
| | RES-002A 1627-1630 | N | 3 FD3 | <0.005 D3 | 0.005 D3 | <0.1 D3 | 0.14 FD3 |
| | RES-002A 1732-1735 | N | 3 FD3 | 0.0002 F | 0.0009 | <0.1 D3 | 0.81 D3 |
| | RES-002A 1755-1756 | N | 3 FD3 | 0.0002 F | 0.0011 | <0.1 D3 | 0.8 D3 |
| | RES-002A 1781-1784 | N | 3 FD3 | <0.0005 | 0.0006 | <0.1 D3 | 0.52 D3 |
| | RES-002A 1814-1817 | N | 3 FD3 | <0.0005 | 0.0013 | <0.1 D3 | 0.22 FD3 |
| | RES-002A 1876-1879 | N | 3 FD3 | 0.0005 | 0.0048 | <0.1 D3 | 0.21 FD3 |
| | RES-002A 1927-1930 | N | 5 FD3 | 0.0005 | 0.0007 | <0.1 D3 | 0.25 FD3 |
| | RES-002A 1981-1984 | N | 4 FD3 | 0.0004 F | 0.0006 | <0.1 D3 | 0.24 FD3 |
| | RES-002A 858-861 | N | 5 FD4 | <0.0005 | 0.0001 F | <0.1 D4 | 0.09 FD4 |
| | RES-002A 888-891 | N | 5 FD4 | <0.0005 | <0.0005 | <0.1 D4 | <0.3 D4 |
| | RES-002A 927-930 | N | 4 FD4 | <0.0005 | 0.0001 F | <0.1 D4 | 0.11 FD4 |
| | RES-002A 965-968 | N | 4 FD4 | 0.0003 F | 0.0002 F | <0.1 D4 | 0.11 FD4 |
| | RES-002A 992-995 | N | 4 FD4 | <0.0005 | <0.0005 | <0.1 D4 | 0.11 FD4 |
| | | FD | 4 FD4 | <0.0005 V5 | <0.0005 | <0.1 D4 | 0.14 FD4 |
| RES-005I | RES-005I 1011.88-1012.45 | N | 11 D3 | 0.0005 FD3 | <0.003 D3 | 0.03 FD3 | 0.11 FD3 |
| | RES-005I 1322.73-1323.23 | N | 6 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.13 FD3 |
| | RES-005I 1353-1353.49 | N | 6 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.15 FD3 |
| | | FD | 5 FD3 | 0.0005 FD3 | <0.003 D3 | <0.1 D3 | 0.15 FD3 |
| | RES-005I 1370.93-1374 | N | 5 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.35 D3 |
| | RES-005I 1380-1383 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.11 FD3 |
| | RES-005I 1389-1391.57 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.14 FD3 |
| | RES-005I 1396.3-1399.3 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.19 FD3 |
| | RES-005I 1405-1406.67 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.12 FD3 |
| | RES-005I 1410.18-1413.18 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.1 FD3 |
| | RES-005I 1419.18-1422.18 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | 0.05 FD3 | 0.1 FD3 |
| | | FD | 3 FD3 | <0.003 D3 | <0.003 D3 | 0.05 FD3 | 0.14 FD3 |
| | RES-005I 1428.18-1431.18 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.13 FD3 |
| | RES-005I 1437.13-1440.13 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.11 FD3 |
| | RES-005I 1446.13-1449.13 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3M1 | 0.13 FD3 |
| | RES-005I 1455.13-1458.13 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.12 FD3 |
| | RES-005I 1464.13-1467.13 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.13 FD3 |
| | RES-005I 1473.13-1476.13 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.12 FD3 |
| | RES-005I 1481-1482.66 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.08 FD3 |
| | | FD | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.11 FD3 |
| | RES-005I 1487.1-1490.1 | N | 3 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.07 FD2 |
| | RES-005I 1490.1-1493.1 | N | 3 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.06 FD2 |
| | RES-005I 1499-1502 | N | 3 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.1 FD2 |
| | RES-005I 1506.56-1509.47 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.09 FD2 |
| | RES-005I 1515.47-1518.47 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.17 FD2 |
| | RES-005I 1524.47-1527.47 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.13 FD2 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1532.98-1534.97 | N | 3 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.22 FD2 |
| | RES-005I 1544-1546.55 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.07 FD2 |
| | RES-005I 1552.55-1555.58 | N | 3 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.07 FD2 |
| | RES-005I 1559.46-1562.46 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.11 FD2 |
| | RES-005I 1568.46-1571.46 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.19 FD2 |
| | RES-005I 1577.46-1580.46 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.1 FD2 |
| | | FD | <8 D2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.11 FD2 |
| | RES-005I 1586.46-1589.46 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.22 FD2 |
| | RES-005I 1595.46-1598.46 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.11 FD2 |
| | RES-005I 1604.46-1607.46 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.41 D2 |
| | RES-005I 1613.46-1616.46 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.12 FD2 |
| | RES-005I 1616.46-1619 | N | 3 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.1 FD2 |
| | RES-005I 1626.54-1627.16 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.12 FD2 |
| | RES-005I 1627.16-1630 | N | 2 FD2 | <0.003 D2 | <0.003 D2 | <0.1 D2 | 0.08 FD2 |
| | RES-005I 1632.56-1635.56 | N | 3 FD3 | <0.005 D2 | <0.005 D2 | <0.1 D3 | 0.62 D3 |
| | RES-005I 1638.37-1641 | N | 3 FD3 | 0.0002 F | 0.0006 | <0.1 D3 | 0.67 D3 |
| | RES-005I 1645.84-1648.08 | N | 3 FD3 | <0.0005 | 0.0004 F | <0.1 D3 | 0.28 FD3 |
| | RES-005I 1652-1654.93 | N | 3 FD3 | 0.0001 F | 0.0003 F | <0.1 D3 | 0.28 FD3 |
| | RES-005I 1654.93-1657.3 | N | 3 FD3 | 0.0002 F | 0.0006 | <0.1 D3 | 0.18 FD3 |
| | RES-005I 1677.8-1680.8 | N | 3 FD3 | <0.0005 | 0.0009 | <0.1 D3 | 0.37 D3 |
| | RES-005I 1695.23-1697.23 | N | 3 FD3 | 0.0001 F | 0.0003 F | <0.1 D3 | 0.38 D3 |
| | RES-005I 1711.23-1713.23 | N | 3 FD3 | 0.0001 F | 0.0014 | <0.1 D3 | 0.37 D3 |
| | RES-005I 1727.23-1729.23 | N | 3 FD3 | <0.0005 | 0.0004 F | <0.1 D3 | 0.4 D3 |
| | | FD | 3 FD3 | <0.005 D2 | <0.005 D2 | <0.1 D3 | 0.85 D3M2 |
| | RES-005I 1743.23-1745.23 | N | 4 FD3 | <0.005 D2 | <0.005 D2 | <0.1 D3 | 0.2 FD3 |
| | RES-005I 1759.23-1761.23 | N | 3 FD3 | 0.0013 | 0.0013 | <0.1 D3 | 0.34 D3 |
| | RES-005I 1775.23-1778.23 | N | 3 FD3 | 0.0008 | 0.0009 | <0.1 D3 | 0.28 FD3 |
| | RES-005I 1794.36-1796.3 | N | 3 FD3 | 0.0003 F | 0.0006 | <0.1 D3 | 0.2 FD3 |
| | RES-005I 1811.3-1814.3 | N | 3 FD3 | 0.0013 | 0.0015 | <0.1 D3 | 0.29 FD3 |
| | RES-005I 1830.5-1831.5 | N | 3 FD3 | 0.0012 | 0.0015 | <0.1 D3 | 0.28 FD3 |
| | RES-005I 1835.3-1838.3 | N | 3 FD3 | 0.0003 F | 0.0011 | <0.1 D3 | 0.37 D3 |
| | RES-005I 1855.91-1858.91 | N | 3 FD3 | 0.0002 F | 0.0026 | <0.1 D3 | 1.54 D3 |
| | RES-005I 1872.9-1875.38 | N | 3 FD3 | 0.0002 F | 0.0015 | <0.1 D3 | 4 D3 |
| | RES-005I 1875.38-187 | N | 2 FD3 | 0.0006 FD3 | 0.0022 FD3 | <0.1 D3 | 19.1 D3M3 |
| | RES-005I 1884-1887 | N | 3 FD3 | <0.005 D3 | 0.002 FD3 | <0.1 D3 | 0.71 D3 |
| | RES-005I 1895-1897.0 | N | 3 FD3 | 0.001 FD3 | 0.0156 D3 | <0.1 D3 | 7.93 D3 |
| | RES-005I 1901.49-190 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 7.63 D3 |
| | RES-005I 1917.29-191 | N | 3 FD3 | 0.0005 FD3 | 0.001 FD3 | <0.1 D3 | 1.81 D3 |
| | RES-005I 1923.1-1925 | N | 3 FD3 | 0.0006 FD3 | 0.0011 FD3 | <0.1 D3 | 6.43 D3 |
| | RES-005I 1955.06-195 | N | 4 FD3 | 0.0006 FD3 | <0.003 D3 | <0.1 D3 | 3.77 D3 |
| | | FD | 3 FD3 | 0.0006 FD3 | <0.003 D3 | <0.1 D3 | 3.68 D3 |
| | RES-005I 1979.06-198 | N | 4 FD3 | 0.0006 FD3 | 0.0008 FD3 | <0.1 D3 | 0.22 FD3 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 2008.11-201 | N | 3 FD3 | 0.0005 FD3 | 0.0008 FD3 | <0.1 D3 | 0.32 D3 |
| | RES-005I 2032.11-203 | N | 3 FD3 | <0.005 D3 | 0.001 FD3 | <0.1 D3 | 0.22 FD3 |
| | RES-005I 2049.84-205 | N | 3 FD3 | 0.0006 FD3 | 0.0008 FD3 | <0.1 D3 | 0.98 D3 |
| | RES-005I 2061.84-206 | N | 3 FD3 | <0.003 D3 | 0.0005 FD3 | <0.1 D3 | 1.84 D3 |
| RES-005J | RES-005J 1660.4-1668 | N | 3 FD3 | 0.0009 FD3 | 0.0006 FD3 | <0.1 D3 | 0.55 D3 |
| RES-006D | RES-006D 1247.48-1250.48 | N | 6 FD3 | <0.005 D3 | <0.005 D3 | 0.04 FD3 | 5.2 D3 |
| | RES-006D 1405.47-1408.44 | N | 7 FD3 | 0.0007 FD3 | 0.0014 FD3 | <0.1 D3 | 1.05 D3 |
| | RES-006D 1450.44-1453.44 | N | 5 FD3 | <0.003 D3 | 0.0114 D3 | <0.1 D3 | 13.5 D3 |
| | RES-006D 1495.44-1498.44 | N | 3 FD3 | 0.0007 FD3 | 0.0071 D3 | <0.1 D3 | 18.5 D3 |
| | RES-006D 1532.81-1535.81 | N | 3 FD3 | <0.003 D3 | 0.008 D3 | <0.1 D3 | 6.23 D3 |
| | RES-006D 1577.43-1580.43 | N | 5 FD3 | 0.0007 FD3 | 0.0036 D3 | <0.1 D3 | 6.2 D3 |
| | | FD | 4 FD3 | 0.0005 FD3 | 0.0024 FD3 | <0.1 D3 | 4.66 D3 |
| | RES-006D 1622.43-1625.43 | N | 4 FD3 | 0.0005 FD3 | 0.003 D3 | <0.1 D3 | 5.38 D3 |
| | RES-006D 1667.43-1670.43 | N | 3 FD3 | <0.003 D3 | 0.0023 FD3 | <0.1 D3 | 5.67 D3 |
| | RES-006D 1705.4-1708.4 | N | 4 FD3 | <0.003 D3 | 0.0029 FD3 | <0.1 D3 | 3 D3 |
| | RES-006D 1750.4-1753.4 | N | 15 D3 | <0.003 D3 | 0.0013 FD3 | <0.1 D3 | 3.42 D3 |
| | RES-006D 1798.4-1801.4 | N | 18 D3 | <0.005 D3 | 0.001 FD3 | <0.1 D3 | 3.54 D3 |
| | RES-006D 1843.4-1846.4 | N | 16 D3 | <0.003 D3 | 0.0013 FD3 | <0.1 D3 | 3.06 D3 |
| | RES-006D 1898.21-1901.09 | N | 16 D3 | <0.003 D3 | 0.0017 FD3 | <0.1 D3 | 0.06 FD3 |
| | RES-006D 1927.23-1930.23 | N | 16 D3 | <0.003 D3 | 0.0014 FD3 | <0.1 D3 | 0.1 FD3 |
| | | FD | 16 D3 | <0.003 D3 | 0.0016 FD3 | <0.1 D3 | 0.31 D3 |
| | RES-006D 1952.56-1954.83 | N | 17 D3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.11 FD3 |
| | RES-006D 1954.83-197 | N | 3 FD3 | <0.003 D3 | 0.0007 FD3 | <0.1 D3 | 0.2 FD3 |
| | RES-006D 1980.6-1983.6 | N | 16 D3 | <0.003 D3 | 0.0016 FD3 | <0.1 D3 | 3.13 D3D |
| | RES-006D 1995.6-1998.6 | N | 18 D3 | <0.003 D3 | 0.0097 D3 | <0.1 D3 | 4.08 D3 |
| | RES-006D 2022.66-2025.66 | N | 17 D3 | <0.003 D3 | 0.0007 FD3 | <0.1 D3 | 1.58 D3 |
| | RES-006D 2040.66-2043.66 | N | 17 D3 | <0.005 D3 | 0.003 FD3 | <0.1 D3 | 2.97 D3 |
| | RES-006D 2058.16-2061.16 | N | 18 D3 | 0.0005 FD3 | <0.003 D3 | <0.1 D3 | 0.47 D3 |
| | RES-006D 2073.13-2076.13 | N | 18 D3 | <0.003 D3 | 0.0009FD3 | <0.1 D3 | 2.73 D3 |
| | | FD | 17 D3 | <0.003 D3 | 0.0008 FD3 | <0.1 D3 | 2.49 D3 |
| | RES-006D 2091.13-2094.13 | N | 32 D3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.64 D3 |
| | RES-006D 2115.47-2118.47 | N | 18 D3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.21 FD3 |
| | RES-006D 2125.45-2128.42 | N | 17 D3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.09 FD3 |
| | RES-006D 2137.08-2138.5 | N | 19 D3 | <0.003 D3 | 0.0008 FD3 | <0.1 D3 | 0.41 D3 |
| RES-009 | RES-009 1012.16-1014.16 | N | 4 FD3 | <0.0005 | 0.0005 | <0.1 D3 | 0.22 FD3 |
| | RES-009 1027.38-1030.3 | N | 6 FD3 | <0.0005 | 0.0003 F | <0.1 D3 | 0.11 FD3 |
| | RES-009 1045.3-1048.3 | N | 12 D3 | 0.0001 F | 0.0003 F | 0.03 FD3 | 2.01 D3 |
| | RES-009 105.16-105.73 | N | 5 FD3 | <0.0005 | 0.0003 F | <0.1 D3 | 0.18 FD3 |
| | RES-009 1063.3-1066.3 | N | 13 D3 | <0.0005 | 0.0001 F | 0.05 FD3 | 2.71 D3 |
| | RES-009 1081.3-1084.3 | N | 13 D3 | 0.0001 F | 0.001 | <0.1 D3 | 2.08 D3 |
| | RES-009 1098.34-1100.96 | N | 10 D3 | <0.0005 | 0.0005 | 0.05 FD3 | 3.59 D3 |
| | RES-009 199.18-199.78 | N | 6 FD3 | <0.0005 | 0.0014 | <0.1 D3 | 0.09 FD3 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
|---|---|---|---|---|---|---|---|
| RES-009 | | FD | 7 FD3 | <0.0005 | 0.0014 | <0.1 D3 | 0.06 FD3 |
| | RES-009 281.14-281.64 | N | 7 FD3 | <0.0005 | 0.0006 | <0.1 D3 | 0.13 FD3 |
| | RES-009 348.3-348.83 | N | 7 FD3 | <0.005 D3 | 0.001 FD3 | <0.1 D3 | 0.09 FD3 |
| | RES-009 447.23-447.8 | N | 25 D3 | <0.0005 | 0.0002 F | <0.1 D3 | 0.07 FD3 |
| | RES-009 485.12-485.71 | N | 15 D3 | <0.0005 | 0.0001 F | <0.1 D3 | 0.12 FD3 |
| | RES-009 557.06-557.56 | N | 19 D3 | <0.0005 | 0.0052 | 0.12 D3 | 0.13 FD3 |
| | RES-009 647.52-648.1 | N | 16 D3 | <0.0005 | <0.0005 | 0.03 FD3 | 0.08 FD3 |
| | RES-009 7.43-7.96 | N | 5 FD3 | < 0.0005 | 0.0006 F | <0.1 D3 | 0.08 FD3 |
| | RES-009 718-718.58 | N | 5 FD3 | <0.0005 | 0.0005 | 0.14 D3 | 0.09 FD3 |
| | | FD | 4 FD3 | <0.0005 | <0.0005 | 0.08 FD3 | 0.07 FD3 |
| | RES-009 810.42-810.98 | N | 12 D3 | <0.0005 | <0.0005 | 0.03 FD3 | 0.11 FD3 |
| | RES-009 906.08-906.58 | N | 10 D3 | <0.005 D3 | <0.005 D3 | 0.04 FD3 | 0.07 FD3 |
| | RES-009 987.9-988.45 | N | 9 D3 | <0.0005 | 0.0001 F | 0.07 FD3 | 0.08 FD3 |
| | RES-009 994.67-997.67 | N | 5 FD3 | <0.0005 | 0.0011 | 0.08 FD3 | 0.18 FD3 |
| RES-009D | RES-009D 1119.32-1122.42 | N | 10 D3 | 0.0002 F | 0.0008 | <0.1 D3 | 1.68 D3 |
| | | FD | 13 D3 | 0.0004 F | 0.001 | <0.1 D3 | 2.48 D3 |
| | RES-009D 1128.62-1131.72 | N | 11 D3 | 0.0003 F | 0.0012 | <0.1 D3 | 4.38 D3 |
| RES-009E | RES-009E 1307.1-1310.1 | N | 3 FD3 | <0.005 D2 | 0.003 FD2 | <0.1 D3 | 0.17 FD3 |
| | RES-009E 1319.1-1322.1 | N | 3 FD3 | 0.0002 F | 0.001 | <0.1 D3 | 0.22 FD3 |
| | RES-009E 1335.41-1338.16 | N | 2 FD3 | 0.0001 F | 0.0016 | <0.1 D3 | 0.3 D3 |
| | RES-009E 1351.03-1354.03 | N | 2 FD3 | 0.0003 F | 0.0006 | <0.1 D3 | 0.05 FD3 |
| | RES-009E 1368.07-1370.69 | N | 2 FD3 | <0.0005 | 0.0011 | <0.1 D3 | 0.11 FD3 |
| | RES-009E 1385.61-1388.61 | N | 2 FD3 | <0.0005 | 0.0005 | <0.1 D3 | 0.22 FD3 |
| | RES-009E 1402.22-1404.53 | N | <8 D3 | 0.0002 F | 0.0007 | <0.1 D3 | 0.08 FD3 |
| | | FD | 2 FD3 | 0.0002 F | 0.0006 | <0.1 D3 | 0.21 FD3 |
| | RES-009E 1418.16-1419.8 | N | 2 FD3 | <0.005 D2 | 0.002 FD2 | <0.1 D3 | 0.12 FD3 |
| | RES-009E 1431.42-1433.8 | N | 2 FD3 | 0.0007 | 0.0024 | <0.1 D3 | 0.19 FD3 |
| | RES-009E 1446.41-1449.41 | N | 3 FD3 | 0.0003 F | 0.0014 | <0.1 D3 | 0.17 FD3 |
| | RES-009E 1464.41-1467.41 | N | 2 FD3 | 0.0002 F | 0.0016 | <0.1 D3 | 0.09 FD3 |
| | RES-009E 1478.13-1481.13 | N | 2 FD3 | 0.0004 F | 0.0018 | <0.1 D3 | 0.12 FD3 |
| | RES-009E 1496.13-1499.13 | N | 3 FD3 | 0.0003 F | 0.0024 | <0.1 D3 | 0.13 FD3 |
| | RES-009E 1510.74-1527.19 | N | 18 D3 | <0.003 D3 | 0.003 D3 | <0.1 D3 | 0.08 FD3 |
| | RES-009E 1514.13-1517.13 | N | 3 FD3 | 0.0001 F | 0.0012 | <0.1 D3 | 0.09 FD3 |
| | RES-009E 1532.4-1534.49 | N | 2 FD3 | <0.0005 | 0.002 | <0.1 D3 | 0.16 FD3 |
| | | FD | 2 FD3 | <0.0005 | 0.0021 | <0.1 D3 | 0.15 FD3 |
| | RES-009E 1547.47-1550.47 | N | 2 FD3 | 0.0002 F | 0.0037 | <0.1 D3 | 1.97 D3 |
| | RES-009E 1565.47-1568-47 | N | 3 FD3 | <0.0005 | 0.0016 | <0.1 D3 | 13.9 D3 |
| | RES-009E 1597.32-1599.88 | N | 3 FD3 | <0.0005 | 0.0012 | <0.1 D3 | 9.27 D3 |
| | RES-009E 1602.44-1605 | N | 2 FD3 | <0.005 D3 | 0.001 FD3 | <0.1 D3 | 5.25 D3 |
| | RES-009E 1617.38-1619-.14 | N | 3 FD3 | 0.0002 F | 0.0015 | <0.1 D3 | 2.47 D3 |
| | RES-009E 1634.46-1637.47 | N | 3 FD3 | 0.0002 F | 0.002 | <0.1 D3 | 1.51 D3 |
| | RES-009E 1650.14-1652.81 | N | 2 FD3 | 0.0003 F | 0.0021 | <0.1 D3 | 4.03 D3 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX B**
**NET ACID GENERATION RESULTS**

| Hole ID | Sample ID | Type | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
|---|---|---|---|---|---|---|---|
| RES-009E | | FD | 2 FD3 | 0.0001 F | 0.0021 | <0.1 D3 | 4.11 D3 |
| | RES-009E 1669.07-1672.07 | N | 3 FD3 | 0.0003 F | 0.0014 | <0.1 D3 | 12 D3 |
| | RES-009E 1685.09-1687-47 | N | 2 FD3 | 0.0007 | 0.0007 | <0.1 D3 | 0.06 FD3 |
| | RES-009E 1697.61-1700.61 | N | 4 FD3 | 0.0001 F | 0.0013 | <0.1 D3 | 0.12 FD3 |
| | RES-009E 1718.61-1721.61 | N | 3 FD3 | <0.005 D3 | <0.005 D3 | 0.03 FD3 | 0.22 FD3 |
| | RES-009E 1739.63-1742.63 | N | 3 FD3 | 0.0003 F | 0.0005 | <0.1 D3 | 0.27 FD3 |
| | RES-009E 1760.86-1763.86 | N | 3 FD3 | <0.0005 | 0.0007 | <0.1 D3 | 0.4 D3 |
| | | FD | 3 FD3 | <0.0005 | 0.0008 | <0.1 D3 | 0.49 D3 |
| | RES-009E 1789.83-1792.31 | N | 3 FD3 | <0.0005 | 0.0014 | <0.1 D3 | 0.19 FD3 |
| | RES-009E 1798.16-1799.79 | N | 3 FD3 | 0.0019 | 0.0008 | <0.1 D3 | 15.1 D3 |
| | RES-009E 1801.42-1804.15 | N | 3 FD3 | 0.0012 | 0.0199 | <0.1 D3 | 8.48 D3 |
| | RES-009E 1818.62-1821.62 | N | 3 FD3 | 0.0005 | 0.0231 | <0.1 D3 | 0.52 D3 |
| | RES-009E 1829.95-1832.48 | N | 4 FD3 | 0.0003 F | 0.0446 | <0.1 D3 | 1.85 D3 |
| | RES-009E 1846.66-1849.66 | N | 5 FD3 | 0.0003 F | 0.0772 | <0.1 D3 | 21.5 D3 |
| | RES-009E 1862.15-1865.15 | N | 4 FD3 | 0.0006 FD3 | <0.003 D3 | <0.1 D3 | 0.18 FD3 |
| | RES-009E 1867.87-1884.35 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.22 FD3 |
| | RES-009E 1880.15-1882.37 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.17 FD3 |
| | | FD | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.08 FD3 |
| | RES-009E 1899-1901.88 | N | 3 FD3 | <0.003 D3 | 0.0062 D3 | <0.1 D3 | 1 D3 |
| | RES-009E 1929.76-1932.58 | N | 3 FD3 | <0.003 D3 | 0.0054 D3 | <0.1 D3 | 12.2 D3 |
| | RES-009E 1947.67-1950.67 | N | 17 D3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.12 FD3 |
| | RES-009E 1954.6-1956 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.09 FD3 |
| | RES-009E 1967.76-1969.72 | N | 3 FD3 | <0.003 D3 | 0.0011 FD3 | <0.1 D3 | 0.39 D3 |
| | RES-009E 1974.78-1977.89 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 0.09 FD3 |
| | RES-009E 1984.74-1987.74 | N | 3 FD3 | <0.003 D3 | <0.003 D3 | <0.1 D3 | 1.71 D3 |
| | RES-009E 2056.38-2075 | N | 2 FD3 | <0.003 D3 | 0.0075 D3 | <0.1 D3 | 0.38 D3 |

| | |
|---|---|
| B7 | Target analyte detected in method blank at or above the method reporting imit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| M1 | Matrix spike recovery was high. Method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. Method control sample recovery was acceptable. |
| V5 | Calibration verification recovery after a group of samples was above  acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA 8000B. |

**APPENDIX C**
**SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS**

**APPENDIX C**
**SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS**

| | | | ACZS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Alkalinity, Total (as CaCO3) MG/L | Alkalinity, Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Temperature pH taken at DEG C | Hardness (as CaCO3) MG/L | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L |
| RES-001C | RES-001C 1502-1505 | N | 8 FB4 | 3 F | <20 | <20 | 3 F | 7.5 | 23.2 | 11 | 97 | 40 |
| | RES-001C 1530-1533 | N | <10 | 23 | <20 | <20 | 22 | 8.7 | 23.2 | 25 | 127 | 60 |
| | RES-001C 1557-1560 | N | <10 | 29 | <20 | <20 | 29 | 8.5 | 23.2 | 51 | 184 | 100 |
| | RES-001C 1584-1587 | N | <10 | 29 | <20 | <20 | 28 | 9 | 23.2 | 24 | 120 | 60 |
| | | FD | <10 | 29 | <20 | <20 | 27 | 9 | 23.2 | 25 | 128 | 70 |
| | RES-001C 1611-1614 | N | <10 | 27 | <20 | <20 | 25 | 9 | 23.2 | 30 | 146 | 80 |
| | RES-001C 1639-1642 | N | <10 | 32 | 2 F | <20 | 30 | 9 | 23.2 | 25 | 128 | 70 |
| | RES-001C 1666-1669 | N | <10 | 28 | 2 F | <20 | 26 | 9.1 | 23.2 | 28 | 130 | 70 |
| | RES-001C 1693-1696 | N | <10 | 31 | <20 | <20 | 30 | 9.1 | 23.2 | 28 | 130 | 70 |
| | RES-001C 1711-1714.96 | N | <10 | 13 F | <20 | <20 | 13 F | 8.5 | 23.2 | 306 | 655 | 460 |
| | RES-001C 1745-1748 | N | 8 FB4 | 9 F | <20 | <20 | 9 F | 8.1 | 23.2 | 1250 | 1960 | 1790 |
| | RES-001C 1771.75-1791.4 | N | 2 FB4 | 12 F | 11 F | <20 | <20 | 7.2 | 21.4 | 1320 | 2120 | 2070 |
| | RES-001C 1781-1784 | N | <10 | 14 F | 10 F | <20 | 4 F | 8.9 | 23.6 | 1610 | 2520 | 2570 |
| | RES-001C 1799-1802 | N | 7 FB4 | 29 | 4 F | <20 | 25 | 8.9 | 23.6 | 79 | 170 | 90 |
| | | FD | <10 | 25 | 5 F | <20 | 19 F | 8.8 | 23.6 | 67 | 163 | 80 |
| | RES-001C 1814-1817 | N | <10 | 13 F | 4 F | <20 | 9 F | 8.5 | 23.6 | 805 | 1400 | 1180 |
| | RES-001C 1837-1840 | N | 2 FB4 | 11 F | <20 | <20 | 10 F | 8.5 | 23.6 | 1310 | 2170 | 2080 |
| | RES-001C 1855-1858 | N | 4 FB4 | 13 F | 5 F | <20 | 8 F | 8.7 | 23.6 | 240 | 552 | 380 |
| | RES-001C 1873-1876 | N | <10 | 38 | 12 F | <20 | 26 | 9.1 | 23.6 | 117 | 174 | 90 |
| | RES-001C 1892.5-1895 | N | <10 | 30 | 10 F | <20 | 20 | 9 | 23.6 | 62 | 212 | 130 |
| | RES-001C 1934-1937 | N | <10 | 27 | <20 | <20 | 25 | 8.3 | 23.6 | 52 | 155 | 90 |
| | RES-001C 1987-1990 | N | <10 | 28 | 2 F | <20 | 26 | 8.5 | 23.6 | 60 | 216 | 110 |
| | RES-001C 2007-2010 | N | <10 | 23 | <20 | <20 | 21 | 8.6 | 23.6 | 70 | 270 | 140 |
| | | FD | <10 | 38 | 10 F | <20 | 28 | 8.7 | 23.6 | 70 | 258 | 130 |
| | RES-001C 2041-2044 | N | 13 B4 | 22 | <20 | <20 | 22 | 8.4 | 23.6 | 196 | 530 | 350 |
| | RES-001C 2115-2118 | N | <10 | 32 | 4 F | <20 | 28 | 8.7 | 23.6 | 67 | 229 | 120 |
| | RES-001C 2164.4-2166.3 | N | 562 B7 | <20 | <20 | <20 | <20 | 3.9 | 23.6 | 127 | 1140 | 1110 |
| | RES-001C 2214-2215 | N | 14 B4 | 9 F | <20 | <20 | 9 F | 6 | 23.6 | 1400 | 2450 | 2450 |
| | RES-001C 2242-2244 | N | 8 FB4 | 4 F | <20 | <20 | 4 F | 6 | 23.6 | 1570 | <0.05 | 2250 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-001C | RES-001C 1502-1505 | N | <0.2 | <0.002 | <0.001 | 0.032 | <0.01 | <0.05 | <0.0005 | 3.7 | <3 | <0.05 | <0.05 | 0.01 F | 0.2 F | <0.05 | 0.0008 B5 |
| | RES-001C 1530-1533 | N | 0.53 | <0.002 | 0.0015 | 0.009 F | <0.01 | <0.05 | <0.0005 | 9.2 | <3 | <0.05 | <0.05 | <0.05 | 0.9 | 0.1 | 0.0008 B5 |
| | RES-001C 1557-1560 | N | 0.16 F | <0.002 | <0.001 | 0.007 F | <0.01 | <0.05 | <0.0005 | 18.6 | 0.5 F | <0.05 | <0.05 | <0.05 | 1 | <0.05 | 0.0002 FB5 |
| | RES-001C 1584-1587 | N | 0.43 | <0.002 | <0.001 | 0.009 F | <0.01 | <0.05 | <0.0005 | 8.8 | <3 | <0.05 | <0.05 | <0.05 | 1.2 | 0.11 | 0.0011 B5 |
| | | FD | 0.33 | <0.002 | <0.001 | 0.006 F | <0.01 | <0.05 | <0.0005 | 9.3 | <3 | <0.05 | <0.05 | <0.05 | 1.2 | 0.08 | 0.0038 B7 |
| | RES-001C 1611-1614 | N | 0.32 | 0.0007 F | 0.0006 F | 0.027 | <0.01 | <0.05 | <0.0005 | 11.3 | <3 | <0.05 | <0.05 | <0.05 | 1.1 | 0.05 | 0.001 B5 |
| | RES-001C 1639-1642 | N | 0.35 | 0.0006 F | <0.001 | 0.03 | <0.01 | <0.05 | <0.0005 | 9.5 | <3 | <0.05 | <0.05 | <0.05 | 1.1 | 0.06 | 0.0007 B5 |
| | RES-001C 1666-1669 | N | 0.31 | <0.002 | <0.001 | 0.012 F | <0.01 | <0.05 | <0.0005 | 10.7 | <3 | <0.05 | <0.05 | <0.05 | 1.1 | 0.05 | 0.0011 B5 |
| | RES-001C 1693-1696 | N | 0.37 | 0.0007 F | <0.001 | 0.067 | <0.01 | <0.05 | <0.0005 | 10.5 | <3 | <0.05 | <0.05 | <0.05 | 1.4 | 0.04 F | 0.0009 B5 |
| | RES-001C 1711-1714.96 | N | 0.09 F | 0.001 F | <0.001 | 0.003 F | <0.01 | <0.05 | <0.0005 | 120 | <3 | <0.05 | <0.05 | <0.05 | 0.4 F | <0.05 | 0.0005 B5 |
| | RES-001C 1745-1748 | N | 0.16 F | <0.002 | <0.001 | 0.012 F | <0.01 | <0.05 | <0.0005 | 495 | <30 D1 | <0.05 | <0.05 | 0.01 F | <5 D1 | <0.05 | 0.0009 B5 |
| | RES-001C 1771.75-1791.4 | N | <0.2 | 0.0005 F | <0.001 | 0.012 F | <0.01 | 0.01 F | <0.0005 | 516 | 5.8 | <0.05 | 0.01 F | <0.05 | 0.5 | <0.05 | 0.0001 F |
| | RES-001C 1781-1784 | N | <0.2 | <0.004 D1 | <0.002 D1 | 0.009 F | <0.01 | <0.05 | <0.001 D1 | 622 M3 | 7.1 | <0.05 | <0.05 | <0.05 | 1.1 | <0.05 | <0.001 D1 |
| | RES-001C 1799-1802 | N | 0.03 F | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 21.2 | 4.5 | <0.05 | <0.05 | <0.05 | 1 | <0.05 | 0.0003 F |
| | | FD | <0.2 | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 18 | 4.6 | <0.05 | <0.05 | 0.02 F | 1.1 | <0.05 | 0.0078 |
| | RES-001C 1814-1817 | N | 0.03 F | <0.002 | <0.001 | 0.007 F | <0.01 | <0.05 | <0.0005 | 307 | 0.7 F | <0.05 | <0.05 | 0.03 F | 1.1 | <0.05 | 0.0131 R1 |
| | RES-001C 1837-1840 | N | 0.03 F | <0.004 D1 | <0.002 D1 | 0.005 F | <0.01 | <0.05 | <0.001 D1 | 503 | 1.1 F | <0.05 | <0.05 | 0.02 F | 0.7 | <0.05 | 0.0036 D1 |
| | RES-001C 1855-1858 | N | 0.04 F | 0.0005 F | <0.001 | 0.038 | <0.01 | <0.05 | <0.0005 | 85.4 | 3.1 | <0.05 | <0.05 | 0.04 F | 1 | 0.03 F | 0.0207 |
| | RES-001C 1873-1876 | N | 5.37 | <0.002 | <0.001 | 0.009 F | <0.01 | <0.05 | <0.0005 | 16.7 | <3 | 0.01 F | <0.05 | 0.32 | 3.2 | 7.15 | 0.0073 |
| | RES-001C 1892.5-1895 | N | 0.04 F | 0.0004 F | <0.001 | 0.015 F | <0.01 | <0.05 | <0.0005 | 16.4 | <3 | <0.05 | <0.05 | 0.02 F | 1 | 0.03 F | 0.0029 |
| | RES-001C 1934-1937 | N | 0.07 F | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 18.9 | 0.8 F | <0.05 | <0.05 | 0.04 F | 0.3 F | 0.05 | 0.0011 |
| | RES-001C 1987-1990 | N | 0.23 | <0.002 | <0.001 | 0.004 F | <0.01 | <0.05 | <0.0005 | 19.2 | <3 | <0.05 | <0.05 | 0.01 F | 0.6 | <0.05 | 0.002 |
| | RES-001C 2007-2010 | N | 0.18 F | <0.002 | <0.001 | 0.06 | <0.01 | <0.05 | <0.0005 | 23.7 | <3 | <0.05 | <0.05 | 0.02 F | 0.5 | <0.05 | 0.0011 |
| | | FD | 0.19 F | <0.002 | <0.001 | 0.064 | <0.01 | <0.05 | <0.0005 | 23.7 | <3 | <0.05 | <0.05 | 0.01 F | 0.5 | <0.05 | 0.0013 |
| | RES-001C 2041-2044 | N | 0.12 F | <0.002 | <0.001 | 0.04 | <0.01 | 0.01 F | <0.0005 | 69.8 | <3 | <0.05 | <0.05 | 0.01 F | 0.5 | <0.05 | 0.0013 |
| | RES-001C 2115-2118 | N | 0.06 F | <0.002 | <0.001 | 0.028 | <0.01 | <0.05 | <0.0005 | 19.6 | <3 | <0.05 | <0.05 | 0.02 F | 1.2 | 0.08 | 0.0062 |
| | RES-001C 2164.4-2166.3 | N | 29.3 | 0.0013 F | 0.0006 F | 0.017 F | 0.004 F | <0.05 | 0.0021 | 42.2 | <3 | 0.1 | 1.19 | 26.9 | 48 D1M1 | 186 | 0.0046 |
| | RES-001C 2214-2215 | N | 0.04 F | <0.004 D1 | <0.002 D1 | <0.02 | <0.01 | <0.05 | <0.001 D1 | 538 | <3 | <0.05 | <0.05 | 0.04 F | <0.5 | 0.07 | 0.0037 D1 |
| | RES-001C 2242-2244 | N | 11.7 | <0.004 D1 | <0.002 D1 | 0.019 F | <0.01 | <0.05 | 0.0003 FD1 | 610 | <3 | <0.05 | 0.02 | 0.09 | 1.8 | <0.05 | 0.0029 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-001C | RES-001C 1502-1505 | N | 0.5 F | 0.046 | <0.001 | <0.05 | <0.05 | 14.3 | 0.001 | 8.4 | <0.03 | 2.6 | 28 | <0.0005 | <0.0005 | <0.03 | 0.05 B5 |
| | RES-001C 1530-1533 | N | 0.6 F | 0.01 F | <0.001 | <0.05 | <0.05 | 13.1 | 0.0025 | 8.9 | <0.03 | 6.4 | 22.3 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-001C 1557-1560 | N | 1.2 | 0.065 | <0.001 | 0.01 F | <0.05 | 13.5 | 0.0018 | 5.8 | <0.03 | 4.8 | 44.3 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-001C 1584-1587 | N | 0.5 F | 0.017 F | <0.001 | <0.05 | <0.05 | 11 | 0.0014 | 7.1 | <0.03 | 6.9 | 17.7 | <0.0005 | <0.0005 | <0.03 | 0.05 B5 |
| | | FD | 0.4 F | 0.012 F | <0.001 | 0.01 F | <0.05 | 13.2 | 0.0014 | 6.9 | <0.03 | 7.2 | 19.4 | <0.0005 | <0.0005 | <0.03 | 0.09 B5 |
| | RES-001C 1611-1614 | N | 0.3 F | 0.01 F | <0.001 | 0.02 F | <0.05 | 14.2 | 0.0023 | 7.8 | <0.03 | 6.5 | 25.2 | <0.0005 | 0.0001 F | <0.03 | 0.04 FB5 |
| | RES-001C 1639-1642 | N | 0.3 F | 0.02 F | <0.001 | <0.05 | <0.05 | 14.7 | 0.0014 | 7.5 | <0.03 | 5.3 | 16.6 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-001C 1666-1669 | N | 0.3 F | 0.034 | <0.001 | 0.02 F | <0.05 | 13.9 | 0.003 | 7.3 | <0.03 | 3.8 | 19.2 | <0.0005 | <0.0005 | <0.03 | 0.06 B5 |
| | RES-001C 1693-1696 | N | 0.4 F | 0.032 | <0.001 | 0.02 F | <0.05 | 14.5 | 0.0021 | 8.1 | <0.03 | 4 | 19.2 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-001C 1711-1714.96 | N | 1.4 | 0.015 F | <0.001 | <0.05 | <0.05 | 11.1 | 0.0014 | 7.1 | <0.03 | 7.3 | 326 D1M2 | <0.0005 | 0.0003 F | <0.03 | 0.03 FB5 |
| | RES-001C 1745-1748 | N | 2.8 | 0.061 | <0.001 | 0.02 F | <0.05 | 16.1 | 0.0009 | 5.8 | <0.03 | 4 | 1230 D1 | <0.0005 | 0.0002 F | <0.03 | 0.03 FB5 |
| | RES-001C 1771.75-1791.4 | N | 8.3 | <0.03 | <0.001 | 0.17 | <0.05 | 6.7 | 0.0044 | 20.3 | <0.03 | 3.1 | 1320 D2 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-001C 1781-1784 | N | 13.6 | <0.03 | <0.001 | 0.03 F | <0.05 | 8.6 | 0.0032 D1 | 29.2 M2 | <0.03 | 2.9 | 1590 D1 | 0.001 <D1 | 0.001 <D1 | <0.03 | 0.03 F |
| | RES-001C 1799-1802 | N | 6.2 | 0.007 F | <0.001 | 0.12 | <0.05 | 2.7 | 0.0024 | 9.8 | <0.03 | 2.9 | 35.1 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | | FD | 5.4 | 0.007 F | <0.001 | 0.1 | <0.05 | 2.4 | 0.0018 | 9.1 | <0.03 | 2.6 | 32.6 | 0.0003 F | <0.0005 | <0.03 | 0.12 |
| | RES-001C 1814-1817 | N | 9.2 | 0.007 F | <0.001 | 0.03 F | <0.05 | 14.2 | 0.002 | 13.3 | <0.03 | 9.7 | 820 D1 | 0.0001 F | 0.0002 F | <0.03 | 0.17 R1 |
| | RES-001C 1837-1840 | N | 12.4 | 0.022 F | <0.001 | 0.03 F | <0.05 | 12.4 | 0.0032 D1 | 11.6 | <0.03 | 3.1 | 1430 D1 | 0.001 <D1 | 0.001 <D1 | <0.03 | 0.07 |
| | RES-001C 1855-1858 | N | 6.5 | <0.03 | <0.001 | 0.02 F | <0.05 | 4.9 | 0.0043 | 15.5 | <0.03 | 5.8 | 245 D1 | <0.0005 | <0.0005 | <0.03 | 0.25 |
| | RES-001C 1873-1876 | N | 18.2 | 0.202 | <0.001 | 0.03 F | <0.05 | 13 | 0.0026 | 34.8 | <0.03 | 6.9 | 24.7 | <0.0005 | 0.0001 F | 0.017 F | 0.19 |
| | RES-001C 1892.5-1895 | N | 5.2 | <0.03 | <0.001 | 0.07 | <0.05 | 11.3 | 0.0045 | 19.7 | <0.03 | 3.7 | 46.9 | <0.0005 | <0.0005 | <0.03 | 0.07 |
| | RES-001C 1934-1937 | N | 1.2 | 0.348 | <0.001 | 0.09 | <0.05 | 4.9 | 0.0025 | 7.4 | <0.03 | 0.5 F | 31.5 | <0.0005 | <0.0005 | <0.03 | 0.06 |
| | RES-001C 1987-1990 | N | 3 | 0.022 F | <0.001 | 0.06 | <0.05 | 18.8 | 0.0037 | 3.3 | <0.03 | 1 F | 51 | <0.0005 | <0.0005 | <0.03 | 0.08 |
| | RES-001C 2007-2010 | N | 2.6 | 0.012 F | <0.001 | 0.02 F | <0.05 | 20.9 | 0.0026 | 4 | <0.03 | 1.1 F | 75.6 | <0.0005 | <0.0005 | <0.03 | 0.06 |
| | | FD | 2.6 | 0.012 F | <0.001 | 0.02 F | <0.05 | 21.3 | 0.0027 | 4.2 | <0.03 | 1.1 F | 66.1 | <0.0005 | <0.0005 | <0.03 | 0.06 |
| | RES-001C 2041-2044 | N | 5.3 | 0.022 F | <0.001 | 0.02 F | <0.05 | 22.7 | 0.0015 | 4.6 | <0.03 | 1.4 F | 204 D1 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | RES-001C 2115-2118 | N | 4.4 | 0.009 F | <0.001 | 0.14 | <0.05 | 13.6 | 0.0015 | 6.3 | <0.03 | 3.2 | 53.6 | <0.0005 | <0.0005 | <0.03 | 0.14 |
| | RES-001C 2164.4-2166.3 | N | 5.2 | 0.998 | <0.001 | 0.02 F | 0.25 | <2 | 0.0006 | 4.9 | <0.03 | <2 | 970 D1 | <0.0005 | 0.0045 | <0.03 | 1.18 |
| | RES-001C 2214-2215 | N | 12.9 | 0.066 | <0.001 | 0.03 F | <0.05 | 1.2 F | 0.0087 D1 | 22.1 | <0.03 | 0.5 F | 1550 D1 | <0.001 D1 | <0.001 D1 | <0.03 | 0.08 |
| | RES-001C 2242-2244 | N | 10.5 | 0.902 | <0.001 | 0.01 F | 0.01 F | 18.2 | 0.0705 | 6.5 | <0.03 | 0.5 F | 1640 D1 | 0.001 F | 0.0041 | <0.03 | 0.06 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Alkalinity, Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Alkalinity, Total (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Temperature pH taken at DEG C | Hardness (as CaCO3) MG/L | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L | Aluminum MG/L | Antimony MG/L |
| RES-002A | RES-002A 858-861 | N | <10 | <20 | <20 | 8 F | 8 F | 6.6 | 23.2 | 24 | 29 | 40 | 0.58 | 0.002 |
| | RES-002A 888-891 | N | <10 | 2 F | <20 | 6 F | 6 F | 6.2 | 23.2 | 14 | 51 | 70 | 0.14 F | 0.0005 F |
| | RES-002A 927-930 | N | 2 FB4 | <20 | <20 | 7 F | 7 F | 6.2 | 23.2 | 13 | 58 | 60 | 0.21 | 0.0006 F |
| | RES-002A 965-968 | N | 6 FB4 | <20 | <20 | 4 F | 4 F | 6.4 | 23.2 | 1670 | 73 | 50 | 0.03 F | 0.002 |
| | RES-002A 992-995 | N | <10 | <20 | <20 | 5 F | 5 F | 6.9 | 23.2 | 1630 | 42 | 20 | 0.11 F | 0.0029 |
| | | FD | 2 FB4 | <20 | <20 | 5 F | 5 F | 7.1 | 23.2 | 1500 | 42 | 40 | 0.1 F | 0.0028 |
| | RES-002A 1007-1010 | N | <10 | <20 | <20 | 4 F | 4 F | 8.2 | 23 | <1 | 53 | 40 | 0.07 F | 0.0017 F |
| | RES-002A 1058-1061 | N | 16 B4 | <20 | <20 | 5 F | 5 F | 8.3 | 23 | <1 | 68 | 50 | 0.03 F | 0.002 |
| | RES-002A 1109-1112 | N | 6 FB4 | <20 | <20 | 4 F | 4 F | 8.3 | 23 | <1 | 59 | 40 | 0.2 | 0.0006 F |
| | RES-002A 1154-1156 | N | 2 FB4 | <20 | <20 | 4 F | 4 F | 7.7 | 23 | 7 | 82 | 60 | 0.2 | 0.002 |
| | RES-002A 1414.6-1417 | N | 18 B4 | <20 | <20 | <20 | <20 | 7.9 | 23 | 1 | 120 | 70 | 0.18 F | 0.002 |
| | RES-002A 1201-1203 | N | 119 B7 | <20 | <20 | <20 | <20 | 7.8 | 23 | 1 | 328 | 230 | 5.32 | 0.001 F |
| | | FD | 111 B7 | <20 | <20 | <20 | <20 | 7.7 | 23 | 3 | 317 | 220 | 4.43 | 0.0008 F |
| | RES-002A 1246-1249 | N | 16 B4 | <20 | <20 | <20 | <20 | 7.4 | 23 | 6 | 93 | 70 | 0.39 | 0.0011 F |
| | RES-002A 1291-1292 | N | 51 B4 | <20 | <20 | <20 | <20 | 7.1 | 23 | 6 | 119 | 80 | 2.93 | 0.0005 F |
| | RES-002A 1325-1328 | N | 41 B4 | <20 | <20 | <20 | <20 | 6.9 | 23 | 10 | 143 | 100 | 0.48 | 0.002 |
| | RES-002A 1363-1366 | N | 14 B4 | <20 | <20 | 2 F | 2 F | 4.2 | 23 | 19 | 92 | 60 | 0.24 | 0.002 |
| | RES-002A 1395-1397 | N | 97 B4 | <20 | <20 | <20 | <20 | 4.2 | 23 | 18 | 251 | 180 | 7.68 | 0.002 |
| | RES-002A 1454-1457 | N | 12 B4 | <20 | <20 | <20 | <20 | 4.8 | 23 | 12 | 107 | 70 | 0.49 | 0.0005 F |
| | RES-002A 1538-1541 | N | 10 B4 | <20 | <20 | <20 | <20 | 4.5 | 23 | 8 | 111 | 80 | 1.18 | 0.002 |
| | RES-002A 1583-1586 | N | 8 FB4 | <20 | <20 | <20 | <20 | 4.9 | 23 | 10 | 112 | 60 | 1.12 | 0.002 |
| | RES-002A 1627-1630 | N | 10 B4 | <20 | <20 | <20 | <20 | 5.1 | 23 | 11 | 109 | 60 | 0.2 | 0.002 |
| | RES-002A 1732-1735 | N | 4 FB4 | <20 | <20 | 2 F | 2 F | 4.2 | 23 | 9 | 133 | 70 | 0.04 F | 0.002 |
| | | FD | 6 FB4 | <20 | <20 | 3 F | 3 F | 5.2 | 23 | 11 | 138 | 60 | 0.2 | 0.002 |
| | RES-002A 1781-1784 | N | 8 FB4 | <20 | <20 | <20 | <20 | 6 | 23 | 11 | 94 | 40 | 0.73 | 0.002 |
| | RES-002A 1814-1817 | N | 8 FB4 | <20 | <20 | <20 | <20 | 6.1 | 23 | 19 | 80 | 30 | 0.65 | 0.002 |
| | RES-002A 1876-1879 | N | 37 B4 | <20 | <20 | 2 F | 2 F | 5.2 | 23.2 | 14 | 2490 | 2500 | 0.2 | 0.002 |
| | RES-002A 1927-1930 | N | <10 | <20 | <20 | 13 F | 13 F | 6 | 23.2 | 16 | 2470 | 2430 | 0.03 F | 0.002 |
| | RES-002A 1981-1984 | N | <10 | <20 | <20 | 14 F | 14 F | 6.4 | 23.2 | 24 | 2340 | 2240 | 0.05 F | 0.002 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Nickel MG/L |
| RES-002A | RES-002A 858-861 | N | 0.0183 | 0.003 F | 0.01 | 0.05 | 0.0005 | <1 | 0.6 F | 0.05 | 0.05 | 0.05 | 0.3 F | 0.16 B5 | 0.0007 | <1 | 0.03 | 0.001 | 0.05 |
| | RES-002A 888-891 | N | 0.0443 | 0.016 F | 0.01 | 0.05 | 0.0005 | <1 | <3 | 0.05 | 0.05 | 0.05 | 0.1 F | 0.03 FB5 | 0.0015 | <1 | 0.03 | 0.001 | 0.05 |
| | RES-002A 927-930 | N | 0.0408 | 0.049 | 0.01 | 0.01 F | 0.0005 | <1 | 0.6 F | 0.05 | 0.05 | 0.05 | 0.2 F | 0.04 FB5 | 0.0012 | <1 | 0.03 | 0.001 | 0.05 |
| | RES-002A 965-968 | N | 0.001 | 0.122 | 0.01 | 0.05 | 0.0005 | 2.3 | <3 | 0.05 | 0.05 | 0.22 | 0.5 | 0.05 | 0.0003 F | 0.3 F | 0.015 F | 0.001 | 0.05 |
| | RES-002A 992-995 | N | 0.0072 | 0.01 F | 0.01 | 0.05 | 0.0005 | 0.4 F | <3 | 0.05 | 0.05 | 0.05 | 0.7 | 0.05 B5 | 0.0063 | <1 | 0.03 | 0.001 | 0.05 |
| | | FD | 0.0059 | 0.009 F | 0.01 | 0.05 | 0.0005 | 0.5 F | <3 | 0.05 | 0.05 | 0.05 | 0.8 | 0.04 FB5 | 0.0046 | <1 | 0.03 | 0.001 | 0.05 |
| | RES-002A 1007-1010 | N | 0.0134 | 0.124 | 0.01 | 0.05 | 0.0005 | 1 | <3 | 0.05 | 0.05 | 0.05 | 0.1 F | 0.05 | 0.0006 | <1 | 0.03 | 0.001 | 0.05 |
| | RES-002A 1058-1061 | N | 0.0006 F | 0.059 | 0.01 | 0.01 F | 0.0005 | 2 | <3 | 0.05 | 0.05 | 0.04 F | 0.2 F | 0.05 | 0.0004 F | 0.3 F | 0.009 F | 0.001 | 0.05 |
| | RES-002A 1109-1112 | N | 0.001 | 0.013 F | 0.01 | 0.05 | 0.0005 | 1.9 | <3 | 0.05 | 0.05 | 0.04 F | 0.1 F | 0.05 | 0.0005 | 0.3 F | 0.019 F | 0.001 | 0.05 |
| | RES-002A 1154-1156 | N | 0.001 | 0.148 | 0.01 | 0.05 | 0.0005 | 3 | <3 | 0.05 | 0.05 | 0.05 | 0.5 | 0.5 B5 | 0.0007 | 0.6 F | 0.181 | 0.001 | 0.05 |
| | RES-002A 1414.6-1417 | N | 0.001 | 0.01 F | 0.01 | 0.05 | 0.0005 | 3 | <3 | 0.05 | 0.01 F | 0.38 | 0.5 | 3.05 B5 | 0.0002 F | 0.8 F | 0.372 | 0.001 | 0.05 |
| | RES-002A 1201-1203 | N | 0.0012 | 0.004 F | 0.01 | 0.05 | 0.0007 | 6.4 | <3 | 0.02 F | 0.05 | 54.9 | 0.5 | 14.1 B5 | 0.0022 | 0.8 F | 0.443 | 0.001 | 0.04 F |
| | | FD | 0.0011 | 0.004 F | 0.01 | 0.05 | 0.0005 | 6.2 | <3 | 0.02 F | 0.05 | 54.8 | 0.5 | 12.6 B5 | 0.0013 | 0.7 F | 0.449 | 0.001 | 0.04 F |
| | RES-002A 1246-1249 | N | 0.001 | 0.092 | 0.01 | 0.05 | 0.0001 F | 3.6 | <3 | 0.05 | 0.03 F | 11.1 | 0.1 F | 0.28 B5 | 0.0035 | 0.6 F | 0.152 | 0.001 | 0.01 F |
| | RES-002A 1291-1292 | N | 0.0006 F | 0.03 | 0.01 | 0.05 | 0.0001 F | 3.3 | <3 | 0.05 | 0.03 F | 12.9 | 0.7 | 4.02 B5 | 0.0003 F | <1 | 0.275 | 0.001 | 0.03 F |
| | RES-002A 1325-1328 | N | 0.001 | 0.029 | 0.01 | 0.05 | 0.0001 F | 3.1 | <3 | 0.05 | 0.03 F | 26.7 | 0.4 F | 0.38 B5 | 0.001 | 0.5 F | 0.169 | 0.001 | 0.02 F |
| | RES-002A 1363-1366 | N | 0.001 | 0.061 | 0.01 | 0.05 | 0.0005 | 3.5 | <3 | 0.05 | 0.03 F | 10.1 | 0.5 | 0.24 B5 | 0.0015 | 0.6 F | 0.138 | 0.001 | 0.01 F |
| | RES-002A 1395-1397 | N | 0.001 | 0.004 F | 0.01 | 0.05 | 0.0001 F | 2.9 | <3 | 0.01 F | 0.04 F | 30 | 0.5 | 16.1 B5 | 0.0014 | 0.4 F | 0.397 | 0.001 | 0.06 |
| | RES-002A 1454-1457 | N | 0.001 | 0.009 F | 0.01 | 0.05 | 0.0005 | 3 | <3 | 0.05 | 0.05 | 0.02 F | 0.7 | 5.26 B5 | 0.0013 | 0.8 F | 0.553 | 0.001 | 0.05 |
| | RES-002A 1538-1541 | N | 0.002 | 0.079 | 0.01 | 0.05 | 0.0038 | 6.4 | <3 | 0.05 | 0.02 F | 0.35 | 4 | 0.05 B5 | 0.0005 | 0.8 F | 0.065 | 0.001 | 0.05 |
| | RES-002A 1583-1586 | N | 0.001 | 0.07 N1 | 0.01 | 0.05 | 0.0032 N1 | 4.3 | <3 | 0.05 | 0.02 F | 1.12 | 2.1 | 0.15 | 0.0003 FB5 | 0.9 F | 0.248 | 0.001 | 0.05 |
| | RES-002A 1627-1630 | N | 0.001 | 0.125 | 0.01 | 0.05 | 0.0005 | 5.1 | 0.6 F | 0.05 | 0.05 | 0.05 | 1.9 | 3.09 | 0.0002 FB5 | 0.7 F | 0.353 | 0.001 | 0.05 |
| | RES-002A 1732-1735 | N | 0.001 | 0.004 F | 0.01 | 0.05 | 0.0005 | 5 | <3 | 0.05 | 0.05 | 0.01 F | 3.1 | 0.05 | 0.0003 FB5 | 2.8 | 0.406 | 0.001 | 0.05 |
| | | FD | 0.001 | 0.003 F | 0.01 | 0.05 | 0.0005 | 4.8 | <3 | 0.05 | 0.05 | 0.05 | 3.1 | 0.05 | 0.0003 FB5 | 2.9 | 0.366 | 0.001 | 0.05 |
| | RES-002A 1781-1784 | N | 0.001 | 0.076 | 0.01 | 0.05 | 0.0015 | 4.6 | 0.8 F | 0.05 | 0.01 F | 0.02 F | 3.8 | 0.03 F | 0.0003 FB4 | 0.6 F | 0.421 | 0.001 | 0.05 |
| | RES-002A 1814-1817 | N | 0.001 | 0.011 F | 0.01 | 0.05 | 0.0008 | 4.3 | 0.8 F | 0.05 | 0.05 | 0.2 | 4 | 0.05 | 0.0002 FB5 | 0.5 F | 0.194 | 0.001 | 0.05 |
| | RES-002A 1876-1879 | N | 0.001 | 0.016 F | 0.01 | 0.05 | 0.0005 | 655 | <30 D1 | 0.05 | 0.05 | 0.05 | <5 D1 | 12.5 | 0.0002 FB5 | 8.3 | 1.12 | 0.001 | 0.05 |
| | RES-002A 1927-1930 | N | 0.001 | 0.014 F | 0.01 | 0.05 | 0.0005 | 638 | <30 D1 | 0.05 | 0.05 | 0.05 | <5 D1 | 0.17 | 0.0003 FB5 | 7.3 | 0.221 | 0.001 | 0.05 |
| | RES-002A 1981-1984 | N | 0.001 | 0.011 F | 0.01 | 0.05 | 0.0005 | 591 | <30 D1 | 0.05 | 0.05 | 0.05 | <5 D1 | 0.05 | 0.0013 B5 | 6.5 | 0.144 | 0.001 | 0.05 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Molybdenum MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-002A | RES-002A 858-861 | N | 0.05 | 5 | 0.0041 | 8.3 | 0.03 | 2.2 | 0.7 F | 0.0005 | 0.0005 | 0.03 | 0.03 F |
| | RES-002A 888-891 | N | 0.05 | 8.1 | 0.0324 | 6.4 | 0.03 | 2.8 | 8.3 | 0.0005 | 0.0005 | 0.03 | 0.04 F |
| | RES-002A 927-930 | N | 0.05 | 11.4 | 0.0036 | 6.8 | 0.03 | 2.1 | 10.9 | 0.0006 | 0.0005 | 0.03 | 0.03 F |
| | RES-002A 965-968 | N | 0.05 | 12.9 | 0.0007 | 6.6 | 0.03 | 1.1 F | 18.4 | 0.0003 F | 0.0005 | 0.03 | 0.04 F |
| | RES-002A 992-995 | N | 0.05 | 6.6 | 0.0062 | 4.1 | 0.03 | 1.9 F | 6.4 | 0.0002 F | 0.0005 | 0.005 F | 0.03 F |
| | | FD | 0.05 | 7.1 | 0.0064 | 4.2 | 0.03 | 1.9 F | 6.9 | 0.0005 | 0.0005 | 0.03 | 0.02 F |
| | RES-002A 1007-1010 | N | 0.05 | 9.8 | 0.0163 | 4.9 | 0.03 | 1.3 F | 11.6 | 0.0005 | 0.0005 | 0.03 | 0.02 F |
| | RES-002A 1058-1061 | N | 0.05 | 11.4 | 0.0098 | 5.1 | 0.03 | 1.7 F | 16.7 | 0.0005 | 0.0005 | 0.03 | 0.05 |
| | RES-002A 1109-1112 | N | 0.05 | 10.2 | 0.0149 | 5.8 | 0.03 | 0.9 F | 13.4 | 0.0005 | 0.0005 | 0.03 | 0.03 F |
| | RES-002A 1154-1156 | N | 0.05 | 14.6 | 0.0017 | 8.5 | 0.03 | 0.7 F | 21.8 | 0.0005 | 0.0005 | 0.03 | 0.04 F |
| | RES-002A 1414.6-1417 | N | 0.05 | 14.2 | 0.0003 F | 4 | 0.03 | 0.6 F | 47 | 0.0005 | 0.0005 | 0.03 | 0.04 F |
| | RES-002A 1201-1203 | N | 0.05 | 1.6 F | 0.0007 | 3 | 0.03 | <2 | 203 D1 | 0.0005 | 0.0088 | 0.03 | 0.22 |
| | | FD | 0.05 | 1.3 F | 0.0006 | 2.5 | 0.03 | <2 | 193 D1 | 0.0005 | 0.0078 | 0.03 | 0.18 |
| | RES-002A 1246-1249 | N | 0.05 | 5.5 | 0.0003 F | 4.8 | 0.03 | 0.4 F | 40.3 | 0.0005 | 0.0002 F | 0.03 | 0.04 F |
| | RES-002A 1291-1292 | N | 0.05 | 0.8 F | 0.0004 F | 3.2 | 0.03 | <2 | 63.1 | 0.0005 | 0.0006 | 0.03 | 0.08 |
| | RES-002A 1325-1328 | N | 0.05 | 7.3 | 0.0005 | 3.5 | 0.03 | <2 | 66.4 | 0.0001 F | 0.0004 F | 0.03 | 0.08 |
| | RES-002A 1363-1366 | N | 0.05 | 7 | 0.0007 | 3.8 | 0.03 | 0.4 F | 40.2 | 0.0005 | 0.0001 F | 0.03 | 0.07 |
| | RES-002A 1395-1397 | N | 0.05 | 0.4 F | 0.0006 | 3.1 | 0.03 | <2 | 184 D1 | 0.0005 | 0.0016 | 0.03 | 0.07 |
| | RES-002A 1454-1457 | N | 0.05 | 15.9 | 0.0005 | 5.6 | 0.03 | 0.7 F | 36.4 | 0.0005 | 0.0005 | 0.03 | 0.06 |
| | RES-002A 1538-1541 | N | 0.05 | 14.6 | 0.0008 | 4.3 | 0.03 | 0.6 F | 31.7 | 0.0004 F | 0.0005 | 0.03 | 0.04 F |
| | RES-002A 1583-1586 | N | 0.01 F | 14.7 N1 | 0.0014 | 4 | 0.03 | 0.5 F | 41.2 | 0.0005 | 0.0003 FN1 | 0.03 | 0.03 FB5N1 |
| | RES-002A 1627-1630 | N | 0.02 F | 13.4 | 0.0005 | 5.5 | 0.03 | 0.6 F | 34.3 | 0.0005 | 0.0005 | 0.03 | 0.03 FB5 |
| | RES-002A 1732-1735 | N | 0.05 | 17.7 | 0.0018 | 5.2 | 0.03 | 0.8 F | 35.9 | 0.0004 F | 0.0005 | 0.03 | 0.03 FB5 |
| | | FD | 0.01 F | 19.5 | 0.0018 | 5.5 | 0.03 | 0.9 F | 36.5 | 0.0002 F | 0.0005 | 0.03 | 0.04 FB5 |
| | RES-002A 1781-1784 | N | 0.05 | 12.6 | 0.0002 F | 3.3 | 0.03 | 0.6 F | 27.3 | 0.0005 | 0.0005 | 0.03 | 0.06 B5 |
| | RES-002A 1814-1817 | N | 0.01 F | 10.3 | 0.0002 F | 3.3 | 0.03 | 0.5 F | 18.7 | 0.0005 | 0.0005 | 0.03 | 0.03 FB5 |
| | RES-002A 1876-1879 | N | 0.05 | 22.5 | 0.0027 | 6.4 | 0.03 | 0.9 F | 1730 D1 | 0.0005 | 0.0005 | 0.03 | 0.03 FB5 |
| | RES-002A 1927-1930 | N | 0.05 | 26.3 | 0.002 | 5.3 | 0.03 | 6.2 | 1640 D1 | 0.0005 | 0.0005 | 0.03 | 0.04 FB5 |
| | RES-002A 1981-1984 | N | 0.02 F | 29.2 | 0.0014 | 4.4 | 0.03 | 6.6 | 1530 D1 | 0.0005 | 0.0001 F | 0.03 | 0.05 B5 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Alkalinity, Total (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Temperature pH taken at DEG C | Hardness (as CaCO3) MG/L | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L | Aluminum MG/L | Antimony MG/L |
| RES-005I | RES-005I 1011.88-1012.45 | N | <10 | 18 F | <20 | 43 | 25 | 9.5 | 23 | 8 | 125 | 110 | 0.32 | 0.0009 F |
| | RES-005I 1322.73-1323.23 | N | <10 | 11 F | <20 | 31 | 20 | 9.3 | 23 | 21 | 100 | 90 | 0.18 F | <0.002 |
| | RES-005I 1353-1353.49 | N | <10 | 13 F | <20 | 31 | 18 F | 9.3 | 23 | 17 | 91 | 80 | 0.09 F | 0.0004 F |
| | RES-005I 1360.5-1361.51 | N | <10 | 14 F | <20 | 32 | 19 F | 9.4 | 23 | 17 | 105 | 90 | 0.17 F | 0.0006 F |
| | RES-005I 1370.93-1374 | N | 2 F | <20 | <20 | 5 F | 3 F | 8.9 | 23 | 3 F | 72 | 90 | 0.31 | <0.002 |
| | RES-005I 1380-1383 | N | 2 F | <20 | <20 | 4 F | 3 F | 8.4 | 23 | 9 | 73 | 80 | 0.06 F | 0.0004 F |
| | RES-005I 1389-1391.57 | N | 12 | <20 | <20 | 3 F | 3 F | 8.3 | 23 | 12 | 54 | 60 | 0.04 F | 0.0005 F |
| | RES-005I 1396.3-1399.3 | N | 6 F | <20 | <20 | <20 | <20 | 7.9 | 23 | 12 | 53 | 50 | <0.2 | 0.0004 F |
| | RES-005I 1405-1406.67 | N | 2 F | <20 | <20 | 3 F | 3 F | 8.1 | 23 | 11 | 63 | 50 | <0.2 | 0.0007 F |
| | RES-005I 1410.18-1413.18 | N | 4 F | <20 | <20 | 4 F | 3 F | 7.6 | 23 | 5 F | 53 | 60 | 0.03 F | 0.0005 F |
| | RES-005I 1419.18-1422.18 | N | <10 | <20 | <20 | 5 F | 4 F | 7.5 | 23 | 4 F | 50 | 80 | 0.06 F | 0.0011 F |
| | RES-005I 1425.5-1426.51 | N | 4 F | <20 | <20 | 4 F | 3 F | 7.3 | 23 | 4 F | 51 | 80 | <0.2 | 0.0013 F |
| | RES-005I 1428.18-1431.18 | N | 6 F | <20 | <20 | 4 F | 4 F | 7.2 | 23 | 6 F | 50 | 70 | <0.2 | 0.0007 F |
| | RES-005I 1446.13-1449.13 | N | 2 F | <20 | <20 | 5 F | 5 F | 7.4 | 23 | 7 | 63 | 90 | 0.27 | <0.002 |
| | RES-005I 1437.13-1440.13 | N | 4 F | <20 | <20 | 4 F | 4 F | 7.8 | 23 | 3 F | 73 | 90 | 0.14 F | 0.0005 F |
| | RES-005I 1455.13-1458.13 | N | <10 | <20 | <20 | 5 F | 4 F | 7.8 | 23 | <7 | 68 | 100 | 0.26 | 0.0005 F |
| | RES-005I 1464.13-1467.13 | N | 2 F | 2 F | <20 | 5 F | 3 F | 7.9 | 23 | <7 | 58 | 100 | 0.36 | <0.002 |
| | RES-005I 1473.13-1476.13 | N | 8 F | <20 | <20 | 5 F | 4 F | 8.6 | 23 | 3 F | 71 | 120 | 0.16 F | <0.002 |
| | RES-005I 1481-1482.66 | N | 2 F | 2 F | <20 | 6 F | 4 F | 8.2 | 23 | <7 | 36 | 90 | 0.17 F | <0.002 |
| | RES-005I 1485.5-1486.51 | N | 4 F | <20 | <20 | 6 F | 4 F | 7.9 | 23 | <7 | 37 | 90 | 0.2 | <0.002 |
| | RES-005I 1487.1-1490.1 | N | 4 FB4 | <20 | <20 | 4 F | 4 F | 7.5 | 23 | 1 F | 78 | 90 | 0.55 M1N1 | <0.002 |
| | RES-005I 1490.1-1493.1 | N | <10 | <20 | <20 | 5 F | 4 F | 7.6 | 23 | <7 | 73 | 100 | 0.34 | <0.002 |
| | RES-005I 1499-1502 | N | <10 | <20 | <20 | 5 F | 4 F | 8.1 | 23 | <7 | 53 | 70 | 0.79 | <0.002 |
| | RES-005I 1506.56-1509.47 | N | 2 FB4 | <20 | <20 | 4 F | 4 F | 7.9 | 23 | <7 | 60 | 80 | 0.84 | <0.002 |
| | RES-005I 1515.47-1518.47 | N | <10 | <20 | <20 | 5 F | 4 F | 7.9 | 23 | <7 | 74 | 100 | 0.71 | <0.002 |
| | RES-005I 1524.47-1527.47 | N | 2 FB4 | <20 | <20 | 5 F | 5 F | 8 | 23 | <7 | 74 | 100 | 0.94 | <0.002 |
| | RES-005I 1532.98-1534.97 | N | <10 | <20 | <20 | 5 F | 5 F | 7.9 | 23 | 1 F | 74 | 90 | 1.03 | <0.002 |
| | RES-005I 1544-1546.55 | N | 2 FB4 | <20 | <20 | 4 F | 4 F | 7.6 | 23 | 1 F | 57 | 60 | 0.51 | <0.002 |
| | RES-005I 1552.55-1555.58 | N | 4 FB4 | <20 | <20 | 5 F | 5 F | 8 | 23 | <7 | 55 | 80 | 0.56 | <0.002 |
| | RES-005I 1559.46-1562.46 | N | <10 | <20 | <20 | 6 F | 5 F | 8 | 23 | <7 | 58 | 100 | 0.65 | <0.002 |
| | RES-005I 1568.46-1571.46 | N | <10 | <20 | <20 | 6 F | 5 F | 7.9 | 23 | <7 | 57 | 80 | 0.73 | <0.002 |
| | RES-005I 1577.46-1580.46 | N | 4 FB4 | <20 | <20 | 5 F | 5 F | 7.8 | 23 | <7 | 42 | 50 | 0.45 | <0.002 |
| | | FD | 4 FB4 | <20 | <20 | 5 F | 5 F | 7.9 | 23 | <7 | 43 | 80 | 0.45 | <0.002 |
| | RES-005I 1586.46-1589.46 | N | <10 | <20 | <20 | 4 F | 4 F | 7.8 | 23 | <7 | 74 | 90 | 0.55 | <0.002 |
| | RES-005I 1595.46-1598.46 | N | 2 FB4 | <20 | <20 | 5 F | 5 F | 8.1 | 23 | <7 | 69 | 100 | 0.86 | <0.002 |
| | RES-005I 1604.46-1607.46 | N | 2 FB4 | <20 | <20 | 5 F | 5 F | 7.9 | 23 | <7 | 71 | 110 | 1.57 | <0.002 |
| | RES-005I 1613.46-1616.46 | N | <10 | <20 | <20 | 6 F | 6 F | 8.2 | 23 | <7 | 49 | 70 | 0.72 | <0.002 |
| | RES-005I 1616.46-1619 | N | <10 | <20 | <20 | 5 F | 5 F | 8.2 | 23 | <7 | 63 | 100 | 0.96 | <0.002 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Alkalinity, Total (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Temperature pH taken at DEG C | Hardness (as CaCO3) MG/L | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L | Aluminum MG/L | Antimony MG/L |
| RES-005I | RES-005I 1626.54-1627.16 | N | <10 | <20 | <20 | 4 F | 4 F | 7.5 | 23 | 2 F | 56 | 80 | 0.21 | 0.0008 F |
| | RES-005I 1627.16-1630 | N | <10 | <20 | <20 | 5 F | 5 F | 7.8 | 23 | <7 | 53 | 70 | 0.68 | <0.002 |
| | RES-005I 1630.5-1631.5 | N | 6 FB4 | <20 | <20 | 4 F | 4 F | 8.3 | 24 | 1 F | 45 | 40 | 0.51 | <0.002 |
| | RES-005I 1632.56-1635.56 | N | 4 FB4 | <20 | <20 | 4 F | 4 F | 7 | 24 | 8 | 101 | 70 | 0.05 F | <0.002 |
| | RES-005I 1638.37-1641 | N | 6 F | <20 | <20 | 4 F | 4 F | 6.5 | 24 | 11 | 115 | 80 | 0.11 F | <0.002 |
| | RES-005I 1645.84-1648.08 | N | 2 F | <20 | <20 | 4 F | 4 F | 7.1 | 24 | 5 F | 73 | 60 | 0.43 | <0.002 |
| | RES-005I 1652-1654.93 | N | <10 | <20 | <20 | 3 F | 3 F | 6.1 | 24 | 12 | 108 | 70 | 0.16 F | <0.002 |
| | RES-005I 1654.93-1657.3 | N | 8 F | <20 | <20 | 3 F | 3 F | 6.3 | 24 | 17 | 105 | 60 | 0.13 F | <0.002 |
| | RES-005I 1677.8-1680.8 | N | 4 FB4 | <20 | <20 | 3 F | 3 F | 6.8 | 24 | 5 F | 70 | 60 | 0.11 F | <0.002 |
| | RES-005I 1695.23-1697.23 | N | 2 FB4 | <20 | <20 | 4 F | 4 F | 6.9 | 24 | 6F | 91 | 80 | 0.47 | <0.002 |
| | RES-005I 1711.23-1713.23 | N | <10 | <20 | <20 | 4 F | 4 F | 6.7 | 24 | 7 | 125 | 80 | 0.12 F | <0.002 |
| | RES-005I 1727.23-1729.23 | N | 4 FB4 | <20 | <20 | 5 F | 4 F | 7 | 24 | 8 | 84 | 50 | 0.6 | <0.002 |
| | RES-005I 1730.5-1731.5 | N | 2 FB4 | <20 | <20 | 4 F | 4 F | 7.1 | 24 | 7 | 81 | 60 | 0.23 | <0.002 |
| | RES-005I 1743.23-1745.23 | N | 4 FB4 | <20 | <20 | 3 F | 3 F | 7.1 | 24 | 7 | 211 | 140 | 0.47 | <0.002 |
| | RES-005I 1759.23-1761.23 | N | 4 FB4 | <20 | <20 | 3 F | 3 F | 6.8 | 24 | 12 | 290 | 180 | 0.54 | <0.002 |
| | RES-005I 1775.23-1778.23 | N | 2 FB4 | <20 | <20 | <20 | <20 | 6.6 | 24 | 6F | 116 | 60 | 0.24 | <0.002 |
| | RES-005I 1794.36-1796.3 | N | 4 FB4 | <20 | <20 | <20 | <20 | 6.4 | 24 | 7 | 104 | 60 | <0.2 | <0.002 |
| | RES-005I 1811.3-1814.3 | N | 8 FB4 | <20 | <20 | <20 | <20 | 5.4 | 24 | 13 | 123 | 70 | 0.43 | <0.002 |
| | RES-005I 1830.5-1831.5 | N | 14 B4 | <20 | <20 | <20 | <20 | 5.3 | 24 | 12 | 124 | 70 | 0.41 | <0.002 |
| | RES-005I 1835.3-1838.3 | N | 6 FB4 | <20 | <20 | <20 | <20 | 6.1 | 24 | 9 | 136 | 90 | <0.2 | <0.002 |
| | RES-005I 1855.91-1858.91 | N | 14 B4 | <20 | <20 | <20 | <20 | 6.1 | 24 | 19 | 153 | 90 | <0.2 | <0.002 |
| | RES-005I 1872.9-1875.38 | N | 32 B4 | <20 | <20 | <20 | <20 | 6 | 24 | 13 | 192 | 130 | <0.2 | <0.002 |
| | RES-005I 1884-1887 | N | 6 F | <20 | <20 | <20 | <20 | 5.1 | 23 | 13 | 145 | 90 | 0.13 F | <0.002 |
| | RES-005I 1875.38-1878.2 | N | 16 | <20 | <20 | <20 | <20 | 5.9 | 23 | 22 | 102 | 60 | 0.45 | <0.002 |
| | RES-005I 1895-1897.06 | N | <10 | <20 | <20 | 3 F | 3 F | 6.4 | 23 | 36 | 156 | 120 | <0.2 | 0.001 F |
| | RES-005I 1901.49-1902.36 | N | 20 | <20 | <20 | <20 | <20 | 6.4 | 23 | 21 | 168 | 130 | 0.05 F | <0.002 |
| | RES-005I 1917.29-1919.1 | N | 6 F | <20 | <20 | 3 F | 3 F | 6.7 | 23 | 15 | 135 | 90 | 0.18 F | <0.002 |
| | RES-005I 1923.1-1925.3 | N | <10 | <20 | <20 | 10 F | 10 F | 6.8 | 23 | 31 | 177 | 120 | 0.09 F | <0.002 |
| | RES-005I 1955.06-1958.06 | N | 2 F | 3 F | <20 | 8 F | 5 F | 7.7 | 23 | 6F | 91 | 80 | 0.42 | <0.002 |
| | RES-005I 1960.5-1961.5 | N | 2 F | <20 | <20 | 6 F | 5 F | 8 | 23 | 6F | 87 | 90 | 0.29 | <0.002 |
| | RES-005I 1979.06-1982.06 | N | <10 | 6 F | <20 | 38 | 32 | 8.8 | 23 | 17 | 125 | 90 | 0.43 | <0.002 |
| | RES-005I 2008.11-2011.11 | N | <10 | 6 F | <20 | 37 | 30 | 8.8 | 23 | 29 | 158 | 110 | 0.35 | <0.002 |
| | RES-005I 2032.11-2035.11 | N | <10 | 2 F | <20 | 39 | 37 | 8.3 | 23 | 75 | 291 | 190 | 0.18 F | <0.002 |
| | RES-005I 2049.84-2052.84 | N | 10 | <20 | <20 | <20 | <20 | 7.2 | 23 | 16 | 182 | 110 | 0.06 F | <0.002 |
| | RES-005I 2061.84-2064.84 | N | 10 | <20 | <20 | <20 | <20 | 7 | 23 | 17 | 170 | 120 | <0.2 | <0.002 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L |
| RES-005I | RES-005I 1011.88-1012.45 | N | 0.0047 | 0.003 F | <0.01 | 0.07 | <0.0005 | 2.7 | 2.1 F | <0.05 | <0.05 | <0.05 | 0.6 | 0.15 | 0.0003 F | 0.3 F | <0.03 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1322.73-1323.23 | N | 0.0027 | <0.02 | <0.01 | <0.05 | <0.0005 | 6.6 | 1.5 F | <0.05 | <0.05 | <0.05 | 0.7 | 0.04 F | 0.0001 F | 1.1 | <0.03 | <0.001 | 0.03 F | <0.05 |
| | RES-005I 1353-1353.49 | N | 0.0264 | 0.007 F | <0.01 | <0.05 | <0.0005 | 5.6 | 1.3 F | <0.05 | <0.05 | <0.05 | 0.6 | 0.05 | 0.0002 F | 0.7 F | <0.03 | <0.001 | 0.04 F | <0.05 |
| | RES-005I 1360.5-1361.51 | N | 0.0281 | 0.046 | <0.01 | <0.05 | <0.0005 | 5.7 | 1.1 F | <0.05 | <0.05 | <0.05 | 0.8 | 0.09 | 0.0002 F | 0.7 F | <0.03 | <0.001 | 0.03 F | <0.05 |
| | RES-005I 1370.93-1374 | N | 0.003 | 0.063 | <0.01 | <0.05 | <0.0005 | 1.1 | <5 D1 | 0.01 F | <0.05 | <0.05 | 2.5 D1 | 0.15 | 0.0004 F | <1 | 0.014 F | <0.001 | <0.05 | <0.05 |
| | RES-005I 1380-1383 | N | 0.0028 | 0.081 | <0.01 | <0.05 | <0.0005 | 3 | <5 D1 | <0.05 | <0.05 | <0.05 | 2.4 D1 | 0.25 | 0.0008 | 0.3 F | 0.056 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1389-1391.57 | N | 0.0023 | 0.024 | <0.01 | <0.05 | <0.0005 | 4.2 | 0.7 F | <0.05 | <0.05 | <0.05 | 2.4 | 0.06 | 0.0001 F | 0.3 F | 0.052 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1396.3-1399.3 | N | 0.0044 | 0.039 | <0.01 | <0.05 | <0.0005 | 4.5 | 1 F | 0.01 F | <0.05 | 0.02 F | 4.3 | 0.02 F | <0.0005 | 0.2 F | 0.086 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1405-1406.67 | N | 0.003 | 0.224 | <0.01 | <0.05 | <0.0005 | 3.9 | 0.6 F | <0.05 | <0.05 | <0.05 | 3.4 | <0.05 | 0.0014 | 0.3 F | 0.092 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1410.18-1413.18 | N | 0.005 | 0.23 | <0.01 | <0.05 | <0.0005 | 2 | 0.8 F | <0.05 | <0.05 | <0.05 | 1.1 | 0.05 | 0.0011 | <1 | 0.063 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1419.18-1422.18 | N | 0.0195 | 0.472 | <0.01 | <0.05 | <0.0005 | 1.7 | 1 FD1 | <0.05 | <0.05 | 0.02 F | <1 D1 | 0.41 | 0.0067 | <1 | 0.014 F | <0.001 | 0.03 F | <0.05 |
| | RES-005I 1425.5-1426.51 | N | 0.0197 | 0.258 | <0.01 | <0.05 | <0.0005 | 1.6 | 1 FD1 | <0.05 | <0.05 | <0.05 | <1 D1 | 0.11 | 0.0012 | <1 | 0.016 F | <0.001 | 0.04 F | <0.05 |
| | RES-005I 1428.18-1431.18 | N | 0.0057 | 0.302 | <0.01 | <0.05 | <0.0005 | 2.3 | <5 D1 | <0.05 | <0.05 | 0.04 F | <1 D1 | 0.1 | 0.0011 | <1 | 0.07 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1446.13-1449.13 | N | 0.0084 | 0.088 | <0.01 | <0.05 | <0.0005 | 1.2 | 0.7 F | <0.05 | <0.05 | <0.05 | 0.6 | 0.03 F | 0.0026 | <1 | <0.03 | 0.0002 F | <0.05 | <0.05 |
| | RES-005I 1437.13-1440.13 | N | 0.0038 | 0.107 | <0.01 | <0.05 | <0.0005 | 2.2 | <5 D1 | <0.05 | <0.05 | <0.05 | 0.5 FD1 | 0.23 | 0.0014 | 0.3 F | 0.048 | <0.001 | <0.05 | 0.01 F |
| | RES-005I 1455.13-1458.13 | N | 0.0037 | 0.031 | <0.01 | <0.05 | <0.0005 | <1 | <5 D1 | <0.05 | <0.05 | <0.05 | 1.2 D1 | 0.17 | 0.0027 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1464.13-1467.13 | N | 0.0036 | 0.031 | <0.01 | <0.05 | <0.0005 | <1 | 0.6 F | <0.05 | <0.05 | <0.05 | 1.9 | 0.06 | 0.0014 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1473.13-1476.13 | N | 0.0028 | 0.13 | <0.01 | <0.05 | <0.0005 | 1 | <5 D1 | <0.05 | <0.05 | <0.05 | 3.1 D1 | 0.11 | 0.0001 F | <1 | 0.013 F | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1481-1482.66 | N | 0.0154 | <0.02 | <0.01 | <0.05 | <0.0005 | <1 | <5 D1 | <0.05 | <0.05 | <0.05 | 0.6 FD1 | 0.13 | 0.0008 | <1 | <0.03 | <0.001 | 0.03 F | <0.05 |
| | RES-005I 1485.5-1486.51 | N | 0.0151 | 0.006 F | <0.01 | <0.05 | <0.0005 | <1 | <5 D1 | 0.02 F | <0.05 | <0.05 | 0.5 FD1 | 0.36 | 0.0008 | <1 | <0.03 | <0.001 | 0.03 F | <0.05 |
| | RES-005I 1487.1-1490.1 | N | 0.0007 F | 0.165 | <0.01 | <0.05 | <0.0005 | 0.4 F | <30 D2 | <0.05 | <0.05 | <0.05 | 1 FD2 | 0.69 M2R1 | 0.0004 FB5 | <1 | <0.03 | <0.001 | 0.01 F | <0.05 |
| | RES-005I 1490.1-1493.1 | N | 0.0026 | 0.051 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | <5 D2 | 0.47 | 0.0004 FB5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1499-1502 | N | 0.0071 | 0.02 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | 0.02 F | <5 D2 | 0.65 | 0.0025 B5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1506.56-1509.47 | N | 0.0038 | 0.04 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | 1 FD2 | 0.6 | 0.0024 B5 | <1 | <0.03 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1515.47-1518.47 | N | 0.0009 F | 0.041 | <0.01 | <0.05 | <0.0005 | <1 | 0.6 F | <0.05 | <0.05 | <0.05 | 2.1 | 0.31 | 0.0009 B5 | <1 | <0.03 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1524.47-1527.47 | N | 0.0039 | 0.093 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | 0.03 F | <5 D2 | 0.65 | 0.0004 FB5 | <1 | <0.03 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1532.98-1534.97 | N | 0.0054 | 0.044 | <0.01 | <0.05 | <0.0005 | 0.2 F | 0.8 F | <0.05 | <0.05 | 0.02 F | 2.5 | 0.3 | 0.001 B5 | <1 | <0.03 | <0.001 | 0.01 F | <0.05 |
| | RES-005I 1544-1546.55 | N | 0.0009 F | 0.041 | <0.01 | <0.05 | <0.0005 | 0.3 F | <30 D2 | <0.05 | <0.05 | <0.05 | <5 D2 | 0.38 | 0.0057 B5 | <1 | 0.01 F | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1552.55-1555.58 | N | 0.0019 | 0.028 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | <5 D2 | 0.68 | 0.0009 B5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1559.46-1562.46 | N | 0.0035 | 0.028 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | 0.01 F | 1 FD2 | 0.75 | 0.001 B5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1568.46-1571.46 | N | 0.0034 | 0.033 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | 0.01 F | <5 D2 | 0.75 | 0.0007 B5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1577.46-1580.46 | N | 0.0058 | 0.03 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | <5 D2 | 1.08 | 0.0018 B5 | <1 | <0.03 | 0.0003 F | 0.02 F | <0.05 |
| | | FD | 0.0051 | 0.032 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | <5 D2 | 1.06 | 0.0022 B5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1586.46-1589.46 | N | 0.0023 | 0.036 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | 1 FD2 | 0.75 | 0.0003 FB5 | <1 | <0.03 | <0.001 | 0.01 F | <0.05 |
| | RES-005I 1595.46-1598.46 | N | 0.0059 | 0.032 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | 1 FD2 | 0.96 | 0.0015 B5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1604.46-1607.46 | N | 0.0016 | 0.093 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | 1 FD2 | 1.27 | 0.0023 B5 | <1 | <0.03 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1613.46-1616.46 | N | 0.0063 | 0.056 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | <5 D2 | 0.54 | 0.0013 B5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1616.46-1619 | N | 0.0044 | 0.048 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | <0.05 | 1 FD2 | 0.65 | 0.0016 B5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L |
| RES-005I | RES-005I 1626.54-1627.16 | N | 0.0037 | 0.098 | <0.01 | <0.05 | <0.0005 | 0.8 F | <50 D2 | <0.05 | <0.05 | 0.01 F | <10 D2 | 2.03 | 0.0015 B5 | <1 | 0.025 F | <0.001 | 0.06 | <0.05 |
| | RES-005I 1627.16-1630 | N | 0.0122 | 0.08 | <0.01 | <0.05 | <0.0005 | <1 | <30 D2 | <0.05 | <0.05 | 0.02 F | <5 D2 | 0.78 | 0.0007 B5 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1630.5-1631.5 | N | 0.012 | 0.071 | <0.01 | 0.04 FB1 | <0.0005 | 0.4 F | <10 D1 | <0.05 | <0.05 | 0.01 F | <3 D1 | 0.26 | 0.0006 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1632.56-1635.56 | N | <0.002 | 0.068 | <0.01 | 0.08 B1 | <0.0005 | 2.1 | 0.6 F | <0.05 | <0.05 | 0.02 F | 0.3 F | <0.05 | <0.0005 | 0.6 F | 0.084 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1638.37-1641 | N | <0.002 | 0.051 | <0.01 | 0.06 | 0.0001 F | 2.9 | <3 | <0.05 | 0.01 F | 0.08 | 1 | <0.05 | 0.0002 F | 0.8 F | 0.069 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1645.84-1648.08 | N | 0.0016 F | 0.051 | <0.01 | 0.09 | 0.0011 | 1.4 | 0.7 F | <0.05 | <0.05 | 0.02 F | 1.8 | 0.19 | 0.002 | 0.4 F | <0.03 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1652-1654.93 | N | <0.002 | 0.057 | <0.01 | 0.07 | 0.0008 | 3.5 | 0.8 F | <0.05 | 0.02 F | 0.1 | 1.5 | <0.05 | <0.0005 N1 | 0.8 F | 0.128 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1654.93-1657.3 | N | <0.002 | 0.087 | <0.01 | 0.07 | 0.002 | 5.9 | 0.9 F | <0.05 | 0.02 F | 0.07 | 3.3 | <0.05 | 0.0005 | 0.6 F | 0.176 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1677.8-1680.8 | N | 0.001 F | 0.039 | <0.01 | 0.09 B1 | <0.0005 | 1.5 | 0.8 F | <0.05 | <0.05 | 0.02 F | 0.6 | 0.02 F | 0.0006 | 0.4 F | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1695.23-1697.23 | N | 0.0027 | 0.053 | <0.01 | 0.08 B1 | <0.0005 | 1.6 | 0.6 F | <0.05 | <0.05 | 0.08 | 0.7 | 0.07 | 0.0002 F | 0.5 F | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1711.23-1713.23 | N | <0.002 | 0.045 | <0.01 | 0.08 B1 | <0.0005 | 1.7 | 1 F | <0.05 | <0.05 | 0.01 F | 1.5 | <0.05 | 0.0005 | 0.7 F | 0.072 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1727.23-1729.23 | N | 0.0098 | 0.06 | <0.01 | 0.09 B1 | <0.0005 | 2.4 | 1 F | <0.05 | <0.05 | 0.08 | 2.5 | 0.08 | 0.0002 F | 0.5 F | <0.03 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1730.5-1731.5 | N | 0.0109 | 0.067 | <0.01 | 0.07 B1 | <0.0005 | 2.3 | 1 F | <0.05 | <0.05 | 0.06 | 2.3 | 0.03 F | 0.0007 | 0.4 F | 0.008 F | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1743.23-1745.23 | N | 0.0062 | 0.069 | <0.01 | 0.08 B1 | <0.0005 | 1.2 | 1 F | <0.05 | <0.05 | 0.09 | 2.4 | 0.04 F | 0.0007 | 0.9 F | 0.014 F | <0.001 | 0.39 | <0.05 |
| | RES-005I 1759.23-1761.23 | N | 0.0065 | 0.064 | <0.01 | 0.1 B1 | <0.0005 | 1.7 | 0.9 F | <0.05 | <0.05 | 0.09 | 1.5 | 0.08 | 0.0014 | 1.9 | 0.029 F | <0.001 | 0.18 | <0.05 |
| | RES-005I 1775.23-1778.23 | N | 0.0007 F | 0.027 | <0.01 | 0.23 B1 | <0.0005 | 1.5 | 1 F | <0.05 | <0.05 | <0.05 | 0.9 | 0.05 | 0.0003 F | 0.6 F | <0.03 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1794.36-1796.3 | N | <0.002 | 0.065 | <0.01 | 0.04 FB1 | <0.0005 | 1.7 | 1.1 F | <0.05 | <0.05 | <0.05 | 1.1 | 0.27 | 0.0005 | 0.6 F | 0.145 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1811.3-1814.3 | N | <0.002 | 0.088 | <0.01 | 0.09 B1 | 0.007 | 3.7 | 0.7 F | <0.05 | 0.02 F | 3.51 | 0.9 | 0.03 F | 0.0012 | 1 | 0.068 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1830.5-1831.5 | N | <0.002 | 0.086 | <0.01 | 0.05 B1 | 0.007 | 3.5 | 0.7 F | <0.05 | 0.02 F | 3.88 | 0.9 | 0.03 F | <0.0005 N1 | 0.9 F | 0.067 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1835.3-1838.3 | N | <0.002 | 0.086 | <0.01 | 0.06 B1 | <0.0005 | 2.1 | 0.7 F | 0.01 F | <0.05 | <0.05 | 1.3 | 2.26 | 0.0003 F | 1 | 0.276 | <0.001 | 0.01 F | <0.05 |
| | RES-005I 1855.91-1858.91 | N | <0.002 | 0.083 | <0.01 | 0.06 B1 | <0.0005 | 5.5 | 0.6 F | <0.05 | <0.05 | <0.05 | 2.8 | 6.79 | 0.0004 F | 1.2 | 0.373 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1872.9-1875.38 | N | <0.002 | 0.052 | <0.01 | 0.05 B1 | 0.0002 F | 2.9 | 0.6 F | <0.05 | <0.05 | <0.05 | 1 | 11.1 | 0.0006 | 1.3 | 0.387 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1884-1887 | N | <0.002 | 0.043 | <0.01 | 0.06 | 0.0001 F | 6.1 | <3 | <0.05 | <0.05 | 0.01 F | 2.9 | 0.02 F | 0.0003 F | 1.7 | 0.118 | <0.001 | 0.02 F | <0.05 |
| | RES-005I 1875.38-1878.2 | N | <0.002 | 0.066 | <0.01 | 0.04 FB1 | 0.0026 | 3.4 | 0.6 F | <0.05 | 0.03 F | 1.01 | 0.3 FM1 | 0.85 | 0.0005 F | 1.1 | 0.097 | <0.001 | <0.05 | 0.02 F |
| | RES-005I 1895-1897.06 | N | <0.002 | 0.07 | <0.01 | 0.07 B1 | <0.0005 | 12.2 | 0.5 F | <0.05 | <0.05 | <0.05 | 1.2 | 0.6 | 0.001 | 1.3 | 0.167 | <0.001 | 0.04 F | <0.05 |
| | RES-005I 1901.49-1902.36 | N | <0.002 | 0.072 | <0.01 | 0.1 B1 | <0.0005 | 6 | <3 | <0.05 | <0.05 | <0.05 | 1.8 | 11.4 | 0.0005 F | 1.4 | 0.422 | <0.001 | <0.05 | <0.05 |
| | RES-005I 1917.29-1919.1 | N | <0.002 | 0.031 | <0.01 | 0.22 B1 | <0.0005 | 3.1 | <3 | <0.05 | <0.05 | 0.02 F | 1.4 | 0.15 | 0.0003 F | 1.7 | <0.03 | <0.001 | 0.04 F | <0.05 |
| | RES-005I 1923.1-1925.3 | N | <0.002 | 0.027 | <0.01 | 0.09 B1 | <0.0005 | 7.6 | <3 | <0.05 | <0.05 | 0.02 F | 1.3 | 0.07 | 0.0012 | 3 | 0.138 | <0.001 | 0.03 F | <0.05 |
| | RES-005I 1955.06-1958.06 | N | <0.002 | 0.022 | <0.01 | 0.13 B1 | <0.0005 | 1.4 | <3 | <0.05 | <0.05 | 0.03 F | 1.5 | 0.45 | 0.0012 | 0.6 F | 0.01 F | <0.001 | 0.07 | <0.05 |
| | RES-005I 1960.5-1961.5 | N | <0.002 | 0.02 F | <0.01 | 0.14 B1 | <0.0005 | 1.4 | <3 | <0.05 | <0.05 | 0.02 F | 1.4 | 0.3 | 0.0014 | 0.6 F | 0.006 F | <0.001 | 0.07 | <0.05 |
| | RES-005I 1979.06-1982.06 | N | <0.002 | 0.023 | <0.01 | 0.14 B1 | <0.0005 | 5 | <3 | <0.05 | <0.05 | 0.04 F | 1.2 | 0.36 | 0.0006 | 1 | 0.012 F | <0.001 | 0.12 | <0.05 |
| | RES-005I 2008.11-2011.11 | N | <0.002 | 0.025 | <0.01 | 0.12 B1 | <0.0005 | 8.8 | <3 | <0.05 | <0.05 | 0.02 F | 1.4 | 0.35 | 0.0005 F | 1.7 | 0.007 F | <0.001 | 0.06 | <0.05 |
| | RES-005I 2032.11-2035.11 | N | <0.002 | 0.023 | <0.01 | 0.1 B1 | <0.0005 | 21.9 | <3 | <0.05 | <0.05 | 0.02 F | 0.6 | 0.16 | 0.0004 F | 4.8 | 0.185 | <0.001 | 0.06 | <0.05 |
| | RES-005I 2049.84-2052.84 | N | <0.002 | 0.045 | <0.01 | 0.04 FB1 | <0.0005 | 2.9 | <3 | <0.05 | <0.05 | 0.01 F | 0.6 | 5.48 | 0.0005 | 2.2 | 0.369 | <0.001 | <0.05 | <0.05 |
| | RES-005I 2061.84-2064.84 | N | <0.002 | 0.056 | <0.01 | 0.09 B1 | <0.0005 | 3.2 | <3 | <0.05 | <0.05 | <0.05 | 1.6 | 4.18 | 0.0001 F | 2.2 | 0.354 | <0.001 | <0.05 | <0.05 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

**APPENDIX C**
**SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS**

| | | | ACZS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | RES-005I 1011.88-1012.45 | N | 6.3 | 0.0025 | 17.1 | <0.03 | 24.6 | 8.7 | <0.0005 | 0.0001 F | 0.032 | <0.05 |
| | RES-005I 1322.73-1323.23 | N | 9.4 | 0.0006 | 13.3 | <0.03 | 9.2 | 9.9 | <0.0005 | <0.0005 | 0.008 F | <0.05 |
| | RES-005I 1353-1353.49 | N | 9.1 | 0.0016 | 13.7 | <0.03 | 8.3 | 5.8 | <0.0005 | <0.0005 | 0.008 F | <0.05 |
| | RES-005I 1360.5-1361.51 | N | 12.1 | 0.0022 | 12.9 | <0.03 | 8.1 | 9.5 | <0.0005 | <0.0005 | 0.008 F | <0.05 |
| | RES-005I 1370.93-1374 | N | 17.4 | 0.0027 | 7.8 | <0.03 | 1.7 F | 13 D1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1380-1383 | N | 13.3 | 0.0012 | 7.1 | <0.03 | 2.2 | 15 D1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1389-1391.57 | N | 4.8 | 0.0007 | 8.3 | <0.03 | 2.1 | 10.2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1396.3-1399.3 | N | 3.5 | 0.0057 | 5.7 | <0.03 | 2.9 | 6.5 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1405-1406.67 | N | 8.8 | 0.0008 | 7.6 | <0.03 | 2.2 | 11.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1410.18-1413.18 | N | 6.1 | 0.0046 | 5.2 | <0.03 | 3.2 | 11.7 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1419.18-1422.18 | N | 3.2 | 0.0112 | 5.7 | <0.03 | 4.6 | 11 D1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1425.5-1426.51 | N | 3.4 | 0.0125 | 6.6 | <0.03 | 4.5 | 11 D1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1428.18-1431.18 | N | 1.8 F | 0.0043 | 5.3 | <0.03 | 4.6 | 10 D1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1446.13-1449.13 | N | 10.8 | 0.0101 | 6.1 | <0.03 | 2.9 | 14.5 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1437.13-1440.13 | N | 10.4 | 0.01 | 6.4 | <0.03 | 3.2 | 18 D1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1455.13-1458.13 | N | 15.6 | 0.0103 | 6.3 | <0.03 | 1.3 F | 14 D1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1464.13-1467.13 | N | 13.7 | 0.0179 | 6.2 | <0.03 | 1.5 F | 9.3 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1473.13-1476.13 | N | 13.6 | 0.0033 | 6.3 | <0.03 | 1.8 F | 11 D1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1481-1482.66 | N | 5.7 | 0.0106 | 4.8 | <0.03 | 1.8 F | 3 FD1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1485.5-1486.51 | N | 5.6 | 0.0107 | 4.8 | <0.03 | 1.9 F | 3 FD1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-005I 1487.1-1490.1 | N | 20.1 | 0.0083 | 8.8 | <0.03 | 1.8 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1490.1-1493.1 | N | 18.7 | 0.0132 | 7.8 | <0.03 | 1.6 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-005I 1499-1502 | N | 13.6 | 0.0151 | 9.3 | <0.03 | 1.6 F | <30 D2 | 0.0002 F | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1506.56-1509.47 | N | 15.2 | 0.0198 | 8.7 | <0.03 | 1.3 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1515.47-1518.47 | N | 19.3 | 0.0148 | 7.2 | <0.03 | 1.5 F | 12.8 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1524.47-1527.47 | N | 18.4 | 0.0122 | 9.4 | <0.03 | 1.4 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-005I 1532.98-1534.97 | N | 18.1 | 0.0027 | 9.3 | <0.03 | 2 | 11.2 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-005I 1544-1546.55 | N | 11.6 | 0.0042 | 7.9 | <0.03 | 1.7 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1552.55-1555.58 | N | 13.1 | 0.0142 | 7.7 | <0.03 | 2.1 | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1559.46-1562.46 | N | 13.2 | 0.0367 | 7.8 | <0.03 | 1.6 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-005I 1568.46-1571.46 | N | 13.1 | 0.0433 | 7 | <0.03 | 1.6 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1577.46-1580.46 | N | 8.1 | 0.0176 | 7.3 | <0.03 | 2 | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | | FD | 7.5 | 0.0153 | 7 | <0.03 | 1.7 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1586.46-1589.46 | N | 19 | 0.029 | 8.9 | <0.03 | 1.6 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-005I 1595.46-1598.46 | N | 16.9 | 0.0299 | 8.8 | <0.03 | 1.8 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-005I 1604.46-1607.46 | N | 17.4 | 0.015 | 12.7 | <0.03 | 1.5 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1613.46-1616.46 | N | 9.4 | 0.0099 | 7.2 | <0.03 | 1.5 F | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1616.46-1619 | N | 15.2 | 0.0095 | 9.2 | <0.03 | 1 F | <30 D2 | <0.0005 | <0.0005 | 0.006 F | 0.04 FB5 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

**APPENDIX C**
**SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS**

| | | | ACZS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | RES-005I 1626.54-1627.16 | N | 8.7 | 0.0185 | 7 | <0.03 | 2.5 | <100 D2M2 | <0.0005 | <0.0005 | <0.03 | 0.03 FB5 |
| | RES-005I 1627.16-1630 | N | 10.7 | 0.031 | 7 | <0.03 | 2.2 | <30 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-005I 1630.5-1631.5 | N | 9 | 0.0331 | 5.4 | <0.03 | 3.2 B1 | 8 FD1 | <0.0005 | <0.0005 | <0.03 | 0.06 B1 |
| | RES-005I 1632.56-1635.56 | N | 21.4 | 0.0013 | 6.2 | <0.03 | 3.8 B1 | 30.5 | <0.0005 | <0.0005 | <0.03 | 0.05 B1 |
| | RES-005I 1638.37-1641 | N | 22.9 | 0.0016 | 7.8 | <0.03 | 3.6 | 34.2 | 0.0004 F | <0.0005 | <0.03 | 0.06 |
| | RES-005I 1645.84-1648.08 | N | 14.6 | 0.0278 | 6.1 | <0.03 | 4.6 | 16 | 0.0001 F | <0.0005 | <0.03 | 0.07 |
| | RES-005I 1652-1654.93 | N | 21.4 | 0.0055 | 6.5 | <0.03 | 3 | 31 | <0.0005 | <0.0005 | <0.03 | 0.07 |
| | RES-005I 1654.93-1657.3 | N | 16.4 | 0.0046 | 6.3 | <0.03 | 3.2 | 27.8 | 0.0001 F | <0.0005 | <0.03 | 0.07 |
| | RES-005I 1677.8-1680.8 | N | 12.8 | 0.0009 | 7.1 | <0.03 | 3.9 B1R1 | 16.8 | <0.0005 | <0.0005 | <0.03 | 0.06 B1 |
| | RES-005I 1695.23-1697.23 | N | 17.2 | 0.0004 F | 7.1 | <0.03 | 4.7 B1 | 23.5 | <0.0005 | <0.0005 | <0.03 | 0.05 B1 |
| | RES-005I 1711.23-1713.23 | N | 26.6 | 0.0003 F | 7.3 | <0.03 | 3 B1 | 33.2 | <0.0005 | <0.0005 | <0.03 | 0.06 B1 |
| | RES-005I 1727.23-1729.23 | N | 14.1 | 0.0004 F | 8.7 | <0.03 | 4.7 B1 | 17.7 | <0.0005 | <0.0005 | <0.03 | 0.05 B1 |
| | RES-005I 1730.5-1731.5 | N | 13.9 | 0.0004 F | 6.9 | <0.03 | 3.1 B1 | 17.9 | <0.0005 | <0.0005 | <0.03 | 0.05 B1 |
| | RES-005I 1743.23-1745.23 | N | 52.7 | 0.0018 | 10.1 | <0.03 | 3.3 B1 | 60 | <0.0005 | <0.0005 | <0.03 | 0.07 B1 |
| | RES-005I 1759.23-1761.23 | N | 70.9 | 0.0019 | 14 | <0.03 | 4.2 B1 | 91.2 | 0.0003 F | <0.0005 | <0.03 | 0.07 B1 |
| | RES-005I 1775.23-1778.23 | N | 18.9 | 0.0002 F | 8.2 | <0.03 | 8.1 B1 | 33.2 | <0.0005 | <0.0005 | <0.03 | 0.05 B1 |
| | RES-005I 1794.36-1796.3 | N | 20.7 | 0.0002 F | 5.6 | <0.03 | 2.6 B1 | 28.7 | <0.0005 | <0.0005 | <0.03 | 0.06 B1 |
| | RES-005I 1811.3-1814.3 | N | 19.7 | 0.0006 | 5.5 | <0.03 | 3.8 B1 | 40.8 | 0.0008 | <0.0005 | <0.03 | 0.1 B1 |
| | RES-005I 1830.5-1831.5 | N | 19.8 | 0.0006 | 5.6 | <0.03 | 3.4 B1 | 41.5 | 0.0009 | <0.0005 | <0.03 | 0.08 B1 |
| | RES-005I 1835.3-1838.3 | N | 25.2 | 0.0007 | 8.8 | <0.03 | 3.6 B1 | 42.2 | <0.0005 | <0.0005 | <0.03 | 0.06 B1 |
| | RES-005I 1855.91-1858.91 | N | 20.1 | 0.0012 | 5.4 | <0.03 | 3.8 B1 | 48.4 | <0.0005 | <0.0005 | <0.03 | 0.06 B1 |
| | RES-005I 1872.9-1875.38 | N | 21.3 | 0.0011 | 4.3 | <0.03 | 3.1 B1 | 71 | <0.0005 | <0.0005 | <0.03 | 0.07 B1 |
| | RES-005I 1884-1887 | N | 23 | 0.0014 | 7 R4 | <0.03 | 2.8 B1 | 48.9 | <0.0005 | <0.0005 | <0.03 | 0.07 B1 |
| | RES-005I 1875.38-1878.2 | N | 13.2 | 0.0009 | 5.3 | <0.03 | 1.4 FB1 | 41.7 | <0.0005 | 0.0005 F | <0.03 | 2.87 B7 |
| | RES-005I 1895-1897.06 | N | 15.3 | 0.0022 | 8.3 | <0.03 | 3.1 B1 | 56.3 | <0.0005 | <0.0005 | <0.03 | 0.05 B1 |
| | RES-005I 1901.49-1902.36 | N | 17.8 | 0.0009 | 4.8 | <0.03 | 4.4 B1 | 65.2 | <0.0005 | <0.0005 | <0.03 | 0.06 B1 |
| | RES-005I 1917.29-1919.1 | N | 22.8 | 0.0017 | 9.3 | <0.03 | 10.2 B1 | 40.9 | 0.0001 F | <0.0005 | <0.03 | 0.07 B1 |
| | RES-005I 1923.1-1925.3 | N | 24.7 | 0.002 | 6.9 | <0.03 | 4.4 B1 | 57.6 | <0.0005 | <0.0005 | <0.03 | 0.07 B1 |
| | RES-005I 1955.06-1958.06 | N | 14.7 | 0.0013 | 10.1 | <0.03 | 6.6 B1 | 20.8 | <0.0005 | <0.0005 | <0.03 | 0.12 B1 |
| | RES-005I 1960.5-1961.5 | N | 13.7 | 0.0013 | 10.4 | <0.03 | 7.7 B1 | 20.6 | <0.0005 | <0.0005 | <0.03 | 0.07 B1 |
| | RES-005I 1979.06-1982.06 | N | 15.4 | 0.0011 | 7.5 | <0.03 | 9.1 B1 | 10 | <0.0005 | 0.0001 F | <0.03 | 0.09 B1 |
| | RES-005I 2008.11-2011.11 | N | 19.3 | 0.002 | 8.9 | <0.03 | 6.9 B1 | 23.5 | <0.0005 | <0.0005 | 0.006 F | 0.05 B1 |
| | RES-005I 2032.11-2035.11 | N | 27.5 | 0.0026 | 6 | <0.03 | 6.6 B1 | 83.9 | <0.0005 | 0.0001 F | <0.03 | 0.07 B1 |
| | RES-005I 2049.84-2052.84 | N | 29 | 0.0024 | 5.1 | <0.03 | 2.4 B1 | 64.1 | <0.0005 | <0.0005 | <0.03 | 0.15 B1 |
| | RES-005I 2061.84-2064.84 | N | 26.1 | 0.0004 F | 5.9 | <0.03 | 4 B1 | 60.9 | <0.0005 | <0.0005 | <0.03 | 0.06 B1 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Alkalinity, Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Alkalinity, Total (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Temperature pH taken at DEG C | Hardness (as CaCO3) MG/L | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L | Aluminum MG/L | Antimony MG/L |
| RES-005J | RES-005J 1660.4-1668.47 | N | 4 F | <20 | <20 | 4 F | 4 F | 7.4 | 23 | 6 F | 88 | 80 | 0.18 F | 0.0016 F |

DEG C degrees Celcius.
MG/L micrograms per liter.
UMHOS/CM micro ohms per centimeter.
B1 Target analyte detected in method blank at or above the method reporting limit.
B4 Target analyte detected in blank at or above method acceptance criteria.
B5 Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
B7 Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank.
D1 Sample required dilution due to matrix.
D2 Sample required dilution due to high concentration of target analyte.
F Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
FD Field duplicate.
M2 Matrix spike recovery was low.
M3 The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level.
N Normal.
N1 See Table E-2.
R1 Relative percent difference (RPD) exceeded the method control limit.
R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
V1 Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample.

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L |
| RES-005J | RES-005J 1660.4-1668.47 | N | 0.0057 | 0.042 | <0.01 | 0.17 B1 | <0.0005 | 1.6 | 0.7 F | <0.05 | <0.05 | 0.08 | 1 | 0.03 F | 0.0015 | 0.5 F | <0.03 | <0.001 | 0.16 | <0.05 | 14.8 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005J | RES-005J 1660.4-1668.47 | N | 0.0006 | 7.6 | <0.03 | 6 B1 | 21.2 | <0.0005 | <0.0005 | <0.03 | 0.07 B1 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Alkalinity, Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Alkalinity, Total (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Hardness (as CaCO3) MG/L | Solids, Percent % | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L | Aluminum MG/L |
| RES-006D | RES-006D 1247.48-1250.48 | N | <10 | 10 F | <20 | 37 | 27 | 9 | 20 | 99.2 | 97 | 60 | 4.06 |
| | RES-006D 1405.47-1408.44 | N | <10 | 6 F | <20 | 26 | 20 | 9 | 23 | 99.6 | 119 | 90 | 1.92 |
| | RES-006D 1450.44-1453.44 | N | <10 | <20 | <20 | 40 | 38 | 8.3 | 138 | 99.6 | 373 | 250 | 0.05 F |
| | RES-006D 1495.44-1498.44 | N | <10 | <20 | <20 | 7 F | 5 F | 8.2 | 56 | 99.6 | 214 | 130 | 0.03 F |
| | RES-006D 1532.81-1535.81 | N | 6 FB4 | <20 | <20 | <20 | <20 | 7.5 | 42 | 99.6 | 219 | 140 | 0.04 F |
| | RES-006D 1577.43-1580.43 | N | <10 | 5 F | <20 | 31 | 26 | 8.2 | 35 | 99.2 | 150 | 100 | 0.89 |
| | RES-006D 1600.5-1601.5 | N | <10 | 4 F | <20 | 30 | 26 | 8.6 | 35 | 99.3 | 148 | 90 | 0.87 |
| | RES-006D 1622.43-1625.43 | N | 8 F | <20 | <20 | 3 F | 3 F | 8.4 | 29 | 99.6 | 165 | 100 | 0.06 F |
| | RES-006D 1667.43-1670.43 | N | 18 B4 | <20 | <20 | <20 | <20 | 5.9 | 41 | 99.7 | 230 | 150 | 2.62 |
| | RES-006D 1898.21-1901.09 | N | 26 B4 | <20 | <20 | <20 | <20 | 4.6 | 71 | 99.7 | 168 | 120 | 0.07 F |
| | RES-006D 1705.4-1708.4 | N | 58 B4 | <20 | <20 | <20 | <20 | 4.7 | 48 | 99.9 | 286 | 190 | 8.33 |
| | RES-006D 1750.4-1753.4 | N | 62 B4 | <20 | <20 | <20 | <20 | 5.1 | 84 | 99.8 | 242 | 190 | 7.26 N1 |
| | RES-006D 1798.4-1801.4 | N | 64 B4 | <20 | <20 | <20 | <20 | 3.9 | 18 | 99.8 | 284 | 210 | 12.9 |
| | RES-006D 1843.4-1846.4 | N | 76 B4 | <20 | <20 | <20 | <20 | 6.1 | 32 | 99.7 | 216 | 150 | 6.62 |
| | RES-006D 1927.23-1930.23 | N | 20 B4 | <20 | <20 | 2 F | 2 F | 5.5 | 31 | 99.8 | 130 | 100 | 2.64 |
| | RES-006D 1952.56-1954.83 | N | 8 FB4 | <20 | <20 | <20 | <20 | 5.5 | 31 | 99.9 | 64 | 50 | 0.03 F |
| | | FD | 24 B4 | <20 | <20 | 3 F | 3 F | 5.9 | 10 | 99.9 | 131 | 80 | 2.83 |
| | RES-006D 1954.83-197 | N | <10 | <20 | <20 | <20 | <20 | 6.9 | 9 | 99.8 | 71 | 40 | 0.07 F |
| | RES-006D 1980.6-1983.6 | N | 177 B7 | <20 | <20 | <20 | <20 | 5.6 | 40 | 99.8 | 517 | 420 | 0.09 F |
| | RES-006D 1995.6-1998.6 | N | 203 B7 | <20 | <20 | <20 | <20 | 5.6 | 93 | 99.7 | 547 | 460 | 1.07 |
| | RES-006D 2022.66-2025.66 | N | 85 B4 | <20 | <20 | <20 | <20 | 5.7 | 53 | 99.9 | 351 | 250 | 0.09 F |
| | RES-006D 2040.66-2043.66 | N | 36 B4 | <20 | <20 | <20 | <20 | 6 | 48 | 99.7 | 247 | 170 | 0.09 F |
| | RES-006D 2058.16-2061.16 | N | <10 | 3 F | <20 | 37 | 34 | 7.2 | 59 | 99.7 | 223 | 140 | 0.17 F |
| | RES-006D 2073.13-2076.13 | N | <10 | <20 | <20 | 39 | 39 | 7.1 | 98 | 99.9 | 306 | 190 | 0.04 F |
| | | FD | <10 | <20 | <20 | 37 | 37 | 7.1 | 94 | 99.8 | 294 | 170 | 0.03 F |
| | RES-006D 2091.13-2094.13 | N | 27 B4 | 2 F | <20 | 31 | 29 | 7.7 | 40 | 99.6 | 193 | 120 | 0.2 |
| | RES-006D 2115.47-2118.47 | N | 8 FB4 | <20 | <20 | 3 F | 3 F | 6.7 | 15 | 99.9 | 96 | 60 | 0.45 |
| | RES-006D 2125.45-2128.42 | N | 2 FB4 | <20 | <20 | 3 F | 3 F | 6.9 | 12 | 99.8 | 114 | 60 | <0.2 |
| | RES-006D 2137.08-2138.5 | N | 117 B4 | <20 | <20 | <20 | <20 | 6.6 | 80 | 99.7 | 420 | 320 | 0.58 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L |
| RES-006D | RES-006D 1247.48-1250.48 | N | <0.002 | <0.002 | 0.033 | <0.01 | 0.13 B1 | <0.0005 | 4.6 | 0.6 F | <0.05 | <0.05 | 0.02 F | 0.2 F | 3.21 | <0.0005 | 2 | 0.14 | <0.001 | <0.05 |
| | RES-006D 1405.47-1408.44 | N | <0.002 | <0.002 | 0.035 | <0.01 | 0.11 B1 | <0.0005 | 7.2 | 0.6 F | <0.05 | <0.05 | <0.05 | 0.2 F | 0.74 | 0.0015 | 1.2 | 0.02 F | <0.001 | <0.05 |
| | RES-006D 1450.44-1453.44 | N | <0.002 | <0.002 | 0.048 | <0.01 | 0.11 B1 | <0.0005 | 44.7 | 0.6 F | <0.05 | <0.05 | <0.05 | 1.3 | <0.05 | <0.0005 | 6.5 | 1.08 | <0.001 | <0.05 |
| | RES-006D 1495.44-1498.44 | N | <0.002 | <0.002 | 0.037 | <0.01 | 0.1 B1 | <0.0005 | 8.9 | 0.7 F | <0.05 | 0.01 F | <0.05 | 0.8 | <0.05 | 0.0002 F | 8.1 | 0.05 | <0.001 | <0.05 |
| | RES-006D 1532.81-1535.81 | N | <0.002 | <0.002 | 0.025 | <0.01 | 0.1 B1 | <0.0005 | 9.3 | <3 | <0.05 | 0.01 F | <0.05 | 3.9 | 0.39 | <0.0005 | 4.6 | 0.174 | <0.001 | <0.05 |
| | RES-006D 1577.43-1580.43 | N | <0.002 | <0.002 | 0.042 | <0.01 | 0.11 B1 | <0.0005 | 11.2 | <3 | <0.05 | <0.05 | 0.01 F | 0.7 | 0.3 | <0.0005 | 1.8 | 0.009 F | <0.001 | <0.05 |
| | RES-006D 1600.5-1601.5 | N | <0.002 | <0.002 | 0.034 | <0.01 | 0.1 B1 | <0.0005 | 11.1 | <3 | <0.05 | 0.01 F | 0.01 F | 0.6 | 0.28 | 0.0007 | 1.8 | 0.01 F | <0.001 | <0.05 |
| | RES-006D 1622.43-1625.43 | N | <0.002 | <0.002 | 0.02 | <0.01 | 0.09 B1 | <0.0005 | 5.4 | <3 | <0.05 | 0.01 F | <0.05 | 0.9 | <0.05 | 0.0002 F | 3.7 | 0.336 | <0.001 | <0.05 |
| | RES-006D 1667.43-1670.43 | N | <0.002 | <0.002 | 0.052 | 0.003 F | 0.13 B1 | <0.0005 | 10.9 | <3 | 0.01 F | 0.03 F | 0.15 | 4.6 | 0.77 | 0.0001 F | 3.4 | 0.1 | <0.001 | <0.05 |
| | RES-006D 1898.21-1901.09 | N | <0.002 | <0.001 | 0.042 | <0.01 | <0.05 | <0.0005 | 11.7 | <3 | <0.05 | <0.05 | <0.05 | 9.1 D2 | 11.8 | <0.0005 | 0.7 F | 0.507 | <0.001 | 0.02 F |
| | RES-006D 1705.4-1708.4 | N | <0.002 | <0.002 | 0.034 | 0.005 F | 0.16 B1 | <0.0005 | 17.6 | 0.6 F | <0.05 | 0.04 F | 1.7 | 14.9 D2 | 4.93 | 0.0001 F | 6.5 | 0.198 | <0.001 | <0.05 |
| | RES-006D 1750.4-1753.4 | N | <0.002 | <0.001 | 0.008 F | <0.01 | <0.05 | <0.0005 | 14.4 | 0.6 F | 0.01 F | 0.06 | <0.05 | 10.1 D2 | 9.28 M3 | <0.0005 | 3 | 0.157 | <0.001 | <0.05 |
| | RES-006D 1798.4-1801.4 | N | <0.002 | <0.001 | 0.009 F | <0.01 | <0.05 | <0.0005 | 26.8 | <3 | 0.01 F | 0.04 F | 0.02 F | 22 D2 | 2.51 | 0.0001 F | 4.2 | 0.146 | <0.001 | 0.02 F |
| | RES-006D 1843.4-1846.4 | N | <0.002 | <0.001 | 0.029 | <0.01 | <0.05 | 0.0002 F | 5.4 | <3 | 0.05 | 0.11 | 1.87 | 1.8 | 11.3 | 0.0001 F | 1.1 | 0.17 | <0.001 | 0.02 F |
| | RES-006D 1927.23-1930.23 | N | 0.0005 F | <0.001 | 0.034 | <0.01 | <0.05 | 0.0063 | 11.3 | 0.8 F | 0.01 F | 0.04 F | 4.07 | 6.4 D2 | <0.05 | 0.0007 | 0.6 F | 0.075 | <0.001 | 0.02 F |
| | RES-006D 1952.56-1954.83 | N | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 3.4 | 1.5 F | <0.05 | <0.05 | <0.05 | 3.2 | 1.52 | 0.0001 F | 0.4 F | 0.318 | <0.001 | <0.05 |
| | | FD | 0.0005 F | <0.001 | 0.035 | <0.01 | <0.05 | 0.0067 | 11.6 | 0.9 F | 0.01 F | 0.04 F | 4.48 | 6.4 D2 | <0.05 | 0.0005 | 0.5 F | 0.07 | <0.001 | <0.05 |
| | RES-006D 1954.83-197 | N | <0.002 | 0.0005 F | 0.02 F | <0.01 | 0.12 B1 | 0.0001 F | 2.9 | 0.8 F | <0.05 | <0.05 | 0.02 F | 2.5 | <0.05 | 0.0005 | 0.5 F | 0.018 F | <0.001 | 0.02 F |
| | RES-006D 1980.6-1983.6 | N | <0.002 | <0.001 | 0.004 F | <0.01 | <0.05 | <0.0005 | 14 | <3 | <0.05 | <0.05 | <0.05 | 9.1 D2 | 106 | 0.0004 F | 1.3 | 2.07 | <0.001 | 0.02 F |
| | RES-006D 1995.6-1998.6 | N | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 34.7 | <3 | <0.05 | <0.05 | <0.05 | 20.4 D2 | 95.7 | 0.0007 | 1.5 | 1.73 | <0.001 | 0.04 F |
| | RES-006D 2022.66-2025.66 | N | <0.002 | <0.001 | 0.007 F | <0.01 | <0.05 | <0.0005 | 18.5 | <3 | <0.05 | <0.05 | 0.01 F | 13.4 D2 | 47.3 | 0.0003 F | 1.7 | 1.13 | <0.001 | 0.02 F |
| | RES-006D 2040.66-2043.66 | N | <0.002 | <0.001 | 0.006 F | <0.01 | <0.05 | <0.0005 | 12.4 | <3 | <0.05 | <0.05 | <0.05 | 6.8 D2M1 | 15.6 | 0.0001 F | 4.2 | 0.627 | <0.001 | 0.02 F |
| | RES-006D 2058.16-2061.16 | N | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 8.9 | <3 | <0.05 | <0.05 | <0.05 | 2.2 | <0.05 | 0.0001 F | 9 | 0.007 F | <0.001 | 0.03 F |
| | RES-006D 2073.13-2076.13 | N | <0.002 | <0.001 | 0.019 F | <0.01 | <0.05 | <0.0005 | 16.9 | <3 | <0.05 | <0.05 | 0.02 F | 4.1 | <0.05 | 0.0004 F | 13.6 | 0.147 | <0.001 | 0.02 F |
| | | FD | <0.002 | <0.001 | 0.019 F | <0.01 | <0.05 | <0.0005 | 16.5 | <3 | <0.05 | <0.05 | 0.03 F | 4.1 | 0.02 F | 0.0005 | 12.9 | 0.136 | <0.001 | 0.02 F |
| | RES-006D 2091.13-2094.13 | N | <0.002 | <0.001 | 0.021 | <0.01 | <0.05 | <0.0005 | 6.9 | <3 | <0.05 | 0.01 F | <0.05 | 2.1 | <0.05 | <0.0005 | 5.5 | 0.008 F | <0.001 | 0.07 |
| | RES-006D 2115.47-2118.47 | N | <0.002 | <0.001 | 0.015 F | <0.01 | <0.05 | 0.0004 F | 5 | 1.3 F | <0.05 | <0.05 | 0.03 F | 4.2 | 0.04 F | 0.0001 F | 0.7 F | 0.093 | <0.001 | 0.02 F |
| | RES-006D 2125.45-2128.42 | N | <0.002 | <0.001 | 0.107 | <0.01 | <0.05 | <0.0005 | 3.7 | 1.2 F | <0.05 | <0.05 | <0.05 | 5.8 D2 | <0.05 | 0.0007 | 0.7 F | 0.08 | <0.001 | 0.02 F |
| | RES-006D 2137.08-2138.5 | N | <0.002 | <0.001 | 0.039 | <0.01 | <0.05 | <0.0005 | 31.3 | <3 | 0.01 F | <0.05 | <0.05 | 21 D2 | 58.5 | 0.0005 | 0.4 F | 0.895 | <0.001 | 0.03 F |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

**APPENDIX C**
**SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS**

| | | | ACZS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-006D | RES-006D 1247.48-1250.48 | N | <0.05 | 5.5 | 0.0006 | 20.7 B1 | <0.03 | 17.1 B1 | 7.1 | <0.0005 | <0.0005 | <0.03 | 0.12 |
| | RES-006D 1405.47-1408.44 | N | <0.05 | 16.1 | 0.0007 | 13.2 B1 | <0.03 | 8.1 B1 | 23.5 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-006D 1450.44-1453.44 | N | <0.05 | 21.9 | 0.0006 | 6.1 B1 | <0.03 | 7.5 B1 | 127 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-006D 1495.44-1498.44 | N | <0.05 | 18.6 | 0.0001 F | 5.4 B1 | <0.03 | 4.8 B1 | 75.3 | <0.0005 | <0.0005 | <0.03 | 0.01 F |
| | RES-006D 1532.81-1535.81 | N | <0.05 | 28.7 | 0.0002 F | 7.3 B1 | <0.03 | 7.1 B1 | 74.9 | <0.0005 | <0.0005 | <0.03 | 0.04 F |
| | RES-006D 1577.43-1580.43 | N | <0.05 | 18.1 | 0.0003 F | 9.5 B1 | <0.03 | 4.8 B1 | 31.2 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-006D 1600.5-1601.5 | N | <0.05 | 18 | 0.0003 F | 9.3 B1 | <0.03 | 4.3 B1 | 29.8 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-006D 1622.43-1625.43 | N | <0.05 | 25.2 | 0.0004 F | 7 B1 | <0.03 | 3.3 B1 | 52.6 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-006D 1667.43-1670.43 | N | <0.05 | 29.3 | 0.0008 | 6.6 B1 | <0.03 | 3.9 B1 | 98.5 | 0.0002 F | 0.0005 | <0.03 | 1.1 |
| | RES-006D 1898.21-1901.09 | N | <0.05 | 16.8 | 0.0003 F | 5.8 | <0.03 | 0.7 F | 52.9 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-006D 1705.4-1708.4 | N | 0.02 F | 14.3 | 0.0017 | 6.6 B1 | <0.03 | 4.8 B1 | 175 D2 | 0.0001 F | 0.0018 | <0.03 | 0.83 |
| | RES-006D 1750.4-1753.4 | N | 0.04 F | 15.5 | 0.0008 | 6.3 | <0.03 | 0.8 F | 142 D2 | <0.0005 | 0.0006 | <0.03 | 1.17 |
| | RES-006D 1798.4-1801.4 | N | 0.02 F | 16.2 | 0.0027 | 6.2 | <0.03 | 1 F | 131 D2 | <0.0005 | 0.0006 | <0.03 | 0.82 |
| | RES-006D 1843.4-1846.4 | N | 0.03 F | 8.5 | 0.0012 | 4.1 | <0.03 | 0.8 F | 133 D2 | 0.0003 F | 0.0012 | <0.03 | 1.05 |
| | RES-006D 1927.23-1930.23 | N | <0.05 | 6.9 | 0.0006 | 5 | <0.03 | 0.9 F | 50.1 | <0.0005 | 0.0002 F | <0.03 | 0.05 |
| | RES-006D 1952.56-1954.83 | N | <0.05 | 7.1 | <0.0005 | 6 | <0.03 | 1 F | 11.7 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | | FD | 0.01 F | 7 | 0.0006 | 6.6 | <0.03 | 0.8 F | 50.6 | <0.0005 | 0.0002 F | <0.03 | 0.04 F |
| | RES-006D 1954.83-197 | N | <0.05 | 9.5 | 0.0008 | 6.2 | <0.03 | 4.6 B1 | 18.5 | <0.0005 | <0.0005 | <0.03 | 0.08 B1 |
| | RES-006D 1980.6-1983.6 | N | <0.05 | 18.7 | 0.0018 | 3.7 | <0.03 | 0.8 F | 275 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-006D 1995.6-1998.6 | N | <0.05 | 8.6 | 0.0024 | 6.9 | <0.03 | 0.5 F | 272 D2 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | RES-006D 2022.66-2025.66 | N | <0.05 | 18.4 | 0.0015 | 4.9 | <0.03 | 0.9 F | 161 D2 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-006D 2040.66-2043.66 | N | <0.05 | 23.7 | 0.002 | 6.1 | <0.03 | 1.4 F | 91.7 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-006D 2058.16-2061.16 | N | <0.05 | 26.9 | 0.0028 | 4.2 | <0.03 | 1.2 F | 48.8 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-006D 2073.13-2076.13 | N | <0.05 | 22.4 | 0.0055 | 3.8 | <0.03 | 1.1 F | 87.5 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | | FD | <0.05 | 21.1 | 0.0055 | 3.7 | <0.03 | 1 F | 82.5 | <0.0005 | <0.0005 | <0.03 | 0.04 F |
| | RES-006D 2091.13-2094.13 | N | <0.05 | 28.5 | 0.0044 | 5.7 | <0.03 | 1.9 F | 36.8 | <0.0005 | <0.0005 | <0.03 | 0.01 F |
| | RES-006D 2115.47-2118.47 | N | <0.05 | 12.1 | 0.0012 | 4.9 | <0.03 | 1.3 F | 20.2 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-006D 2125.45-2128.42 | N | <0.05 | 20.3 | <0.0005 | 6.7 | <0.03 | 0.6 F | 21.2 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-006D 2137.08-2138.5 | N | <0.05 | 2 | 0.0003 F | 6.8 | <0.03 | 0.3 F | 193 D2 | <0.0005 | <0.0005 | <0.03 | 0.04 F |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Alkalinity, Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Alkalinity, Total (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Temperature pH taken at DEG C | Hardness (as CaCO3) MG/L | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L | Aluminum MG/L |
| RES-009 | RES-009 1012.16-1014.16 | N | <10 | 10 F | <20 | 41 | 32 | 8.8 | 23.6 | <0 | 110 | 80 | 0.96 |
| | RES-009 1027.38-1030.3 | N | <10 | 9 F | <20 | 41 | 31 | 9.7 | 23.6 | 2 | 139 | 80 | 0.49 |
| | RES-009 1045.3-1048.3 | N | <10 | <20 | <20 | 10 F | 8 F | 9.6 | 24 | <7 | 127 | 80 | 0.44 |
| | RES-009 105.16-105.73 | N | <10 | 13 | <20 | 18 | 5 F | 9.7 | 24 | 8 | 44 | 60 | 0.36 |
| | RES-009 1063.3-1066.3 | N | <10 | <20 | <20 | 10 F | 9 F | 9.8 | 24 | 3 F | 120 | 100 | 0.52 |
| | RES-009 1081.3-1084.3 | N | <10 | 6 F | <20 | 12 F | 6 F | 10.2 | 24 | 2 F | 94 | 110 | 0.87 |
| | RES-009 1098.34-1100.96 | N | <10 | 5 F | <20 | 17 F | 11 F | 10.1 | 24 | 3 F | 102 | 90 | 0.68 |
| | RES-009 199.18-199.78 | N | <10 | 30 | <20 | 33 | 3 F | 9.7 | 24 | 1 F | 80 | 110 | 0.62 |
| | RES-009 199.78-200.3 | N | <10 | 15 F | <20 | 16 F | <20 | 9.9 | 24 | 3 F | 38 | 100 | 0.49 |
| | RES-009 281.14-281.64 | N | <10 | 23 | <20 | 33 | 10 F | 9.3 | 24 | <7 | 68 | 110 | 0.38 |
| | RES-009 348.3-348.83 | N | <10 | 25 | <20 | 29 | 4 F | 9.8 | 24 | 5 F | 60 | 170 | 0.74 |
| | RES-009 447.23-447.8 | N | <10 | 89 | <20 | 101 | 12 F | 9.7 | 24 | 10 | 220 | 170 | 0.45 |
| | RES-009 485.12-485.71 | N | <10 | 64 | <20 | 82 | 18 F | 9.2 | 24 | 26 | 194 | 130 | 0.33 |
| | RES-009 557.06-557.56 | N | <10 | 19 F | <20 | 23 | 4 F | 9.3 | 24 | 16 | 95 | 90 | 0.73 |
| | RES-009 647.52-648.1 | N | <10 | 52 | <20 | 78 | 26 | 9.3 | 24 | 11 | 171 | 140 | 0.41 |
| | RES-009 7.43-7.96 | N | <10 | 4 | <20 | 23 | 19 F | 9.3 | 24 | 28 | 35 | 60 | 0.42 |
| | RES-009 718-718.58 | N | <10 | 13 F | <20 | 15 F | <20 | 8.7 | 24 | 14 | 50 | 90 | 0.61 |
| | RES-009 810.42-810.98 | N | <10 | 35 | <20 | 57 | 22 | 9.5 | 23.6 | 2 | 178 | 130 | 0.23 |
| | RES-009 906.08-906.58 | N | <10 | 21 | <20 | 44 | 22 | 8.5 | 24 | 12 | 171 | 110 | 0.22 |
| | RES-009 987.9-988.45 | N | <10 | 12 F | <20 | 31 | 19 F | 9 | 24 | 1 F | 165 | 110 | 0.24 |
| | RES-009 994.67-997.67 | N | <10 | 8 F | <20 | 37 | 29 | 8.8 | 24 | 11 | 160 | 110 | 0.75 |

DEG C degrees Celcius.
MG/L micrograms per liter.
UMHOS/CM micro ohms per centimeter.

B1 Target analyte detected in method blank at or above the method reporting limit.
B4 Target analyte detected in blank at or above method acceptance criteria.
B5 Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
B7 Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank.
D1 Sample required dilution due to matrix.
D2 Sample required dilution due to high concentration of target analyte.
F Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
FD Field duplicate.
M2 Matrix spike recovery was low.
M3 The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level.
N Normal.
N1 See Table E-2.
R1 Relative percent difference (RPD) exceeded the method control limit.
R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
V1 Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample.

**APPENDIX C**
**SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS**

| | | | ACZS | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L |
| RES-009 | RES-009 1012.16-1014.16 | N | <0.002 | 0.0091 | <0.02 | <0.01 | <0.05 | <0.0005 | 3.3 | 0.8 F | <0.05 | <0.05 | 0.01 F | 1.4 | 0.22 | 0.002 | 0.7 F | 0.021 F | <0.001 | 0.03 F | <0.05 |
| | RES-009 1027.38-1030.3 | N | <0.002 | 0.0071 | 0.008 F | <0.01 | <0.05 | <0.0005 | 8.4 | 0.8 F | <0.05 | <0.05 | <0.05 | 2.2 | 0.03 F | <0.0005 R1 | 1.6 | 0.017 F | <0.001 | 0.02 F | <0.05 |
| | RES-009 1045.3-1048.3 | N | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 2 | 0.6 F | <0.05 | <0.05 | 0.01 F | 1.4 | 0.06 | <0.0005 | 2.2 | 0.016 F | <0.001 | <0.05 | <0.05 |
| | RES-009 105.16-105.73 | N | <0.002 | 0.0018 | 0.005 F | <0.01 | 0.01 F | <0.0005 | 0.4 F | <3 | <0.05 | <0.05 | <0.05 | 0.2 F | 0.09 | 0.0006 | 0.2 F | 0.017 F | <0.001 | <0.05 | <0.05 |
| | RES-009 1063.3-1066.3 | N | <0.002 | 0.0011 | <0.02 | <0.01 | <0.05 | <0.0005 | 2.2 | 0.8 F | <0.05 | <0.05 | 0.02 F | 1.8 | 0.1 | 0.0002 F | 1.7 | 0.011 F | <0.001 | <0.05 | <0.05 |
| | RES-009 1081.3-1084.3 | N | <0.002 | 0.0054 | 0.005 F | <0.01 | <0.05 | 0.0002 F | 0.2 F | 0.8 F | <0.05 | <0.05 | 0.02 F | 1.5 | 0.25 | 0.0002 F | 0.2 F | 0.006 F | <0.001 | <0.05 | <0.05 |
| | RES-009 1098.34-1100.96 | N | <0.002 | 0.0022 | <0.02 | <0.01 | <0.05 | <0.0005 | 1.8 | 1.6 F | <0.05 | <0.05 | <0.05 | 2.5 | 0.14 | <0.0005 | 1.6 | 0.008 F | <0.001 | <0.05 | <0.05 |
| | RES-009 199.18-199.78 | N | <0.002 | 0.002 | 0.009 F | <0.01 | 0.01 F | <0.0005 | 0.4 F | <3 | <0.05 | <0.05 | <0.05 | 0.3 F | 0.19 | 0.0002 F | 0.3 F | 0.033 | <0.001 | <0.05 | <0.05 |
| | RES-009 199.78-200.3 | N | <0.002 | 0.0024 | 0.006 F | <0.01 | <0.05 | <0.0005 | <1 | 1 F | <0.05 | <0.05 | <0.05 | 0.2 F | 0.11 | 0.0003 F | <1 | 0.015 F | <0.001 | <0.05 | <0.05 |
| | RES-009 281.14-281.64 | N | <0.002 | 0.002 | 0.005 F | <0.01 | <0.05 | <0.0005 | 2.7 | <3 | <0.05 | <0.05 | <0.05 | <0.5 | 0.07 | 0.0004 F | 0.3 F | 0.01 F | <0.001 | <0.05 | <0.05 |
| | RES-009 348.3-348.83 | N | <0.002 | 0.0024 | 0.007 F | <0.01 | <0.05 | <0.0005 | 0.7 F | <3 | <0.05 | <0.05 | <0.05 | <0.5 | 0.12 | 0.0007 | 0.2 F | 0.02 F | <0.001 | <0.05 | <0.05 |
| | RES-009 447.23-447.8 | N | <0.002 | 0.0082 | <0.02 | <0.01 | 0.04 F | <0.0005 | 0.6 F | 0.7 F | <0.05 | <0.05 | <0.05 | 0.5 | 0.31 | 0.0007 | 0.2 F | 0.006 F | <0.001 | <0.05 | <0.05 |
| | RES-009 485.12-485.71 | N | <0.002 | 0.0073 | <0.02 | <0.01 | 0.11 | <0.0005 | 1 | 1 F | <0.05 | <0.05 | <0.05 | 1.2 | 0.18 | 0.0003 F | <1 | 0.008 F | <0.001 | <0.05 | <0.05 |
| | RES-009 557.06-557.56 | N | 0.0007 F | 0.018 | 0.01 F | <0.01 | 0.26 | <0.0005 | 0.3 F | <3 | <0.05 | <0.05 | 0.02 F | 1.9 | 0.26 | 0.0014 | <1 | 0.005 F | <0.001 | 0.15 | <0.05 |
| | RES-009 647.52-648.1 | N | 0.0005 F | 0.0096 | <0.02 | <0.01 | 0.15 | <0.0005 | 1 | 1.3 F | <0.05 | <0.05 | <0.05 | 0.8 | 0.27 | 0.0004 F | <1 | <0.03 | <0.001 | <0.05 | <0.05 |
| | RES-009 7.43-7.96 | N | <0.002 | 0.0011 | 0.004 F | <0.01 | <0.05 | <0.0005 | <1 | <3 | <0.05 | <0.05 | <0.05 | 0.2 F | 0.07 | 0.001 | <1 | 0.016 F | <0.001 | <0.05 | <0.05 |
| | RES-009 718-718.58 | N | <0.002 | 0.0187 | <0.02 | <0.01 | 0.02 F | <0.0005 | <1 | <30 D1 | <0.05 | <0.05 | 0.02 F | <5 D1 | 0.86 | 0.0105 | <1 | <0.03 | <0.001 | 0.04 F | <0.05 |
| | RES-009 810.42-810.98 | N | <0.002 | 0.0047 | <0.02 | <0.01 | 0.09 | <0.0005 | 1.6 | 1.3 F | <0.05 | <0.05 | <0.05 | 0.7 | 0.14 | 0.0002 F | 0.2 F | <0.03 | <0.001 | <0.05 | <0.05 |
| | RES-009 906.08-906.58 | N | <0.002 | 0.0031 | 0.006 F | <0.01 | 0.05 | <0.0005 | 3.4 | 1.2 F | <0.05 | <0.05 | <0.05 | 0.9 | 0.1 | 0.0001 F | 0.4 F | <0.03 | <0.001 | 0.01 F | <0.05 |
| | RES-009 987.9-988.45 | N | <0.002 | 0.0126 | <0.02 | <0.01 | 0.02 F | <0.0005 | 9.6 | 1.1 F | <0.05 | <0.05 | <0.05 | 1 | 0.25 | 0.0002 F | 0.5 F | <0.03 | <0.001 | 0.04 F | <0.05 |
| | RES-009 994.67-997.67 | N | <0.002 | 0.0057 | 0.022 | <0.01 | <0.05 | <0.0005 | 5 | 0.8 F | <0.05 | <0.05 | <0.05 | 1.8 | 0.19 | 0.001 | 0.9 F | 0.014 F | <0.001 | 0.04 F | <0.05 |

DEG C degrees Celcius.
MG/L micrograms per liter.
UMHOS/CM micro ohms per centimeter.

B1 Target analyte detected in method blank at or above the method reporting limit.
B4 Target analyte detected in blank at or above method acceptance criteria.
B5 Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
B7 Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank.
D1 Sample required dilution due to matrix.
D2 Sample required dilution due to high concentration of target analyte.
F Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
FD Field duplicate.
M2 Matrix spike recovery was low.
M3 The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level.
N Normal.
N1 See Table E-2.
R1 Relative percent difference (RPD) exceeded the method control limit.
R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
V1 Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample.

**APPENDIX C**
**SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS**

| | | | ACZS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009 | RES-009 1012.16-1014.16 | N | 21.9 | 0.0002 F | 8.2 | <0.03 | 3.9 | 2.4 F | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-009 1027.38-1030.3 | N | 9.2 | <0.0005 | 6.6 | <0.03 | 10.3 | 14.6 | <0.0005 | 0.0001 F | 0.006 F | 0.04 FB5 |
| | RES-009 1045.3-1048.3 | N | 8.7 | <0.0005 | 5.9 | <0.03 | 12.1 | 31 | <0.0005 | <0.0005 | <0.03 | 0.05 B5 |
| | RES-009 105.16-105.73 | N | 2.3 | <0.0005 | 22.6 | <0.03 | 6.5 | <3 | <0.0005 | <0.0005 | <0.03 | 0.04 F |
| | RES-009 1063.3-1066.3 | N | 5.6 | 0.0004 F | 9.2 | <0.03 | 12.4 | 27.5 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-009 1081.3-1084.3 | N | 4.5 | 0.001 | 11 | <0.03 | 13.3 | 17.3 | <0.0005 | <0.0005 | 0.007 F | 0.04 FB5 |
| | RES-009 1098.34-1100.96 | N | 3.8 | 0.001 | 10.8 | <0.03 | 12.7 | 13.9 | <0.0005 | <0.0005 | 0.009 F | 0.05 B5 |
| | RES-009 199.18-199.78 | N | 1.5 F | <0.0005 | 22.2 | <0.03 | 6.3 | 2.6 F | <0.0005 | <0.0005 | <0.03 | 0.04 F |
| | RES-009 199.78-200.3 | N | 1.5 F | <0.0005 | 24.7 | <0.03 | 7 | <3 | <0.0005 | <0.0005 | <0.03 | 0.04 FB5 |
| | RES-009 281.14-281.64 | N | 2.7 | <0.0005 | 26.2 | <0.03 | 10.4 | <3 | <0.0005 | 0.0005 | 0.007 F | 0.03 FB5 |
| | RES-009 348.3-348.83 | N | 3.9 | <0.0005 | 21.4 | <0.03 | 9.5 | <3 | 0.0005 | 0.0002 F | <0.03 | 0.03 FB5 |
| | RES-009 447.23-447.8 | N | 0.7 F | 0.0002 F | 32.8 | <0.03 | 48 | <3 | 0.0002 F | 0.0047 | 0.02 F | 0.03 FB5 |
| | RES-009 485.12-485.71 | N | 1.3 F | 0.0004 F | 26.5 | <0.03 | 39.4 | 6.4 | <0.0005 | 0.0015 | 0.052 | 0.03 FB5 |
| | RES-009 557.06-557.56 | N | 0.4 F | 0.0019 | 27.8 | <0.03 | 17.2 | 13.4 | <0.0005 | 0.0003 F | 0.035 | 0.04 FB5 |
| | RES-009 647.52-648.1 | N | 2.3 | 0.0054 | 23.9 | <0.03 | 33 | 2 F | <0.0005 | 0.0007 | 0.033 | 0.02 FB5 |
| | RES-009 7.43-7.96 | N | 0.8 F | <0.0005 | 16.4 | <0.03 | 4.3 | 1 F | <0.0005 | <0.0005 | 0.032 | 0.05 |
| | RES-009 718-718.58 | N | 1.4 F | 0.0016 | 13 | <0.03 | 5.2 | <30 D1 | <0.0005 | 0.0003 F | <0.03 | 0.04 FB5 |
| | RES-009 810.42-810.98 | N | 3.9 | 0.0046 | 17.6 | <0.03 | 31.9 | 17.6 | <0.0005 | <0.0005 | 0.023 F | 0.03 FB5 |
| | RES-009 906.08-906.58 | N | 5.3 | 0.0021 | 14.8 | <0.03 | 26.3 | 23.9 | <0.0005 | <0.0005 | 0.027 F | 0.02 FB5 |
| | RES-009 987.9-988.45 | N | 4.7 | 0.0207 | 11.7 | <0.03 | 14.9 | 34.1 | <0.0005 | 0.0004 F | 0.005 F | 0.04 FB5 |
| | RES-009 994.67-997.67 | N | 29.9 | 0.0003 F | 8.9 | <0.03 | 4.1 | 21.4 | <0.0005 | 0.0002 F | 0.007 F | 0.04 FB5 |

DEG C degrees Celcius.
MG/L micrograms per liter.
UMHOS/CM micro ohms per centimeter.

B1 Target analyte detected in method blank at or above the method reporting limit.
B4 Target analyte detected in blank at or above method acceptance criteria.
B5 Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
B7 Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank.
D1 Sample required dilution due to matrix.
D2 Sample required dilution due to high concentration of target analyte.
F Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
FD Field duplicate.
M2 Matrix spike recovery was low.
M3 The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level.
N Normal.
N1 See Table E-2.
R1 Relative percent difference (RPD) exceeded the method control limit.
R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
V1 Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample.

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Alkalinity, Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Alkalinity, Total (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Temperature pH taken at DEG C | Hardness (as CaCO3) MG/L | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L | Aluminum MG/L |
| RES-009D | RES-009D 1119.32-1122.42 | N | <10 | 17 F | <20 | 28 | 11 F | 9.7 | 24 | 1 F | 91 | 100 | 0.82 |
| | | FD | <10 | 8 F | <20 | 22 | 13 F | 9.5 | 23 | 1 F | 78 | 60 | 1.2 |
| | RES-009D 1128.62-1131.72 | N | <10 | 11 F | <20 | 30 | 18 F | 9.5 | 23 | 7 F | 96 | 70 | 0.54 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L |
| RES-009D | RES-009D 1119.32-1122.42 | N | 0.0004 F | 0.0188 | <0.02 | <0.01 | <0.05 | 0.0001 F | 0.3 F | 0.9 F | <0.05 | <0.05 | 0.02 F | 1.5 | 0.26 | 0.0006 | <1 | 0.006 F | <0.001 | <0.05 | <0.05 |
| | | FD | 0.0004 F | 0.0169 | 0.004 F | <0.01 | <0.05 | <0.0005 | 0.2 F | 0.8 F | <0.05 | <0.05 | 0.01 F | 1.4 | 0.53 | 0.0003 F | <1 | 0.006 F | <0.001 | <0.05 | <0.05 |
| | RES-009D 1128.62-1131.72 | N | <0.002 | 0.0105 | <0.02 | <0.01 | <0.05 | <0.0005 | 2.5 | 0.9 F | <0.05 | <0.05 | <0.05 | 0.7 | 0.11 | 0.0006 | 0.3 F | <0.03 | <0.001 | <0.05 | <0.05 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009D | RES-009D 1119.32-1122.42 | N | 1.4 F | 0.0212 | 14.2 | <0.03 | 16.5 | 5.3 | <0.0005 | <0.0005 | 0.025 F | 0.05 B5 |
| | | FD | 1.6 F | 0.022 | 16.5 M2 | <0.03 | 15.8 | 3.6 | <0.0005 | <0.0005 | 0.028 F | 0.04 F |
| | RES-009D 1128.62-1131.72 | N | 5.2 | 0.0509 | 13.1 | <0.03 | 16.3 | 5.5 | <0.0005 | <0.0005 | 0.022 F | 0.04 F |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Alkalinity, Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Alkalinity, Total (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Temperature pH taken at DEG C | Hardness (as CaCO3) MG/L | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L | Aluminum MG/L |
| RES-009E | RES-009E 1319.1-1322.1 | N | 6 FB4 | <20 | <20 | <20 | <20 | 5.3 | 23 | 21 | 129 | 70 | 0.08 F |
| | RES-009E 1307.1-1310.1 | N | 16 B4 | <20 | <20 | <20 | <20 | 6.2 | 23 | 13 | 193 | 120 | 0.41 |
| | RES-009E 1335.41-1338.16 | N | 6 FB4 | <20 | <20 | <20 | <20 | 6.1 | 23 | 12 | 137 | 80 | <0.2 |
| | RES-009E 1351.03-1354.03 | N | 6 FB4 | <20 | <20 | <20 | <20 | 6.2 | 23 | 10 | 127 | 70 | 0.06 F |
| | RES-009E 1368.07-1370.69 | N | 81 B4 | <20 | <20 | <20 | <20 | 5.8 | 23 | 19 | 315 | 220 | 0.04 F |
| | RES-009E 1385.61-1388.61 | N | 36 B4 | <20 | <20 | <20 | <20 | 6 | 23 | 17 | 204 | 120 | 0.04 F |
| | RES-009E 1402.22-1404.53 | N | 6 FB4 | <20 | <20 | <20 | <20 | 5.1 | 23 | 13 | 132 | 90 | 0.64 |
| | RES-009E 1410.5-1411.5 | N | 10 B4 | <20 | <20 | <20 | <20 | 5.2 | 23 | 18 | 128 | 70 | 0.58 |
| | RES-009E 1418.16-1419.8 | N | 6 FB4 | <20 | <20 | <20 | <20 | 5.8 | 23 | 11 | 141 | 70 | 0.11 F |
| | RES-009E 1431.42-1433.8 | N | 10 B4 | <20 | <20 | <20 | <20 | 5.8 | 23 | 10 | 107 | 60 | 0.08 F |
| | RES-009E 1464.41-1467.41 | N | 34 B4 | <20 | <20 | <20 | <20 | 4.6 | 23 | 24 | 232 | 140 | 0.17 F |
| | RES-009E 1446.41-1449.41 | N | 54 B4 | <20 | <20 | <20 | <20 | 5.9 | 23 | 28 | 287 | 190 | 1.47 |
| | RES-009E 1478.13-1481.13 | N | 12 B4 | <20 | <20 | <20 | <20 | 6.2 | 23 | 20 | 182 | 100 | 0.26 |
| | RES-009E 1496.13-1499.13 | N | 26 B4 | <20 | <20 | <20 | <20 | 5.6 | 23 | 22 | 201 | 120 | 0.34 |
| | RES-009E 1514.13-1517.13 | N | 60 B4 | <20 | <20 | <20 | <20 | 7.1 | 21.4 | 11 | 301 | 200 | 0.04 F |
| | RES-009E 1510.74-1527.19 | N | 16 B4 | <20 | <20 | 3 F | 3 F | 5.8 | 23 | 16 | 131 | 90 | 0.17 F |
| | RES-009E 1547.47-1550.47 | N | 42 B4 | <20 | <20 | <20 | <20 | 4.3 | 23 | 22 | 247 | 130 | 0.06 F |
| | RES-009E 1532.4-1534.49 | N | 36 B4 | <20 | <20 | <20 | <20 | 4.2 | 23 | 22 | 193 | 100 | 4.03 |
| | RES-009E 1540.5-1541.5 | N | 36 B4 | <20 | <20 | <20 | <20 | 6 | 23 | 48 | 190 | 110 | 3.98 |
| | RES-009E 1565.47-1568.47 | N | 155 B7 | <20 | <20 | <20 | <20 | 5.3 | 23 | 17 | 562 | 300 | <0.2 |
| | RES-009E 1597.32-1599.88 | N | 121 B7 | <20 | <20 | <20 | <20 | 5.6 | 23 | 40 | 427 | 250 | 0.33 |
| | RES-009E 1617.38-1619.14 | N | 12 B4 | <20 | <20 | <20 | <20 | 4.6 | 23 | 18 | 223 | 100 | 1.87 |
| | RES-009E 1602.44-1605 | N | 76 B4 | <20 | <20 | <20 | <20 | 5.8 | 23 | 34 | 289 | 150 | 3.21 |
| | RES-009E 1634.46-1637.47 | N | 42 B4 | <20 | <20 | <20 | <20 | 5.9 | 23 | 26 | 263 | 130 | 0.04 F |
| | RES-009E 1669.07-1672.07 | N | 14 B4 | <20 | <20 | <20 | <20 | 4.8 | 23 | 65 | 211 | 100 | 1.55 |
| | RES-009E 1650.14-1652.81 | N | 80 B4 | <20 | <20 | <20 | <20 | 4.8 | 23 | 64 | 349 | 190 | 7.35 |
| | | FD | 76 B4 | <20 | <20 | <20 | <20 | 5 | 23 | 25 | 363 | 210 | 7.34 |
| | RES-009E 1685.09-1687.47 | N | 2 FB4 | <20 | <20 | 3 F | 3 F | 6.4 | 23 | 8 | 113 | 50 | 0.1 F |
| | RES-009E 1697.61-1700.61 | N | 8 FB4 | <20 | <20 | <20 | <20 | 6.3 | 23 | 14 | 170 | 70 | 0.06 F |
| | RES-009E 1718.61-1721.61 | N | 2 F | <20 | <20 | 6 F | 6 F | 6.2 | 23 | 7 | 111 | 50 | 0.06 F |
| | RES-009E 1739.63-1742.63 | N | 26 B1 | <20 | <20 | <20 | <20 | 6.2 | 23 | 18 | 107 | 50 | 0.06 F |
| | RES-009E 1760.86-1763.86 | N | 8 FB4 | <20 | <20 | <20 | <20 | 5.9 | 23 | 15 | 105 | 40 | 0.56 |
| | | FD | 14 B4 | <20 | <20 | <20 | <20 | 6 | 23 | 14 | 103 | 40 | 0.35 |
| | RES-009E 1798.16-1799.79 | N | 42 B4 | <20 | <20 | 3 F | 3 F | 6.3 | 23 | 13 | 153 | 70 | 0.41 |
| | RES-009E 1789.83-1792.31 | N | <10 | <20 | <20 | 3 F | 3 F | 6.2 | 23 | 23 | 120 | 50 | 0.1 F |
| | RES-009E 1801.42-1804.15 | N | 73 B4 | <20 | <20 | <20 | <20 | 5.7 | 23 | 54 | 403 | 210 | 0.16 F |

DEG C degrees Celcius.
MG/L micrograms per liter.
UMHOS/CM micro ohms per centimeter.
B1 Target analyte detected in method blank at or above the method reporting limit.
B4 Target analyte detected in blank at or above method acceptance criteria.
B5 Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
B7 Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank.
D1 Sample required dilution due to matrix.
D2 Sample required dilution due to high concentration of target analyte.
F Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
FD Field duplicate.
M2 Matrix spike recovery was low.
M3 The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level.
N Normal.
N1 See Table E-2.
R1 Relative percent difference (RPD) exceeded the method control limit.
R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
V1 Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample.

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | SW1312 Acidity, Total MG/L | Alkalinity, Carbonate (as CaCO3) MG/L | Alkalinity, Hydroxide (as CaCO3) MG/L | Alkalinity, Total (as CaCO3) MG/L | Bicarbonate MG/L | pH PH UNITS | Temperature pH taken at DEG C | Hardness (as CaCO3) MG/L | Conductivity at 25 degrees C UMHOS/CM | Total dissolved solids (Residue, filterable) MG/L | Aluminum MG/L |
| RES-009E | RES-009E 1818.62-1821.62 | N | 38 B4 | <20 | <20 | <20 | <20 | 6 | 23 | 82 | 384 | 180 | 0.43 |
| | RES-009E 1829.95-1832.48 | N | 44 B4 | <20 | <20 | <20 | <20 | 6 | 23 | 149 | 555 | 300 | 0.09 F |
| | RES-009E 1846.66-1849.66 | N | <10 | <20 | <20 | 34 | 34 | 7.8 | 23 | 221 | 564 | 280 | 0.1 F |
| | RES-009E 1862.15-1865.15 | N | <10 | <20 | <20 | 28 | 26 | 7.8 | 21.4 | 113 | 247 | 160 | 0.06 F |
| | RES-009E 1867.87-1884.35 | N | <10 | <20 | <20 | 32 | 30 | 8 | 23 | 97 | 249 | 150 | 0.07 F |
| | RES-009E 1880.15-1882.37 | N | <10 | <20 | <20 | 29 | 28 | 8 | 21.4 | 209 | 413 | 290 | <0.2 |
| | RES-009E 1885.5-1886.5 | N | <10 | 4 F | <20 | 30 | 26 | 8 | 21.4 | 205 | 450 | 300 | 0.05 F |
| | RES-009E 1899-1901.88 | N | <10 | 6 F | <20 | 34 | 28 | 8 | 21.4 | 159 | 364 | 250 | 0.06 F |
| | RES-009E 1929.76-1932.58 | N | <10 | 4 F | <20 | 31 | 27 | 8 | 21.4 | 213 | 429 | 310 | <0.2 |
| | RES-009E 1947.67-1950.67 | N | <10 | 5 F | <20 | 16 F | 11 F | 8.4 | 21.4 | 69 | 199 | 120 | 0.07 F |
| | RES-009E 1954.6-1956 | N | <10 | 6 F | <20 | 21 | 15 F | 8.7 | 21.4 | 63 | 185 | 120 | 0.06 F |
| | RES-009E 1967.76-1969.72 | N | <10 | 5 F | <20 | 23 | 18 F | 8.6 | 21.4 | 36 | 149 | 100 | 3.19 |
| | RES-009E 1974.78-1977.89 | N | <10 | 9 F | <20 | 15 F | 6 F | 8.8 | 21.4 | 75 | 187 | 120 | <0.2 |
| | RES-009E 1984.74-1987.74 | N | 4 FB4 | <20 | <20 | <20 | <20 | 7.6 | 21.4 | 939 | 1610 | 1490 | <0.2 |
| | RES-009E 2056.38-2075 | N | <10 | <20 | <20 | 8 F | 8 F | 7.5 | 23 | 1550 | 2350 | 2590 | 0.07 F |

DEG C degrees Celcius.
MG/L micrograms per liter.
UMHOS/CM micro ohms per centimeter.
B1 Target analyte detected in method blank at or above the method reporting limit.
B4 Target analyte detected in blank at or above method acceptance criteria.
B5 Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
B7 Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank.
D1 Sample required dilution due to matrix.
D2 Sample required dilution due to high concentration of target analyte.
F Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
FD Field duplicate.
M2 Matrix spike recovery was low.
M3 The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level.
N Normal.
N1 See Table E-2.
R1 Relative percent difference (RPD) exceeded the method control limit.
R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
V1 Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample.

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Antimony MG/L | Beryllium MG/L | Arsenic MG/L | Barium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Nickel MG/L |
| RES-009E | RES-009E 1319.1-1322.1 | N | <0.002 | <0.01 | 0.0007 F | 0.066 | <0.05 | <0.0005 | 3.9 | <3 | <0.05 | <0.05 | <0.05 | 1.3 | 0.06 | 0.0005 | 0.9 F | 0.085 | <0.001 | <0.05 |
| | RES-009E 1307.1-1310.1 | N | <0.002 | <0.01 | 0.0006 F | 0.049 | <0.05 | 0.0007 | 6 | <3 | <0.05 | 0.03 F | 1.53 | 0.3 F | 6.43 | 0.0012 | 1.4 | 0.253 | <0.001 | 0.01 F |
| | RES-009E 1335.41-1338.16 | N | <0.002 | <0.01 | 0.0009 F | 0.012 F | <0.05 | <0.0005 | 3.2 | <3 | <0.05 | <0.05 | <0.05 | 0.3 F | 5.44 | 0.0002 F | 0.9 F | 0.247 | <0.001 | <0.05 |
| | RES-009E 1351.03-1354.03 | N | <0.002 | <0.01 | 0.0008 F | 0.034 | <0.05 | <0.0005 | 2.8 | <3 | <0.05 | <0.05 | <0.05 | 0.9 | 0.09 | 0.0005 | 0.7 F | 0.103 | <0.001 | <0.05 |
| | RES-009E 1368.07-1370.69 | N | <0.002 | <0.01 | <0.001 | 0.031 | <0.05 | <0.0005 | 5.6 | <3 | <0.05 | <0.05 | <0.05 | 2.4 | 46.3 | 0.0008 | 1.2 | 0.93 | 0.001 | <0.05 |
| | RES-009E 1385.61-1388.61 | N | <0.002 | <0.01 | <0.001 | 0.058 | <0.05 | <0.0005 | 5.3 | <3 | <0.05 | <0.05 | <0.05 | 3.2 | 20.8 | 0.0005 | 1 | 0.518 | 0.0002 F | <0.05 |
| | RES-009E 1402.22-1404.53 | N | <0.002 | <0.01 | 0.0006 F | 0.073 | <0.05 | 0.0001 F | 3.5 | <3 | <0.05 | 0.03 F | 0.75 | 1 | 0.26 | 0.0003 F | 1 | 0.065 | <0.001 | <0.05 |
| | RES-009E 1410.5-1411.5 | N | <0.002 | <0.01 | 0.0007 F | 0.064 | 0.01 F | 0.0001 F | 5.4 | <3 | <0.05 | 0.02 F | 0.6 | 0.9 | 0.11 | 0.0006 | 1 | 0.067 | <0.001 | <0.05 |
| | RES-009E 1418.16-1419.8 | N | <0.002 | <0.01 | 0.0007 F | 0.055 | <0.05 | <0.0005 | 2.9 | <3 | <0.05 | 0.01 F | 0.04 F | 0.3 F | 0.27 | 0.0004 F | 1 | 0.126 | <0.001 | <0.05 |
| | RES-009E 1431.42-1433.8 | N | <0.002 | <0.01 | 0.0009 F | 0.062 | <0.05 | 0.0004 F | 3 | <3 | <0.05 | 0.02 F | 0.7 | 0.5 | <0.05 | 0.0002 F | 0.6 F | 0.032 | <0.001 | <0.05 |
| | RES-009E 1464.41-1467.41 | N | <0.002 | <0.01 | 0.0006 F | 0.004 F | <0.05 | <0.0005 | 8.4 | <3 | <0.05 | <0.05 | <0.05 | 3.2 | 18.5 | 0.001 | 1.7 | 0.33 | 0.0002 F | <0.05 |
| | RES-009E 1446.41-1449.41 | N | <0.002 | <0.01 | 0.0009 F | 0.018 F | <0.05 | 0.0041 | 6.2 | <3 | <0.05 | 0.07 | 2.02 | 0.8 | 13.1 | 0.0007 | 2 | 0.223 | <0.001 | 0.02 F |
| | RES-009E 1478.13-1481.13 | N | <0.002 | <0.01 | 0.0008 F | 0.012 F | <0.05 | 0.0008 N1 | 5 | <3 | <0.05 | 0.03 F | 0.2 | 0.2 F | 4.04 | 0.0003 F | 1.7 | 0.201 | <0.001 | <0.05 |
| | RES-009E 1496.13-1499.13 | N | <0.002 | <0.01 | <0.001 | 0.006 F | <0.05 | <0.0005 | 6 | 0.6 F | <0.05 | 0.02 F | <0.05 | 0.4 F | 10.7 | 0.0006 | 1.6 | 0.328 | <0.001 | <0.05 |
| | RES-009E 1514.13-1517.13 | N | 0.0004 F | <0.01 | <0.001 | 0.004 F | <0.05 | <0.0005 | 3.4 | <3 | <0.05 | <0.05 | <0.05 | 1.2 | 35.3 | 0.0003 F | 1.9 | 0.543 | 0.0005 F | <0.05 |
| | RES-009E 1510.74-1527.19 | N | <0.002 | <0.01 | <0.001 | <0.02 | <0.05 | 0.0005 | 2.9 | <3 | <0.05 | 0.03 F | 0.01 F | 0.5 | 0.03 F | 0.0003 F | 0.9 F | 0.042 | <0.001 | 0.01 F |
| | RES-009E 1547.47-1550.47 | N | <0.002 | <0.01 | <0.001 | 0.018 F | <0.05 | <0.0005 | 16.4 | 0.7 F | <0.05 | <0.05 | <0.05 | 9.4 | 25 | 0.0009 | 1.8 | 0.709 | 0.0003 F | <0.05 |
| | RES-009E 1532.4-1534.49 | N | <0.002 | <0.01 | <0.001 | 0.014 F | <0.05 | 0.0031 | 6.4 | <3 | <0.05 | 0.06 | 3.78 | 1.4 | 6.14 | 0.0006 | 1.4 | 0.076 | <0.001 | 0.03 F |
| | RES-009E 1540.5-1541.5 | N | <0.002 | <0.01 | <0.001 | 0.013 F | <0.05 | 0.003 | 6.6 | <3 | <0.05 | 0.06 | 3.6 | 1.4 | 6.26 | 0.0004 F | 1.4 | 0.079 | <0.001 | 0.02 F |
| | RES-009E 1565.47-1568.47 | N | <0.002 | <0.01 | <0.001 | 0.029 | <0.05 | <0.0005 | 4 | <3 | <0.05 | <0.05 | <0.05 | 1.2 | 85.4 | 0.0029 B5 | 1.6 | 1.69 | <0.001 | <0.05 |
| | RES-009E 1597.32-1599.88 | N | <0.002 | <0.01 | <0.001 | 0.021 | <0.05 | <0.0005 | 15 | 0.7 F | 0.01 F | 0.01 F | <0.05 | 6.6 D2 | 73.1 | 0.0006 B5 | 0.5 F | 1.17 | <0.001 | <0.05 |
| | RES-009E 1617.38-1619.14 | N | <0.002 | <0.01 | <0.001 | 0.048 | <0.05 | 0.0002 F | 10.8 | 0.5 F | <0.05 | 0.01 F | 0.04 F | 8.2 D2 | <0.05 B5 | 0.0005 B5 | 1.7 | 0.092 | <0.001 | <0.05 |
| | RES-009E 1602.44-1605 | N | 0.0004 F | <0.01 | <0.001 | 0.022 | <0.05 | 0.0004 F | 5.8 | <3 | <0.05 | 0.13 | 0.28 | 1.7 | 36.7 | 0.0023 B5 | 0.9 F | 0.597 | <0.001 | 0.06 |
| | RES-009E 1634.46-1637.47 | N | <0.002 | <0.01 | <0.001 | 0.018 F | <0.05 | <0.0005 | 8.1 | <3 | <0.05 | 0.01 F | <0.05 | 4.3 | 19.3 | 0.0006 B5 | 1.4 | 0.566 | <0.001 | <0.05 |
| | RES-009E 1669.07-1672.07 | N | <0.002 | <0.01 | <0.001 | 0.05 | <0.05 | 0.002 | 7.6 | <3 | <0.05 | 0.03 F | 0.35 | 2.7 | 0.99 B5 | 0.001 B5 | 1.5 | 0.154 | <0.001 | <0.05 |
| | RES-009E 1650.14-1652.81 | N | <0.002 | <0.01 | <0.001 | 0.007 F | <0.05 | 0.0008 | 23.5 | <3 | <0.05 | 0.36 | 24.6 | 10.9 D2 | 2.07 | 0.0008 B5 | 1.4 | 0.303 | <0.001 | 0.07 |
| | | FD | <0.002 | <0.01 | <0.001 | 0.008 F | <0.05 | 0.0008 | 23.3 | 0.5 F | <0.05 | 0.36 | 24.2 | 12 D2 | 2.03 | 0.0011 B5 | 1.4 | 0.286 | <0.001 | 0.07 |
| | RES-009E 1685.09-1687.47 | N | <0.002 | <0.01 | 0.0015 | 0.115 R1 | <0.05 | 0.0004 F | 2.2 | 0.7 F | <0.05 | <0.05 | 0.05 | 1.4 M2 | <0.05 B5 | 0.0023 B5R1 | 0.6 F | 0.027 F | <0.001 | <0.05 |
| | RES-009E 1697.61-1700.61 | N | <0.002 | <0.01 | 0.0007 F | 0.088 | <0.05 | <0.0005 | 3.9 | <3 | <0.05 | <0.05 | <0.05 | 4.4 | 1.88 | 0.0002 FB5 | 1 | 0.2 | <0.001 | <0.05 |
| | RES-009E 1718.61-1721.61 | N | 0.0019 F | <0.01 | 0.0011 | 0.089 | <0.05 | 0.001 | 1.8 | <3 | <0.05 | 0.01 F | 0.06 | 0.6 | <0.05 B5 | 0.0012 B5 | 0.6 F | 0.162 | <0.001 | <0.05 |
| | RES-009E 1739.63-1742.63 | N | <0.002 | <0.01 | <0.001 | 0.023 | <0.05 | <0.0005 | 7.1 | 0.8 F | <0.05 | <0.05 | <0.05 | 7.1 D2 | 9.26 | 0.0003 FB5 | <1 | 0.858 | <0.001 | <0.05 |
| | RES-009E 1760.86-1763.86 | N | <0.002 | <0.01 | 0.0022 | 0.007 F | <0.05 | 0.0007 | 5 | 0.5 F | <0.05 | 0.02 F | 0.54 | 4.1 | 0.02 FB5 | 0.0004 FB5 | 0.5 F | 0.115 | <0.001 | <0.05 |
| | | FD | <0.002 | <0.01 | 0.0028 | 0.005 F | <0.05 | 0.0007 | 4.8 | 0.5 F | <0.05 | 0.01 F | 0.35 | 3.4 | <0.05 | 0.0004 FB5 | 0.5 F | 0.113 | <0.001 | <0.05 |
| | RES-009E 1798.16-1799.79 | N | <0.002 | <0.01 | <0.001 | <0.02 V1 | <0.05 | 0.0094 | 7.7 | 0.6 F | <0.05 | 0.02 F | 0.05 | 3.9 | <0.05 B5 | 0.0004 FB5 | 0.8 F | 0.278 | <0.001 | <0.05 |
| | RES-009E 1789.83-1792.31 | N | <0.002 | <0.01 | 0.0011 | <0.02 V1 | <0.05 | <0.0005 | 4.2 | <3 | 0.02 F | 0.01 F | 0.02 F | 6.1 D2 | 0.07 B5 | 0.0008 B5 | 0.5 F | 0.136 | <0.001 | 0.01 F |
| | RES-009E 1801.42-1804.15 | N | <0.002 | <0.01 | <0.001 | <0.02 | <0.05 | <0.0005 | 19.8 | <3 | <0.05 | <0.05 | <0.05 | 11.6 D2 | 43.2 | 0.0005 B5 | 1.1 | 0.905 | <0.001 | <0.05 |

DEG C degrees Celcius.
MG/L micrograms per liter.
UMHOS/CM micro ohms per centimeter.
B1 Target analyte detected in method blank at or above the method reporting limit.
B4 Target analyte detected in blank at or above method acceptance criteria.
B5 Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
B7 Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank.
D1 Sample required dilution due to matrix.
D2 Sample required dilution due to high concentration of target analyte.
F Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
FD Field duplicate.
M2 Matrix spike recovery was low.
M3 The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level.
N Normal.
N1 See Table E-2.
R1 Relative percent difference (RPD) exceeded the method control limit.
R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
V1 Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample.

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# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Antimony MG/L | Beryllium MG/L | Arsenic MG/L | Barium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Nickel MG/L |
| RES-009E | RES-009E 1818.62-1821.62 | N | <0.002 | <0.01 | <0.001 | 0.003 F | <0.05 | <0.0005 | 21.7 | <3 | <0.05 | <0.05 | <0.05 | 10.6 D2 | 14.6 | 0.0002 FB5 | 6.7 | 0.91 | <0.001 | <0.05 |
| | RES-009E 1829.95-1832.48 | N | <0.002 | <0.01 | <0.001 | 0.008 F | <0.05 | <0.0005 | 26.3 | <3 | <0.05 | <0.05 | <0.05 | 10.4 D2 | 23.8 | 0.0003 FB5 | 20.2 | 1.8 | <0.001 | <0.05 |
| | RES-009E 1846.66-1849.66 | N | <0.002 | <0.01 | <0.001 | 0.005 F | <0.05 | <0.0005 | 68.8 | 0.6 F | <0.05 | <0.05 | <0.05 | 2.9 | 0.03 FB5 | 0.0006 B5 | 12 | 0.095 | <0.001 | <0.05 |
| | RES-009E 1862.15-1865.15 | N | <0.002 | <0.01 | <0.002 | 0.016 F | 0.03 FB1 | <0.0005 | 36.9 | 0.7 F | <0.05 | <0.05 | <0.05 | 2 | <0.05 | <0.0005 | 5 | 0.008 F | <0.001 | <0.05 |
| | RES-009E 1867.87-1884.35 | N | <0.002 | <0.01 | <0.002 | 0.056 | 0.08 B1 | <0.0005 | 30.3 | 0.9 F | <0.05 | <0.05 | <0.05 | 1.8 | <0.05 | 0.0004 F | 5.2 | 0.007 F | <0.001 | <0.05 |
| | RES-009E 1880.15-1882.37 | N | <0.002 | <0.01 | <0.002 | 0.026 | 0.05 B1 | <0.0005 | 70.3 | <3 | <0.05 | <0.05 | <0.05 | 1.3 | <0.05 | <0.0005 | 8.1 | 0.024 F | <0.001 | <0.05 |
| | RES-009E 1885.5-1886.5 | N | <0.002 | <0.01 | <0.002 | 0.037 | 0.15 B1 | <0.0005 | 68.1 | <3 | <0.05 | <0.05 | <0.05 | 1.5 | <0.05 | <0.0005 | 8.5 | 0.014 F | <0.001 | <0.05 |
| | RES-009E 1899-1901.88 | N | <0.002 | <0.01 | <0.002 | 0.044 | 0.1 B1 | <0.0005 | 55.3 | <3 | <0.05 | <0.05 | <0.05 | 1.7 | <0.05 | <0.0005 | 5.1 | 0.021 F | <0.001 | <0.05 |
| | RES-009E 1929.76-1932.58 | N | <0.002 | <0.01 | <0.002 | 0.029 | 0.09 B1 | <0.0005 | 75.9 | 0.9 F | <0.05 | <0.05 | <0.05 | 1.4 | <0.05 | 0.0004 F | 5.6 | 0.018 F | <0.001 | <0.05 |
| | RES-009E 1947.67-1950.67 | N | <0.002 | <0.01 | <0.002 | 0.021 | 0.12 B1 | <0.0005 | 20 | <3 | 0.01 F | <0.05 | 0.11 | 2 | <0.05 | 0.006 | 4.6 | <0.03 | <0.001 | <0.05 |
| | RES-009E 1954.6-1956 | N | <0.002 | <0.01 | <0.002 | 0.02 | 0.13 B1 | <0.0005 | 17.4 | <3 | <0.05 | <0.05 | <0.05 | 1.8 | <0.05 | <0.0005 | 4.7 | <0.03 | <0.001 | <0.05 |
| | RES-009E 1967.76-1969.72 | N | <0.002 | <0.01 | <0.002 | 0.068 | 0.14 B1 | <0.0005 | 11.4 | 0.5 F | <0.05 | <0.05 | 0.31 | 1.3 | 0.66 | <0.0005 | 1.9 | 0.007 F | <0.001 | <0.05 |
| | RES-009E 1974.78-1977.89 | N | <0.002 | <0.01 | <0.002 | 0.014 F | 0.11 B1 | <0.0005 | 19.8 | <3 | <0.05 | <0.05 | <0.05 | 1.1 M2 | <0.05 | 0.0001 F | 6.3 | <0.03 | <0.001 | <0.05 |
| | RES-009E 1984.74-1987.74 | N | <0.002 | <0.01 | 0.0005 F | 0.043 | 0.11 B1 | <0.0005 | 375 | 0.9 F | <0.05 | <0.05 | <0.05 | 1.3 | 1.15 | <0.0005 | 0.4 F | 0.487 | <0.001 | <0.05 |
| | RES-009E 2056.38-2075 | N | <0.004 D2 | <0.01 | <0.004 D2 | 0.045 | 0.15 B1 | <0.001 D2 | 609 | <3 | <0.05 | <0.05 | <0.05 | 1.4 | <0.05 | 0.0008 FD2 | 6.7 | 0.049 | <0.001 | <0.05 |

DEG C degrees Celcius.
MG/L micrograms per liter.
UMHOS/CM micro ohms per centimeter.
B1 Target analyte detected in method blank at or above the method reporting limit.
B4 Target analyte detected in blank at or above method acceptance criteria.
B5 Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
B7 Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank.
D1 Sample required dilution due to matrix.
D2 Sample required dilution due to high concentration of target analyte.
F Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
FD Field duplicate.
M2 Matrix spike recovery was low.
M3 The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level.
N Normal.
N1 See Table E-2.
R1 Relative percent difference (RPD) exceeded the method control limit.
R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
V1 Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample.

**APPENDIX C**
**SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS**

| | | | ACZS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Molybdenum MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | RES-009E 1319.1-1322.1 | N | <0.05 | 26.4 | 0.0007 | 6.8 | <0.03 | 0.7 F | 37.6 | <0.0005 | <0.0005 | <0.03 | 0.01 F |
| | RES-009E 1307.1-1310.1 | N | <0.05 | 27.5 | 0.0003 F | 7.6 | <0.03 | 2.5 | 80.9 | 0.0003 F | 0.0005 | <0.03 | 0.06 |
| | RES-009E 1335.41-1338.16 | N | <0.05 | 26.7 | 0.0007 | 6.1 | <0.03 | 0.9 F | 45.9 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 1351.03-1354.03 | N | <0.05 | 27.8 | 0.0008 | 8 | <0.03 | 0.8 F | 37.6 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-009E 1368.07-1370.69 | N | 0.01 F | 28.8 | 0.0009 | 6.4 | <0.03 | 1 F | 165 D2 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1385.61-1388.61 | N | 0.02 F | 24.6 | 0.0009 | 6.3 | <0.03 | 1 F | 85.1 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1402.22-1404.53 | N | <0.05 | 24.3 | 0.0008 | 6.4 | <0.03 | 0.9 F | 48.2 | 0.0002 F | 0.0001 F | <0.03 | 0.03 F |
| | RES-009E 1410.5-1411.5 | N | <0.05 | 22.3 | 0.0008 | 6.2 | <0.03 | 1 F | 46.2 | 0.0001 F | <0.0005 | <0.03 | 0.05 |
| | RES-009E 1418.16-1419.8 | N | <0.05 | 30.4 | 0.0003 F | 7.8 | <0.03 | 1 F | 45 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1431.42-1433.8 | N | <0.05 | 21.3 | 0.0004 F | 10.2 | <0.03 | 0.8 F | 31.2 | 0.0004 F | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 1464.41-1467.41 | N | <0.05 | 28.2 | 0.0008 | 6.9 | <0.03 | 0.9 F | 96.5 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 1446.41-1449.41 | N | <0.05 | 33.3 | 0.0012 | 8.7 | <0.03 | 1.1 F | 157 D2 | 0.0005 | 0.0005 | <0.03 | 0.07 |
| | RES-009E 1478.13-1481.13 | N | <0.05 | 31.9 | 0.0008 N1 | 8.4 | <0.03 | 1 F | 71.5 | 0.0002 F | 0.0001 F | <0.03 | 0.04 F |
| | RES-009E 1496.13-1499.13 | N | <0.05 | 28.5 | 0.0005 | 7.4 | <0.03 | 1.1 F | 82.7 | <0.0005 | <0.0005 | <0.03 | 0.04 F |
| | RES-009E 1514.13-1517.13 | N | 0.01 F | 36.5 | 0.0011 | 6.9 | <0.03 | 0.9 F | 147 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 1510.74-1527.19 | N | <0.05 | 22.9 | 0.0011 | 9.8 | <0.03 | 1 F | 36.3 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | RES-009E 1547.47-1550.47 | N | 0.02 F | 13.6 | 0.0008 | 6.9 | <0.03 | 1.3 F | 91.2 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 1532.4-1534.49 | N | <0.05 | 14.9 | 0.0014 | 5 | <0.03 | 1.1 F | 94.8 | 0.0002 F | 0.0014 | <0.03 | 0.07 |
| | RES-009E 1540.5-1541.5 | N | <0.05 | 15.2 | 0.0014 | 4.7 | <0.03 | 1.2 F | 94.8 | 0.0001 F | 0.0013 | <0.03 | 0.08 |
| | RES-009E 1565.47-1568.47 | N | 0.03 F | 26.8 | 0.001 | 5 | <0.03 | 1.5 F | 259 D2B7 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | RES-009E 1597.32-1599.88 | N | 0.03 F | 2 | 0.0003 F | 5.3 | <0.03 | 0.4 F | 187 D2B7 | <0.0005 | <0.0005 | <0.03 | 0.51 |
| | RES-009E 1617.38-1619.14 | N | <0.05 | 17 | 0.002 | 7.8 | <0.03 | 2.5 | 55.3 B7 | <0.0005 | <0.0005 | <0.03 | 0.1 |
| | RES-009E 1602.44-1605 | N | 0.02 F | 1.1 F | 0.0008 | 5.6 | <0.03 | <2 | 146 D2B7 | <0.0005 | 0.0018 | <0.03 | 2.76 |
| | RES-009E 1634.46-1637.47 | N | <0.05 | 21.9 | 0.0003 F | 5 | <0.03 | 1.3 F | 73.8 B7 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1669.07-1672.07 | N | <0.05 | 18.9 | 0.0015 | 5.1 | <0.03 | 1.1 F | 69.3 B7 | 0.0001 F | 0.0002 F | <0.03 | 2.54 |
| | RES-009E 1650.14-1652.81 | N | 0.02 F | 2.6 | 0.0015 | 7.5 | <0.03 | <2 | 171 D2B1 | <0.0005 | 0.0014 | <0.03 | 4.07 |
| | | FD | 0.02 F | 2.4 | 0.0015 | 7.3 | <0.03 | <2 | 191 D2B7 | <0.0005 | 0.0014 | <0.03 | 4.05 |
| | RES-009E 1685.09-1687.47 | N | 0.04 F | 20.3 | 0.0002 F | 7.2 | <0.03 | 0.6 F | 20 B1 | 0.0002 F | <0.0005 | <0.03 | 0.04 F |
| | RES-009E 1697.61-1700.61 | N | 0.02 F | 26.7 | 0.0002 F | 7 | <0.03 | 0.6 F | 35.7 B1 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1718.61-1721.61 | N | 0.02 F | 19.4 | 0.0003 F | 7.1 | <0.03 | 0.5 F | 21.5 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 1739.63-1742.63 | N | <0.05 | 0.4 F | <0.0005 | 7.1 | <0.03 | 0.5 F | 22.7 | <0.0005 | <0.0005 | <0.03 | 0.01 F |
| | RES-009E 1760.86-1763.86 | N | <0.05 | 10.7 | 0.0003 F | 4.7 | <0.03 | 0.4 F | 20.4 B1 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | | FD | 0.02 F | 10.8 | 0.0003 F | 4.6 | <0.03 | 0.5 F | 19.3 B1 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 1798.16-1799.79 | N | 0.02 F | 15.1 | 0.0002 F | 6.7 | <0.03 | 0.6 F | 30.6 B1 | 0.0005 | <0.0005 | <0.03 | 0.56 |
| | RES-009E 1789.83-1792.31 | N | 0.03 F | 14.2 | 0.0002 F | 5 | <0.03 | 0.4 F | 12.5 B1 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 1801.42-1804.15 | N | 0.03 F | 11.2 | 0.0008 | 6 | <0.03 | 0.6 F | 144 D2B1 | <0.0005 | <0.0005 | <0.03 | 0.06 |

| | |
|---|---|
| DEG C | degrees Celcius. |
| MG/L | micrograms per liter. |
| UMHOS/CM | micro ohms per centimeter. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B5 | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| B7 | Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| F | Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| M2 | Matrix spike recovery was low. |
| M3 | The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. |
| N | Normal. |
| N1 | See Table E-2. |
| R1 | Relative percent difference (RPD) exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

# APPENDIX C
# SYNTHETIC PRECIPITATION LEACHING PROCEDURE RESULTS

| | | | ACZS | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Molybdenum MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Sulfate (as SO4) MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | RES-009E 1818.62-1821.62 | N | 0.03 F | 18.8 | 0.0007 | 7.5 | <0.03 | 0.8 F | 114 D2B7 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1829.95-1832.48 | N | 0.02 F | 12.3 | 0.0006 | 8.7 | <0.03 | 6.2 | 213 D2B7 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1846.66-1849.66 | N | 0.07 | 7.4 | 0.0017 | 3 | <0.03 | 3.3 | 152 D2B7 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1862.15-1865.15 | N | 0.06 | 3.6 | 0.0014 | 4 B1 | <0.03 | 20.3 B1 | 77.6 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1867.87-1884.35 | N | 0.06 | 4.4 | 0.003 | 4.2 | <0.03 | 5.2 B1 | 67.1 | <0.0005 | 0.0002 F | <0.03 | 0.06 B1 |
| | RES-009E 1880.15-1882.37 | N | 0.04 F | 5.5 | 0.003 | 4.2 B1 | <0.03 | 4.9 B1 | 169 D2 | <0.0005 | 0.0001 F | <0.03 | <0.05 |
| | RES-009E 1885.5-1886.5 | N | 0.06 | 4.9 | 0.0032 | 6 B1 | <0.03 | 11.1 B1 | 178 D2 | 0.0003 F | 0.0002 F | <0.03 | 0.04 F |
| | RES-009E 1899-1901.88 | N | 0.03 F | 8.8 | 0.0021 | 5.4 B1 | <0.03 | 9.4 B1 | 125 D2 | 0.0001 F | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1929.76-1932.58 | N | <0.05 | 2.6 | 0.0017 | 5.8 B1 | <0.03 | 8.2 B1 | 160 D2 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1947.67-1950.67 | N | 0.04 F | 10.6 | 0.0009 | 8.7 B1 | <0.03 | 8.7 B1 | 66.4 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | RES-009E 1954.6-1956 | N | 0.03 F | 12.6 | 0.0025 | 10.2 B1 | <0.03 | 4.8 B1 | 56.3 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1967.76-1969.72 | N | <0.05 | 19.2 | 0.0012 | 22.2 B1 | <0.03 | 7.2 B1 | 38.8 | <0.0005 | <0.0005 | <0.03 | 0.02 F |
| | RES-009E 1974.78-1977.89 | N | <0.05 | 2.4 | 0.0038 | 16.7 B1 | <0.03 | 7.7 B1 | 57.6 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 1984.74-1987.74 | N | <0.05 | <2 | <0.0005 | 12.6 B1 | <0.03 | 6.6 B1 | 1030 D2 | <0.0005 | <0.0005 | <0.03 | 0.03 F |
| | RES-009E 2056.38-2075 | N | 0.02 F | 24.2 | 0.0027 D2 | 5.2 | <0.03 | 4.2 B1 | 1870 D2 | 0.001 <D2 | 0.001 FD2 | 0.008 F | 0.06 B1 |

DEG C degrees Celcius.
MG/L micrograms per liter.
UMHOS/CM micro ohms per centimeter.
B1 Target analyte detected in method blank at or above the method reporting limit.
B4 Target analyte detected in blank at or above method acceptance criteria.
B5 Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL.
B7 Target analyte detected in method blank at or above the method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank.
D1 Sample required dilution due to matrix.
D2 Sample required dilution due to high concentration of target analyte.
F Analyte was positively identified but he reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit.
FD Field duplicate.
M2 Matrix spike recovery was low.
M3 The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level.
N Normal.
N1 See Table E-2.
R1 Relative percent difference (RPD) exceeded the method control limit.
R4 RPD exceeded the method control limit. Recovery met acceptance criteria.
V1 Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample.

**APPENDIX D**
**ICP-MS WHOLE ROCK ANALYSIS**

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Beta, Gross PCI/G | Radium 226 with alpha emitting isotopes PCI/G | Radium-228 PCI/G | Solids, Percent % | Aluminum % | Antimony PPM | Arsenic PPM | Barium PPM | Beryllium PPM | Bismuth PPM | Cadmium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-001C | RES-001C 1502-1505 | N | 3.5 | 6.9 | 1.1 | 3.8 | 99.7 | 7.2 | 0.22 | 1.3 | 600 | 2.64 | 5.71 | 1.15 |
| | RES-001C 1530-1533 | N | 7.3 | 11 | 0.57 F | 3 | 99.4 | 6.38 | 0.24 | 0.6 | 480 | 2.21 | 2.64 | 0.29 |
| | RES-001C 1557-1560 | N | 6.4 | 12 | 0.82 F | 2.2 F | 99.7 | 6.24 | 0.31 | 0.6 | 320 | 2.51 | 1.19 | 0.04 |
| | RES-001C 1584-1587 | N | 9.1 | 16 | 0.88 F | 2.2 F | 99.3 | 6.82 | 0.28 | 0.4 | 560 | 2.32 | 0.55 | 0.08 |
| | | FD | 12 | 16 | 0.99 | 2.8 F | 99.3 | 6.53 | 0.27 | 0.6 | 490 | 2.42 | 0.6 | 0.09 |
| | RES-001C 1611-1614 | N | 8.9 | 16 | 1 | 2.7 F | 99.2 | 6.21 | 1.07 | 3.8 | 530 | 2.68 | 8.69 | 1.66 |
| | RES-001C 1639-1642 | N | 8 | 15 | 1.1 | 3.2 | 99.2 | 6.72 | 0.54 | 1.4 | 610 | 2.94 | 0.87 | 0.71 |
| | RES-001C 1666-1669 | N | 9.4 | 14 | 0.83 F | 1.9 F | 99.3 | 6.36 | 0.39 | 0.5 | 540 | 2.69 | 0.53 | 0.22 |
| | RES-001C 1693-1696 | N | 12 | 15 | 0.88 | 1.1 F | 99.2 | 6.58 | 0.53 | 3.7 | 630 | 2.81 | 2.27 | 0.72 |
| | RES-001C 1711-1714.96 | N | 12 | 23 | 1.9 | 1.9 F | 99.2 | 7.39 | 0.39 | 1.1 | 590 | 2.28 | 0.51 | 0.19 |
| | RES-001C 1745-1748 | N | 14 | 25 | 1.6 | 0.95 F | 99.5 | 6.72 | 0.29 | 1.1 | 480 | 2.85 | 0.52 | 0.08 |
| | RES-001C 1771.75-1791.4 | N | 4.6 | -- | 1.3 | 5.7 | 99.5 | 1.02 | 0.63 | 36 | 10 | 7.84 | 43.3 | 1.64 |
| | RES-001C 1781-1784 | N | 9.4 | -- | 1.6 | 3.1 | 99.4 | 0.75 | 0.9 | 10 | 10 | 9.63 | 25.2 | 0.9 |
| | RES-001C 1799-1802 | N | 12 M2 | -- | 3.9 | 3.6 | 99.6 | 0.74 | 4.47 | <5 | 10 | 3.79 | 2.54 | 2.97 |
| | | FD | 13 | -- | 5.4 | 2.6 | 99.6 | 0.76 | 3.21 | 11 | 10 | 3.26 | 2.48 | 2.97 |
| | RES-001C 1814-1817 | N | 7.2 | -- | 3.4 | 5.4 | 98.2 | 7.24 | 0.84 | 1.4 | 110 | 12.65 | 0.38 | 0.14 |
| | RES-001C 1837-1840 | N | 5.9 | -- | 1.4 | 4.3 | 99 | 3.77 | 1.48 | <5 | 50 | 5.18 | 0.87 | 0.55 |
| | RES-001C 1855-1858 | N | 11 | -- | 3 | 3.3 | 98.9 | 2.32 | 0.61 | 7 | 90 | 8.71 | 3.05 | 0.66 |
| | RES-001C 1873-1876 | N | 18 | -- | 5.8 | 3.7 | 98.1 | 4.12 | 0.48 | 0.7 | 170 | 8.23 | 0.86 | 0.84 |
| | RES-001C 1892.5-1895 | N | 2.5 | -- | 2 | 3.2 | 98.4 | 1.58 | 0.61 | 3 | 20 | 6.92 | 22.1 | 11.55 |
| | RES-001C 1934-1937 | N | 2.2 | -- | 0.48 | 3.6 | 99.9 | 0.87 | 1.11 | <0.2 | 30 | 0.93 | 7.84 | <0.02 |
| | RES-001C 1987-1990 | N | 1.8 | -- | 0.76 | 2.1 | 100 | 6.18 | 0.94 | <0.2 | 190 | 3.92 | 1.75 | 0.38 |
| | RES-001C 2007-2010 | N | 9.8 | -- | 0.51 | 1.5 | 99.6 | 6.59 | 0.21 | 0.9 | 500 | 2.38 | 1.4 | 0.42 |
| | | FD | 10 | -- | 0.51 | 2.2 | 99.6 | 6.58 | 0.23 | 0.9 | 490 | 2.44 | 1.33 | 0.47 |
| | RES-001C 2041-2044 | N | 2.4 | -- | 0.68 | 0.86 | 99.6 | 7.74 | 0.38 | 0.3 | 430 | 3.09 | 1.58 | 0.7 |
| | RES-001C 2115-2118 | N | 8 | -- | 1.3 | 1.6 | 98.7 | 4.16 | 0.99 | <0.2 | 70 | 5.49 | 3.85 | 0.8 |
| | RES-001C 2164.4-2166.3 | N | 7.8 | -- | 0.7 | 3.1 | 99.6 | 0.58 | 3.75 | 17.1 | 70 | 0.25 | 23.6 | 0.11 |
| | RES-001C 2214-2215 | N | 2.9 | -- | 1.2 | 1.7 | 99.7 | 0.47 | 0.27 | <5 | <10 | 4.39 | 1.82 | 3.42 |
| | RES-001C 2242-2244 | N | 8.4 | -- | 1.4 | 1.9 | 99.9 | 5.96 | 0.96 | <0.2 | 210 | 3.75 | 18.95 | 0.02 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Calcium % | Cerium PPM | Cesium PPM | Chromium, Total PPM | Cobalt PPM | Copper PPM | Gallium PPM | Germanium PPM | Indium PPM | Iron % | Lanthanum PPM | Lead PPM | Lithium PPM | Magnesium % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-001C | RES-001C 1502-1505 | N | 0.14 | 48.7 | 2.9 | 175 | 13.6 | 2450 | 23.3 | 0.11 | 0.727 | 2.99 | 24.3 | 21.3 | 17.2 | 0.44 |
| | RES-001C 1530-1533 | N | 0.36 | 45.8 | 5.86 | 200 | 14.6 | 1685 | 22 | 0.13 | 0.339 | 4.2 | 22 | 16.7 | 15 | 0.88 |
| | RES-001C 1557-1560 | N | 0.47 | 46 | 3.36 | 203 | 21.4 | 906 | 20.2 | 0.15 | 0.086 | 5.36 | 22.6 | 6.1 | 18.5 | 0.72 |
| | RES-001C 1584-1587 | N | 0.48 | 48 | 4.07 | 198 | 24.2 | 720 | 20.7 | 0.13 | 0.218 | 5.04 | 23.2 | 6.9 | 25.2 | 1.03 |
| | | FD | 0.47 | 49.7 | 4.05 | 200 | 24.4 | 725 | 20.7 | 0.14 | 0.224 | 4.95 | 24 | 6.9 | 24.6 | 0.99 |
| | RES-001C 1611-1614 | N | 0.78 | 47.4 | 3.98 | 181 | 29.5 | 3360 | 20.8 | 0.14 | 1.615 | 4.61 | 23.7 | 285 | 19.1 | 0.81 |
| | RES-001C 1639-1642 | N | 0.63 | 48.7 | 4.92 | 235 | 27.2 | 1270 | 20.8 | 0.14 | 0.759 | 5.57 | 25 | 179 | 17.9 | 0.97 |
| | RES-001C 1666-1669 | N | 0.7 | 46.2 | 5.72 | 167 | 21.5 | 1690 | 20 | 0.13 | 0.171 | 4.37 | 23 | 29.8 | 20.3 | 0.9 |
| | RES-001C 1693-1696 | N | 0.58 | 45 | 5.82 | 171 | 20 | 2000 | 21.2 | 0.12 | 0.454 | 3.97 | 21.4 | 126 | 20.8 | 1.07 |
| | RES-001C 1711-1714.96 | N | 2.95 | 50.9 | 6.22 | 168 | 18.8 | 993 | 22.2 | 0.13 | 0.116 | 4.05 | 22.9 | 10.5 | 15.4 | 1.15 |
| | RES-001C 1745-1748 | N | 4.36 | 48.8 | 5.47 | 236 | 14.2 | 1040 | 21.1 | 0.13 | 0.337 | 3.77 | 22.9 | 8.2 | 19.1 | 1.57 |
| | RES-001C 1771.75-1791.4 | N | 17.35 | 21.6 | 0.83 | 182 | 8.9 | 2620 | 13.1 | 0.18 | 1.75 | 7.47 | 15.8 | 17.8 | 23.2 | 6.42 |
| | RES-001C 1781-1784 | N | 15.4 | 31 | 0.94 | 14 | 6.3 | 1300 | 7.17 | 0.1 | 0.749 | 1.86 | 22.3 | 5.8 | 13.1 | 10.25 |
| | RES-001C 1799-1802 | N | 19.05 | 5.42 | 0.32 | 171 | 17.7 | 9160 | 30.7 | 0.34 | 5.59 | 13.6 | 2.8 | 6.3 | 19.5 | 2.29 |
| | | FD | 19.55 | 5.78 | 0.38 | 17 | 18.1 | 9280 | 32.2 | 0.32 | 5.8 | 13.85 | 2.9 | 6.4 | 20.1 | 2.37 |
| | RES-001C 1814-1817 | N | 8.51 | 70.9 | 7.22 | 71 | 11.7 | 2140 | 28.2 | 0.15 | 0.634 | 3.62 | 34.8 | 6.7 | 20.3 | 6.06 |
| | RES-001C 1837-1840 | N | 11.8 | 50.2 | 3.18 | 174 | 18.2 | 4270 | 17.65 | 0.13 | 0.791 | 4.07 | 25.9 | 47.5 | 15.4 | 7.31 |
| | RES-001C 1855-1858 | N | 14.15 | 41.8 | 0.44 | 212 | 13.2 | 3780 | 28.7 | 0.16 | 4 | 10.4 | 19.2 | 29.1 | 28.8 | 4.02 |
| | RES-001C 1873-1876 | N | 4.83 | 34.3 | 5.81 | 108 | 34.3 | 10000 | 32.5 | 0.16 | 1.255 | 6.09 | 14.4 | 36.2 | 36.7 | 7.73 |
| | RES-001C 1892.5-1895 | N | 8.9 | 17.95 | 2.46 | 48 | 20 | 10000 | 17.95 | 0.12 | 4.09 | 4.72 | 8.5 | 7.7 | 72.4 | 11.8 |
| | RES-001C 1934-1937 | N | 0.1 | 14.2 | 0.28 | 719 | 20.4 | 8900 | 4.5 | 0.18 | 0.298 | 3.61 | 5.3 | 13.3 | 2.1 | 0.12 |
| | RES-001C 1987-1990 | N | 0.63 | 19.95 | 7.31 | 426 | 73.9 | 10000 | 27.4 | 0.39 | 1 | 9.19 | 8 | 9.6 | 16.5 | 2.79 |
| | RES-001C 2007-2010 | N | 1.48 | 22.2 | 9.23 | 328 | 73.2 | 10000 | 26.5 | 0.19 | 0.646 | 9.72 | 9.3 | 5.9 | 21.3 | 3.07 |
| | | FD | 1.47 | 23.2 | 9.38 | 318 | 72.6 | 10000 | 26.6 | 0.2 | 0.625 | 9.64 | 9.7 | 5.9 | 22.4 | 3.07 |
| | RES-001C 2041-2044 | N | 2.07 | 31.7 | 9.61 | 296 | 63.1 | 10000 | 25.1 | 0.2 | 0.549 | 7.93 | 14 | 4.2 | 37.3 | 3.78 |
| | RES-001C 2115-2118 | N | 8.3 | 39.2 | 4.53 | 123 | 40.1 | 10000 | 30.1 | 0.34 | 0.997 | 7.29 | 17.7 | 4.2 | 21 | 5.17 |
| | RES-001C 2164.4-2166.3 | N | 0.14 | 17.95 | 0.06 | 525 | 88.2 | 10000 | 1.64 | 0.49 | 0.992 | 36.6 | 7.2 | 212 | 2.8 | 0.05 |
| | RES-001C 2214-2215 | N | 10.5 | 4.82 | 0.06 | 175 | 32.8 | 10000 | 7.62 | 0.12 | 2.36 | 7.12 | 2.1 | 5.4 | 1.6 | 9.03 |
| | RES-001C 2242-2244 | N | 3.28 | 57.7 | 2.2 | 383 | 57.6 | 10000 | 29.9 | 0.32 | 1.1 | 9.82 | 23.4 | 2.2 | 5.1 | 2.04 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Molybdenum PPM | Phosphorus, Total (as P) PPM | Potassium % | Rubidium PPM | Sulfide % | Thorium PPM | Tin PPM | Titanium % | Yttrium PPM | Zirconium PPM | Manganese PPM | Nickel PPM | Niobium PPM | Rhenium PPM | Selenium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-001C | RES-001C 1502-1505 | N | 11.75 | 490 | 3.39 | 153 | 2.8 | 3.7 | 5.4 | 0.166 | 8.6 | 14.8 | 78 | 12.1 | 3.6 | 0.012 | 5 |
| | RES-001C 1530-1533 | N | 17.75 | 560 | 3.8 | 168 | 3.45 | 3.9 | 5.1 | 0.154 | 11.5 | 15.3 | 274 | 19.6 | 3.5 | 0.016 | 6 |
| | RES-001C 1557-1560 | N | 61.2 | 520 | 3.53 | 154 | 4.82 | 3.9 | 6.3 | 0.124 | 10.9 | 12.4 | 275 | 15.2 | 2.6 | 0.057 | 9 |
| | RES-001C 1584-1587 | N | 24 | 630 | 3.65 | 158 | 2.85 | 3.8 | 4 | 0.166 | 10.9 | 11.6 | 443 | 24.7 | 3.5 | 0.017 | 6 |
| | | FD | 23.6 | 620 | 3.71 | 164.5 | 2.85 | 3.8 | 3.8 | 0.16 | 10.9 | 11.5 | 438 | 24.4 | 3.4 | 0.016 | 7 |
| | RES-001C 1611-1614 | N | 62.9 | 590 | 3.39 | 159.5 | 2.57 | 3.6 | 3.8 | 0.175 | 10.6 | 11.3 | 659 | 18.8 | 3.8 | 0.055 | 7 |
| | RES-001C 1639-1642 | N | 29.9 | 530 | 3.56 | 177 | 2 | 4 | 3.8 | 0.165 | 10.7 | 11.5 | 2390 | 21.5 | 3.9 | 0.033 | 5 |
| | RES-001C 1666-1669 | N | 93.2 | 560 | 3.53 | 169.5 | 2.16 | 3.5 | 4.7 | 0.161 | 10.2 | 13.5 | 1465 | 18.2 | 3.4 | 0.134 | 6 |
| | RES-001C 1693-1696 | N | 68.4 | 530 | 3.77 | 183 | 1.87 | 4.1 | 3.5 | 0.175 | 10.3 | 10.4 | 1030 | 17.8 | 3.7 | 0.083 | 6 |
| | RES-001C 1711-1714.96 | N | 37.9 | 920 | 3.47 | 166.5 | 1.98 | 4.2 | 3.5 | 0.345 | 21 | 15.8 | 589 | 6.2 | 4.7 | 0.039 | 5 |
| | RES-001C 1745-1748 | N | 116.5 | 780 | 3.01 | 142.5 | 2.82 | 4.1 | 5.3 | 0.412 | 20.4 | 19 | 756 | 13.3 | 7 | 0.205 | 5 |
| | RES-001C 1771.75-1791.4 | N | 184.5 | 500 | 0.21 | 17.7 | 1.92 | 1.8 | 9.1 | 0.058 | 24.2 | 32.5 | 3850 | 16.2 | 1.8 | 0.458 | 7 |
| | RES-001C 1781-1784 | N | 44.1 | 360 | 0.27 | 24.1 | 2.42 | 1.5 | 4.3 | 0.054 | 16.5 | 27.8 | 2810 | 12.9 | 1.5 | 0.071 | 5 |
| | RES-001C 1799-1802 | N | 532 | 320 | 0.03 | 2.9 | 3.61 | 1.4 | 39.6 | 0.055 | 10.8 | 32.9 | 3420 | 7.1 | 1.7 | 1.025 | 14 |
| | | FD | 555 | 330 | 0.03 | 2.9 | 3.66 | 1.6 | 45.4 | 0.057 | 11.4 | 35.4 | 3510 | 5.5 | 2.1 | 1.055 | 15 |
| | RES-001C 1814-1817 | N | 94.5 | 1000 | 2.35 | 116.5 | 1.73 | 12.1 | 16.7 | 0.405 | 23 | 54.3 | 2300 | 21.5 | 14.1 | 0.177 | 6 |
| | RES-001C 1837-1840 | N | 89.8 | 400 | 1.34 | 82.2 | 2.36 | 6.5 | 8.3 | 0.193 | 16.9 | 27.2 | 3870 | 15.6 | 6.8 | 0.15 | 7 |
| | RES-001C 1855-1858 | N | 34 | 320 | 0.3 | 16.5 | 1.14 | 4.3 | 36.1 | 0.118 | 13.3 | 54.6 | 4610 | 9.5 | 4.6 | 0.054 | 6 |
| | RES-001C 1873-1876 | N | 64.6 | 650 | 2.39 | 155.5 | 1.96 | 7.8 | 19.5 | 0.23 | 19.8 | 55.6 | 1505 | 21.3 | 8.7 | 0.13 | 14 |
| | RES-001C 1892.5-1895 | N | 125.5 | 420 | 0.7 | 58 | 2.59 | 2.8 | 12.9 | 0.087 | 9.8 | 22.1 | 2360 | 14.5 | 3.7 | 0.239 | 11 |
| | RES-001C 1934-1937 | N | 910 | 60 | 0.41 | 18.5 | 3.38 | 1.9 | 4.8 | 0.051 | 4 | 15.5 | 86 | 28.4 | 1.1 | 1.48 | 17 |
| | RES-001C 1987-1990 | N | 1105 | 1090 | 3.81 | 242 | 3.59 | 0.3 | 9.3 | 0.608 | 17.5 | 61.7 | 1125 | 96.5 | 1.2 | 1.75 | 18 |
| | RES-001C 2007-2010 | N | 291 | 1090 | 4.53 | 217 | 2.96 | 0.8 | 7.3 | 0.66 | 19.5 | 21 | 1175 | 88.9 | 1.7 | 0.44 | 14 |
| | | FD | 293 | 1070 | 4.51 | 264 | 2.89 | 0.8 | 7.4 | 0.656 | 19.7 | 20.7 | 1170 | 88.6 | 1.7 | 0.447 | 14 |
| | RES-001C 2041-2044 | N | 345 | 1210 | 3.9 | 254 | 3.9 | 0.9 | 7.4 | 0.516 | 19.9 | 27.7 | 1120 | 108 | 3 | 0.491 | 15 |
| | RES-001C 2115-2118 | N | 736 | 750 | 1.63 | 121.5 | 4.86 | 2 | 18.4 | 0.304 | 22.3 | 50 | 2280 | 28.2 | 4.2 | 1.18 | 18 |
| | RES-001C 2164.4-2166.3 | N | 40.1 | 200 | 0.06 | 2.9 | 10 | 1.4 | 20.6 | 0.006 | 0.9 | 0.5 | 53 | 63.6 | 0.2 | 0.041 | 49 |
| | RES-001C 2214-2215 | N | 102 | 130 | 0.06 | 3.4 | 6.92 | 0.9 | 7.9 | 0.015 | 4.1 | 11.3 | 3040 | 7.7 | 0.6 | 0.115 | 15 |
| | RES-001C 2242-2244 | N | 673 | 3330 | 2.74 | 146.5 | 8.5 | 2.1 | 13.8 | 0.546 | 19.1 | 29.7 | 455 | 58.4 | 2 | 0.975 | 19 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Silver PPM | Sodium % | Strontium PPM | Tantalum PPM | Tellurium PPM | Thallium PPM | Tungsten PPM | Uranium PPM | Vanadium PPM | Zinc PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-001C | RES-001C 1502-1505 | N | 0.99 | 0.07 | 184 | 0.28 | 2.8 | 0.81 | 25.5 | 2.4 | 56 | 716 |
| | RES-001C 1530-1533 | N | 0.89 | 0.38 | 149.5 | 0.26 | 1.58 | 0.82 | 17.4 | 2 | 54 | 435 |
| | RES-001C 1557-1560 | N | 0.28 | 0.51 | 121 | 0.21 | 0.68 | 0.53 | 18.3 | 1.7 | 56 | 221 |
| | RES-001C 1584-1587 | N | 0.25 | 0.48 | 146.5 | 0.27 | 0.48 | 0.73 | 19.5 | 1.6 | 59 | 552 |
| | | FD | 0.26 | 0.46 | 142 | 0.26 | 0.53 | 0.72 | 18.6 | 1.5 | 57 | 543 |
| | RES-001C 1611-1614 | N | 16 | 0.25 | 186 | 0.28 | 0.7 | 0.85 | 25.2 | 3.3 | 57 | 1420 |
| | RES-001C 1639-1642 | N | 1.1 | 0.3 | 145.5 | 0.29 | 0.4 | 0.94 | 16.5 | 1.6 | 57 | 1110 |
| | RES-001C 1666-1669 | N | 0.63 | 0.2 | 96.6 | 0.25 | 0.2 | 0.82 | 16.7 | 1.5 | 64 | 645 |
| | RES-001C 1693-1696 | N | 1.15 | 0.09 | 96.1 | 0.28 | 0.45 | 1.06 | 15.5 | 1.8 | 61 | 715 |
| | RES-001C 1711-1714.96 | N | 0.35 | 1.31 | 217 | 0.31 | 0.22 | 0.88 | 8.7 | 1.2 | 97 | 125 |
| | RES-001C 1745-1748 | N | 0.48 | 1.1 | 257 | 0.46 | 0.27 | 0.71 | 14 | 1.7 | 110 | 125 |
| | RES-001C 1771.75-1791.4 | N | 1.69 | 0.03 | 42.4 | 0.12 | 21.6 | 0.07 | 103 | 3.9 | 28 | 624 |
| | RES-001C 1781-1784 | N | 0.75 | 0.02 | 25 | 0.11 | 4.43 | 0.06 | 19.6 | 3.9 | 18 | 386 |
| | RES-001C 1799-1802 | N | 5.09 | <0.01 | 29.8 | 0.12 | 1.38 | 0.04 | 184.5 | 9.8 | 40 | 659 |
| | | FD | 5.35 | <0.01 | 31.5 | 0.14 | 1.56 | 0.05 | 191 | 10.3 | 41 | 672 |
| | RES-001C 1814-1817 | N | 0.8 | 0.18 | 129 | 1.06 | 0.15 | 0.52 | 41.3 | 6.8 | 100 | 126 |
| | RES-001C 1837-1840 | N | 1.24 | 0.13 | 81.6 | 0.53 | 0.35 | 0.35 | 24.4 | 3.3 | 49 | 325 |
| | RES-001C 1855-1858 | N | 1.12 | 0.03 | 51.2 | 0.35 | 0.97 | 0.08 | 129.5 | 4.8 | 41 | 306 |
| | RES-001C 1873-1876 | N | 2.79 | 0.05 | 90 | 0.71 | 0.47 | 0.49 | 66.9 | 9 | 77 | 285 |
| | RES-001C 1892.5-1895 | N | 3.67 | 0.04 | 38.2 | 0.29 | 12.3 | 0.27 | 73.2 | 5 | 40 | 2880 |
| | RES-001C 1934-1937 | N | 3.95 | <0.01 | 3.7 | 0.11 | 0.59 | 0.03 | 13.2 | 0.9 | 35 | 12 |
| | RES-001C 1987-1990 | N | 3.93 | 0.01 | 19.5 | 0.11 | 0.79 | 0.99 | 21.8 | 2.3 | 214 | 313 |
| | RES-001C 2007-2010 | N | 3.77 | 0.04 | 66.2 | 0.14 | 1 | 1.36 | 14.9 | 1.4 | 192 | 223 |
| | | FD | 3.79 | 0.04 | 66.6 | 0.13 | 0.95 | 1.35 | 14.5 | 1.3 | 191 | 222 |
| | RES-001C 2041-2044 | N | 4.46 | 0.06 | 122.5 | 0.23 | 0.71 | 1.26 | 17.3 | 1.2 | 209 | 259 |
| | RES-001C 2115-2118 | N | 4.77 | <0.01 | 59.5 | 0.32 | 0.98 | 0.56 | 41.4 | 3.2 | 97 | 299 |
| | RES-001C 2164.4-2166.3 | N | 36.3 | <0.01 | 61.6 | 0.05 | 39.5 | 0.08 | 5.6 | 0.6 | 18 | 80 |
| | RES-001C 2214-2215 | N | 7.47 | 0.01 | 35.3 | 0.05 | 1.62 | 0.03 | 161.5 | 1.9 | 22 | 868 |
| | RES-001C 2242-2244 | N | 4.37 | <0.01 | 118.5 | 0.18 | 1.62 | 0.55 | 45.6 | 3.7 | 220 | 96 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Beta, Gross PCI/G | Radium 226 with alpha emitting isotopes PCI/G | Radium-228 PCI/G | Solids, Percent % | ALS Aluminum % | Antimony PPM | Arsenic PPM | Barium PPM | Beryllium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A | RES-002A 858-861 | N | 1.9 | 3.4 | 0.73 | 1.6 | 99.9 | 8.31 | 0.78 | 20.1 | 1320 | 1.55 |
| | RES-002A 888-891 | N | 4 | 4.8 | 1.2 | 3.3 | 99.9 | 6.25 | 2.62 | 31.5 | 1300 | 2.73 |
| | RES-002A 927-930 | N | 1.9 | 2.3 | 0.66 | 1.8 | 100 | 6.79 | 1.71 | 17.6 | 1490 | 2.66 |
| | RES-002A 965-968 | N | 0.55 | 2.7 | 1.3 | 3 | 99.9 | 6.46 | 0.47 | 2.5 | 660 | 1.59 |
| | RES-002A 992-995 | N | 1.1 | 1.8 | 0.74 | 1 | 100 | 5.63 | 16.45 | 41.5 | 570 | 1.17 |
| | | FD | 0.97 | 2.2 | 0.78 | 2.3 | 100 | 5.62 | 16.7 | 39.4 | 570 | 1.21 |
| | RES-002A 1007-1010 | N | 1.8 | 2.6 | 0.53 | 1.2 | 100 | 6.28 | 8.77 | 25.3 | 1040 | 1.6 |
| | RES-002A 1058-1061 | N | 1.5 | 2.6 | 0.79 | 1.2 | 100 | 6.86 | 0.55 | 6.7 | 730 | 2.15 |
| | RES-002A 1109-1112 | N | 1.6 | 2 | 0.37 | 1.3 | 100 | 6.38 | 1.45 | 10.1 | 540 | 1.35 |
| | RES-002A 1154-1156 | N | 0.5 | 2.2 | 0.29 | 1.2 | 100 | 6.44 | 0.35 | 3.6 | 330 | 1.77 |
| | RES-002A 1201-1203 | N | 3.5 | <4.3 | 0.86 | 1.8 | 99.8 | 5.38 | 1.84 | 73.6 | 40 | 0.67 |
| | | FD | 1.3 | 4.3 | 0.61 | 0.92 | 99.8 | 5.48 | 1.92 | 77 | 30 | 0.74 |
| | RES-002A 1246-1249 | N | 0.92 | 2.1 | 0.31 | 1 | 99.9 | 6.42 | 1.23 | 38.3 | 70 | 0.8 |
| | RES-002A 1291-1292 | N | 0.6 | 0.99 | 0.13 | 0.67 | 99.9 | 5.89 | 0.77 | 41.9 | 50 | 0.38 |
| | RES-002A 1325-1328 | N | <1.2 | 2.1 | 0.4 | 1.5 | 99.9 | 5.86 | 1.55 | 18.2 | 150 | 1.29 |
| | RES-002A 1363-1366 | N | 0.05 | 1.1 | 0.2 | 0.52 | 99.9 | 6.01 | 1.03 | 17.7 | 70 | 1.26 |
| | RES-002A 1395-1397 | N | 0.93 | 0.96 | 0.31 | 0.41 | 99.8 | 4.06 | 1.33 | 11.8 | 90 | 0.53 |
| | RES-002A 1414.6-1417 | N | <0.92 | 2.1 | 0.33 | 0.7 | 100 | 6.37 | 0.28 | 1.9 | 160 | 2.93 |
| | RES-002A 1454-1457 | N | 0.92 | 4.6 | 0.37 | 0.38 | 99.9 | 6.12 | 0.59 | 5.1 | 100 | 2.39 |
| | RES-002A 1538-1541 | N | 1.2 | 2.6 | 0.22 | 0.53 | 99.9 | 6.47 | 0.07 | 91 | 370 | 2.98 |
| | RES-002A 1583-1586 | N | 0.49 R1 | 4.1 | 0.29 F | 1.7 F | 100 | 6.47 | 0.21 | 20.4 | 370 | 3.6 |
| | RES-002A 1627-1630 | N | 2.8 | 3.2 | 0.59F | 0.75 F | 99.9 | 6.7 | 0.19 | 12.3 | 520 | 4.16 |
| | RES-002A 1732-1735 | N | 1.4 F | 24 | 0.69 F | 1.5 F | 99.8 | 6.9 | 0.07 | 0.5 | 190 | 3.07 |
| | | FD | 0.31 F | 28 | 0.3 F | 1 F | 99.7 | 7.28 | 0.07 | 0.4 | 200 | 3.13 |
| | RES-002A 1781-1784 | N | 1.3 | 2.9 | 0.78 F | 2.4 F | 100 | 4.71 | 0.11 | 1.2 | 330 | 2.54 |
| | RES-002A 1814-1817 | N | 2.6 | 3.2 | 0.85 F | 1.2 F | 100 | 3.35 | 0.08 | 0.6 | 170 | 1.9 |
| | RES-002A 1876-1879 | N | 3.4 | 19 | 0.95 | 6.9 | 99.7 | 5.3 | 0.12 | 1.1 | 150 | 3.83 |
| | RES-002A 1927-1930 | N | 1.8 F | 26 | 0.93 | 5.2 | 99.8 | 5.96 | 0.06 | <0.2 | 180 | 2.42 |
| | RES-002A 1981-1984 | N | 12 | 44 | 0.32 F | 2.3 F | 99.6 | 6.76 | 0.18 | 0.3 | 180 | 3.41 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Bismuth PPM | Cadmium PPM | Calcium % | Cerium PPM | Cesium PPM | Chromium, Total PPM | Cobalt PPM | Copper PPM | Gallium PPM | Germanium PPM | Indium PPM | Iron % | Lanthanum PPM | Lead PPM | Lithium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A | RES-002A 858-861 | N | 2.77 | 0.05 | 0.06 | 58.9 | 2.14 | 129 | 0.7 | 198.5 | 26.5 | 0.05 | 1.4 | 1.63 | 28.7 | 54.6 | 8.1 |
| | RES-002A 888-891 | N | 13.55 | 0.03 | 0.05 | 65.7 | 2.86 | 225 | 0.9 | 73.7 | 35.9 | 0.1 | 1.195 | 4.24 | 32.7 | 190.5 | 7.4 |
| | RES-002A 927-930 | N | 8.59 | <0.02 | 0.04 | 53.6 | 2.68 | 124 | 0.5 | 100 | 40.2 | 0.07 | 1.435 | 3.35 | 26 | 45.6 | 4.8 |
| | RES-002A 965-968 | N | 14.3 | 0.04 | 0.06 | 39 | 1.49 | 214 | 7.8 | 10000 | 22.6 | 0.08 | 0.409 | 2.68 | 18.9 | 14.5 | 1.4 |
| | RES-002A 992-995 | N | 13 | <0.02 | 0.09 | 59.5 | 1.04 | 169 | 0.5 | 42.4 | 26.2 | 0.13 | 0.395 | 3.37 | 29.6 | 310 | 1.5 |
| | | FD | 13.2 | <0.02 | 0.09 | 60.9 | 1.03 | 197 | 0.5 | 38.4 | 26.4 | 0.13 | 0.405 | 3.39 | 30.2 | 313 | 1.4 |
| | RES-002A 1007-1010 | N | 14.9 | 0.03 | 0.08 | 36.6 | 1.36 | 195 | 0.8 | 29.4 | 24.2 | 0.1 | 0.499 | 3.92 | 18.4 | 160 | 0.8 |
| | RES-002A 1058-1061 | N | 7.97 | <0.02 | 0.08 | 57.7 | 2.63 | 218 | 9 | 1395 | 33.4 | 0.11 | 0.564 | 2.94 | 28.3 | 23 | 2.6 |
| | RES-002A 1109-1112 | N | 13.75 | <0.02 | 0.07 | 37.7 | 1.21 | 209 | 6.6 | 1645 | 30.7 | 0.1 | 0.593 | 3.37 | 18.5 | 172 | 8.2 |
| | RES-002A 1154-1156 | N | 3.55 | 0.02 | 0.07 | 47.7 | 1.2 | 15 | 8.5 | 2920 | 26.4 | 0.13 | 0.402 | 3.59 | 23.2 | 26.1 | 1.7 |
| | RES-002A 1201-1203 | N | 16.95 | 0.28 | 0.04 | 39.4 | 0.41 | 298 | 34.2 | 4930 | 65.2 | 0.26 | 0.55 | 15.05 | 18.1 | 244 | 9.2 |
| | | FD | 18.15 | 0.25 | 0.04 | 38.2 | 0.42 | 275 | 35.5 | 5140 | 67.3 | 0.26 | 0.558 | 15.6 | 17.3 | 248 | 9.7 |
| | RES-002A 1246-1249 | N | 4.69 | <0.02 | 0.06 | 38.4 | 0.26 | 242 | 15.6 | 4160 | 28.8 | 0.13 | 0.781 | 5.82 | 17.4 | 297 | 40 |
| | RES-002A 1291-1292 | N | 2.59 | <0.02 | 0.04 | 28.2 | 0.07 | 294 | 18.3 | 1640 | 28.4 | 0.17 | 0.226 | 6.04 | 12.4 | 429 | 15.3 |
| | RES-002A 1325-1328 | N | 5.85 | 0.05 | 0.06 | 46.2 | 0.39 | 258 | 17.5 | 5970 | 33.8 | 0.22 | 0.445 | 9.57 | 18.7 | 198 | 15.9 |
| | RES-002A 1363-1366 | N | 6.66 | 0.04 | 0.07 | 37.6 | 0.34 | 255 | 25.8 | 4610 | 25.3 | 0.17 | 0.198 | 6.53 | 18.1 | 164 | 22.3 |
| | RES-002A 1395-1397 | N | 10.15 | 0.03 | 0.03 | 23.6 | 0.17 | 355 | 18 | 3240 | 17.5 | 0.24 | 0.205 | 10.95 | 11 | 161 | 17.9 |
| | RES-002A 1414.6-1417 | N | 4 | <0.02 | 0.07 | 39.9 | 0.62 | 229 | 24.5 | 2290 | 25.6 | 0.17 | 0.204 | 6.99 | 19.4 | 12.3 | 4 |
| | RES-002A 1454-1457 | N | 14.05 | <0.02 | 0.06 | 32.1 | 0.81 | 20 | 34.4 | 10000 | 29.9 | 0.19 | 0.252 | 8.22 | 14.9 | 9.5 | 6.4 |
| | RES-002A 1538-1541 | N | 1.23 | 1.48 | 0.05 | 17.25 | 0.73 | 184 | 17.4 | 10000 | 23.4 | 0.13 | 1 | 4.3 | 8 | 2.3 | 3 |
| | RES-002A 1583-1586 | N | 2.52 | 0.4 | 0.03 | 25.5 | 0.92 | 181 | 21.3 | 10000 | 25.8 | 0.21 | 0.915 | 4.48 | 12.2 | 1.4 | 6.7 |
| | RES-002A 1627-1630 | N | 0.81 | 1.98 | 0.04 | 37.4 | 0.81 | 11 | 11.1 | 10000 | 26.2 | 0.15 | 0.907 | 3.04 | 18.4 | 2.8 | 9.9 |
| | RES-002A 1732-1735 | N | 0.68 | 0.18 | 0.42 | 28.4 | 6.82 | 130 | 45.9 | 10000 | 23.6 | 0.17 | 0.272 | 6.71 | 11.4 | 3.3 | 10.3 |
| | | FD | 0.67 | 0.18 | 0.42 | 34.7 | 7.14 | 130 | 44.9 | 10000 | 24.2 | 0.19 | 0.271 | 6.75 | 14.5 | 3.4 | 10.4 |
| | RES-002A 1781-1784 | N | 1.73 | 0.89 | 0.04 | 34.4 | 0.74 | 13 | 14.2 | 2050 | 16.5 | 0.11 | 0.082 | 3.52 | 15.5 | 46.8 | 5.1 |
| | RES-002A 1814-1817 | N | 0.83 | 0.06 | 0.05 | 23.8 | 0.49 | 221 | 11 | 1815 | 11.9 | 0.1 | 0.037 | 2.99 | 11.2 | 22.2 | 3.1 |
| | RES-002A 1876-1879 | N | 14.9 | 0.16 | 2.83 | 42.6 | 4.99 | 9 | 37.9 | 10000 | 23.9 | 0.2 | 0.596 | 8.84 | 19.1 | 1.5 | 11.3 |
| | RES-002A 1927-1930 | N | 1.25 | 0.2 | 3.86 | 38.1 | 6.54 | 149 | 43 | 10000 | 24.7 | 0.19 | 0.361 | 7.38 | 17.1 | 1.6 | 12 |
| | RES-002A 1981-1984 | N | 0.73 | 0.13 | 3.06 | 33.4 | 8.63 | 139 | 43.2 | 10000 | 21.6 | 0.17 | 0.314 | 7.61 | 14.5 | 3.1 | 14.7 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Magnesium % | Molybdenum PPM | Phosphorus, Total (as P) PPM | Potassium % | Rubidium PPM | Sulfide % | Thorium PPM | Tin PPM | Titanium % | Yttrium PPM | Zirconium PPM | Manganese PPM | Nickel PPM | Niobium PPM | Rhenium PPM | Selenium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A | RES-002A 858-861 | N | 0.25 | 2.67 | 240 | 5.7 | 180.5 | 0.02 | 3.2 | 1.3 | 0.248 | 7 | 32 | 111 | 3.9 | 6.1 | 0.002 | 2 |
| | RES-002A 888-891 | N | 0.33 | 9.38 | 400 | 2.73 | 133.5 | 0.06 | 5.4 | 4.2 | 0.244 | 5.5 | 33.2 | 134 | 4.2 | 6.8 | 0.002 | 13 |
| | RES-002A 927-930 | N | 0.48 | 7.15 | 230 | 3.32 | 172 | 0.05 | 3.4 | 3.3 | 0.144 | 3.3 | 31.1 | 92 | 2.1 | 4.1 | 0.002 | 3 |
| | RES-002A 965-968 | N | 0.4 | 3.3 | 440 | 2.76 | 116.5 | 2.56 | 3.7 | 10.3 | 0.151 | 4.4 | 24.9 | 40 | 11.4 | 3.6 | 0.021 | 5 |
| | RES-002A 992-995 | N | 0.24 | 11.7 | 850 | 2.37 | 98.9 | 0.51 | 3.8 | 56.1 | 0.147 | 4.4 | 43.3 | 28 | 2.8 | 3 | 0.002 | 11 |
| | | FD | 0.24 | 11.65 | 860 | 2.38 | 98.6 | 0.5 | 4 | 56.9 | 0.172 | 4.6 | 46.5 | 30 | 2.6 | 3.7 | 0.002 | 11 |
| | RES-002A 1007-1010 | N | 0.35 | 11.4 | 640 | 2.99 | 125.5 | 0.25 | 4.2 | 4.8 | 0.133 | 3.4 | 32.6 | 38 | 3.4 | 3.2 | 0.003 | 11 |
| | RES-002A 1058-1061 | N | 0.45 | 7.49 | 870 | 3.21 | 141.5 | 1.7 | 5.6 | 6.1 | 0.145 | 5.8 | 28.7 | 40 | 9.3 | 3.8 | 0.007 | 9 |
| | RES-002A 1109-1112 | N | 0.32 | 4.48 | 680 | 2.5 | 112.5 | 2.5 | 4.2 | 8.5 | 0.146 | 4.1 | 28 | 29 | 8.3 | 3.4 | 0.003 | 7 |
| | RES-002A 1154-1156 | N | 0.4 | 6.46 | 540 | 3.09 | 115 | 3.18 | 3.9 | 8.7 | 0.123 | 4.9 | 21.9 | 54 | 9.5 | 3.3 | 0.002 | 7 |
| | RES-002A 1201-1203 | N | 0.08 | 12.6 | 520 | 1.45 | 55.6 | 10 | 5.1 | 7.7 | 0.077 | 3.1 | 23.6 | 25 | 16.3 | 1.6 | 0.026 | 18 |
| | | FD | 0.08 | 13.1 | 540 | 1.48 | 57.2 | 10 | 5.1 | 7.8 | 0.07 | 3.1 | 22.3 | 24 | 16.3 | 1.5 | 0.03 | 19 |
| | RES-002A 1246-1249 | N | 0.1 | 19.2 | 750 | 0.78 | 33 | 6.44 | 3.7 | 9.1 | 0.119 | 2.9 | 22.8 | 23 | 13.4 | 2.7 | 0.029 | 8 |
| | RES-002A 1291-1292 | N | 0.01 | 11.55 | 470 | 0.92 | 5.5 | 8.04 | 3.4 | 11.7 | 0.118 | 3.1 | 18.2 | 22 | 13.3 | 3 | 0.028 | 11 |
| | RES-002A 1325-1328 | N | 0.14 | 14.65 | 880 | 1.43 | 52 | 10 | 3.4 | 17.1 | 0.116 | 4.7 | 19.5 | 21 | 13.1 | 2.4 | 0.149 | 17 |
| | RES-002A 1363-1366 | N | 0.13 | 26.4 | 660 | 1.37 | 51 | 7.37 | 3.4 | 13 | 0.12 | 4.4 | 18.8 | 22 | 12.9 | 2.6 | 0.161 | 14 |
| | RES-002A 1395-1397 | N | 0.04 | 29.1 | 300 | 0.58 | 19.6 | 10 | 2.3 | 11.8 | 0.075 | 2.4 | 13.8 | 26 | 11.2 | 1.7 | 0.056 | 18 |
| | RES-002A 1414.6-1417 | N | 0.31 | 40.1 | 680 | 2.97 | 121 | 7.4 | 3.8 | 12 | 0.124 | 4.5 | 44.9 | 42 | 10.7 | 2.6 | 0.048 | 13 |
| | RES-002A 1454-1457 | N | 0.32 | 79.6 | 730 | 2.86 | 119.5 | 9.07 | 2.2 | 22.7 | 0.148 | 5.8 | 20.9 | 45 | 18.9 | 2.7 | 0.15 | 20 |
| | RES-002A 1538-1541 | N | 0.37 | 311 | 320 | 3.27 | 132 | 3.94 | 0.8 | 18.9 | 0.109 | 2.4 | 7.1 | 23 | 5.9 | 1.2 | 0.481 | 16 |
| | RES-002A 1583-1586 | N | 0.4 | 518 | 320 | 3.36 | 149 | 3.74 | 1.3 | 24.2 | 0.114 | 2.4 | 8.5 | 38 | 10.3 | 1.8 | 0.885 | 22 |
| | RES-002A 1627-1630 | N | 0.4 | 808 | 440 | 3.15 | 138 | 2.67 | 3.4 | 18.1 | 0.102 | 2 | 16.2 | 49 | 9.5 | 2.9 | 1.34 | 13 |
| | RES-002A 1732-1735 | N | 2.57 | 167.5 | 1730 | 3.79 | 171.5 | 3.07 | 1.3 | 6.9 | 0.453 | 12.9 | 15.8 | 619 | 62 | 1.9 | 0.287 | 15 |
| | | FD | 2.62 | 170 | 1690 | 4.2 | 220 | 3.03 | 1.6 | 6.9 | 0.45 | 14.4 | 18.8 | 619 | 61.6 | 1.9 | 0.267 | 16 |
| | RES-002A 1781-1784 | N | 0.27 | 225 | 270 | 2.22 | 103 | 3.44 | 4.3 | 12.5 | 0.089 | 3.5 | 15.2 | 53 | 9.9 | 2.7 | 0.293 | 10 |
| | RES-002A 1814-1817 | N | 0.19 | 307 | 200 | 1.58 | 70.7 | 2.89 | 4.3 | 8.1 | 0.063 | 3.9 | 17.2 | 46 | 10.6 | 1.6 | 0.345 | 8 |
| | RES-002A 1876-1879 | N | 1.77 | 130 | 790 | 3.31 | 207 | 8.42 | 4 | 20.7 | 0.336 | 13.5 | 32.7 | 305 | 65.5 | 2 | 0.19 | 22 |
| | RES-002A 1927-1930 | N | 2.52 | 59.3 | 700 | 3.02 | 199.5 | 5.39 | 3.5 | 8 | 0.517 | 20.1 | 30.4 | 450 | 61.6 | 2.2 | 0.112 | 18 |
| | RES-002A 1981-1984 | N | 3.27 | 202 | 1160 | 3.6 | 240 | 4.74 | 1.6 | 6.2 | 0.503 | 15.8 | 12.4 | 565 | 80.4 | 2.2 | 0.366 | 10 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Silver PPM | Sodium % | Strontium PPM | Tantalum PPM | Tellurium PPM | Thallium PPM | Tungsten PPM | Uranium PPM | Vanadium PPM | Zinc PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A | RES-002A 858-861 | N | 2.53 | 0.09 | 349 | 0.42 | 3.76 | 1.66 | 11.5 | 0.8 | 46 | 99 |
| | RES-002A 888-891 | N | 3.9 | 0.03 | 204 | 0.54 | 6.83 | 0.84 | 26.9 | 2.5 | 48 | 39 |
| | RES-002A 927-930 | N | 1.65 | 0.02 | 136 | 0.3 | 4.91 | 1.07 | 34.9 | 1.6 | 40 | 28 |
| | RES-002A 965-968 | N | 1.46 | 0.03 | 154 | 0.27 | 4.49 | 0.85 | 19.9 | 1.8 | 47 | 11 |
| | RES-002A 992-995 | N | 6.95 | 0.03 | 368 | 0.2 | 14.7 | 0.43 | 69.3 | 1.9 | 57 | 9 |
| | | FD | 6.91 | 0.03 | 369 | 0.24 | 14.65 | 0.44 | 75.3 | 2 | 58 | 8 |
| | RES-002A 1007-1010 | N | 2.84 | 0.02 | 213 | 0.23 | 8.84 | 0.67 | 43.2 | 2 | 50 | 12 |
| | RES-002A 1058-1061 | N | 1.56 | 0.03 | 431 | 0.3 | 5.85 | 0.75 | 36 | 2.2 | 57 | 14 |
| | RES-002A 1109-1112 | N | 2.22 | 0.02 | 306 | 0.26 | 9.56 | 0.49 | 116.5 | 1.8 | 66 | 6 |
| | RES-002A 1154-1156 | N | 0.69 | 0.02 | 134 | 0.22 | 7.73 | 0.55 | 64.1 | 1.4 | 56 | 5 |
| | RES-002A 1201-1203 | N | 8.68 | 0.01 | 395 | 0.11 | 15.35 | 0.22 | 44.6 | 4.2 | 49 | 50 |
| | | FD | 8.63 | 0.01 | 403 | 0.1 | 16.1 | 0.24 | 42.8 | 4.2 | 49 | 52 |
| | RES-002A 1246-1249 | N | 3.77 | 0.01 | 452 | 0.2 | 3.66 | 0.12 | 40.9 | 1.7 | 60 | 9 |
| | RES-002A 1291-1292 | N | 1.37 | 0.04 | 290 | 0.22 | 2.34 | 0.02 | 37.9 | 0.9 | 65 | 5 |
| | RES-002A 1325-1328 | N | 2.09 | 0.01 | 732 | 0.19 | 5.12 | 0.17 | 53.2 | 2.8 | 65 | 7 |
| | RES-002A 1363-1366 | N | 3.41 | 0.02 | 321 | 0.2 | 8.36 | 0.14 | 42.7 | 1.4 | 65 | 8 |
| | RES-002A 1395-1397 | N | 1.48 | 0.01 | 224 | 0.13 | 5.08 | 0.06 | 24.3 | 1 | 43 | 4 |
| | RES-002A 1414.6-1417 | N | 0.49 | 0.03 | 152.5 | 0.21 | 1.09 | 0.28 | 39.4 | 1.7 | 70 | <2 |
| | RES-002A 1454-1457 | N | 3.71 | 0.03 | 460 | 0.18 | 5.66 | 0.34 | 49.1 | 1.8 | 99 | 5 |
| | RES-002A 1538-1541 | N | 1.19 | 0.03 | 268 | 0.15 | 2.63 | 0.47 | 26.2 | 1.3 | 81 | 4 |
| | RES-002A 1583-1586 | N | 2.02 | 0.04 | 211 | 0.22 | 0.3 | 0.41 | 34.9 | 1.3 | 72 | 4 |
| | RES-002A 1627-1630 | N | 0.93 | 0.03 | 327 | 0.32 | 0.11 | 0.36 | 26.9 | 3.9 | 76 | 14 |
| | RES-002A 1732-1735 | N | 1.94 | 0.06 | 80.1 | 0.2 | 0.3 | 1.03 | 12 | 1.2 | 206 | 250 |
| | | FD | 1.97 | 0.06 | 82.3 | 0.18 | 0.35 | 1.01 | 12.8 | 1.3 | 203 | 248 |
| | RES-002A 1781-1784 | N | 1.06 | 0.03 | 147 | 0.17 | 0.25 | 0.26 | 23.3 | 1.1 | 75 | 42 |
| | RES-002A 1814-1817 | N | 0.43 | 0.02 | 74.5 | 0.12 | 0.16 | 0.18 | 16.1 | 1.7 | 61 | <2 |
| | RES-002A 1876-1879 | N | 4.64 | 0.05 | 113.5 | 0.14 | 3.12 | 0.73 | 16.6 | 2.9 | 318 | 45 |
| | RES-002A 1927-1930 | N | 1.86 | 0.61 | 161.5 | 0.19 | 0.4 | 0.68 | 7.6 | 1.2 | 386 | 79 |
| | RES-002A 1981-1984 | N | 2.33 | 0.22 | 155 | 0.17 | 0.53 | 1.03 | 6.2 | 0.7 | 193 | 104 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Radium 226 with alpha emitting isotopes PCI/G | Radium-228 PCI/G | Solids, Percent % | ALS Aluminum % | Arsenic PPM | Barium PPM | Bismuth PPM | Cadmium PPM | Calcium % | Cesium PPM | Cobalt PPM | Copper PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1011.88-1012.45 | N | 2.2 | 0.79 | 4.6 R1 | 99 | 7.11 | 4.3 | 320 | 1.43 | 0.7 | 2.58 | 2.93 | 26 | 439 |
| | RES-005I 1322.73-1323.23 | N | 1.5 | 0.54 | 6.7 | 99.5 | 4.45 | 6.3 | 170 | 2.32 | 2.76 | 7.86 | 1.74 | 15.5 | 1250 |
| | RES-005I 1353-1353.49 | N | 3.3 | 0.39 | 3.5 | 99.3 | 4.57 | 39 | 190 | 3.65 | 2.46 | 6.03 | 3.27 | 17.6 | 751 |
| | RES-005I 1360.5-1361.51 | N | 1.4 | 0.41 | 4.7 | 99.5 | 5.99 | 31.9 | 350 | 3.39 | 1.31 | 3.15 | 3.29 | 17.4 | 814 |
| | RES-005I 1370.93-1374 | N | 1.9 | 0.55 | 1.9 | 100 | 4.15 | 34.8 | 460 | 2.51 | 0.02 | 0.15 | 0.71 | 0.8 | 272 |
| | RES-005I 1380-1383 | N | 2.3 | 0.74 | 3.4 | 100 | 2.54 | 135 | 400 | 26.2 | 0.02 | 0.3 | 0.48 | 0.7 | 438 |
| | RES-005I 1389-1391.57 | N | 2.3 | 0.42 | 2.6 | 100 | 1.97 | 57.3 | 320 | 28 | <0.02 | 0.16 | 0.9 | 0.7 | 253 |
| | RES-005I 1396.3-1399.3 | N | 1.5 | 0.41 | 0.59 | 99.9 | 1.7 | 116 | 110 | 6.18 | 0.06 | 0.35 | 0.56 | 1.6 | 1460 |
| | RES-005I 1405-1406.67 | N | 5.4 | 0.63 | 1.1 | 100 | 1.6 | 688 | 470 | 107.5 | 0.07 | 0.19 | 0.66 | 1.6 | 348 |
| | RES-005I 1410.18-1413.18 | N | 2.9 | 0.82 | 0.95 | 100 | 1.2 | 90 | 2470 | 19.45 | 0.03 | 0.04 | 0.29 | 1.6 | 573 |
| | RES-005I 1419.18-1422.18 | N | 1.5 | 0.57 | 0.7 | 100 | 0.81 | 210 | 2100 | 18.1 | 0.08 | 0.08 | 0.15 | 2.8 | 447 |
| | RES-005I 1425.5-1426.51 | N | 1.2 | 0.69 | 0.67 | 99.9 | 0.82 | 205 | 2150 | 12.95 | 0.06 | 0.08 | 0.11 | 1.9 | 395 |
| | RES-005I 1428.18-1431.18 | N | 2.2 | 0.43 | 1.5 | 100 | 0.51 | 62.7 | 1370 | 47.8 | 0.02 | 0.05 | 0.18 | 2.2 | 426 |
| | RES-005I 1437.13-1440.13 | N | 1.6 | 0.24 | 0.44 | 99.9 | 1.76 | 43.9 | 530 | 24.2 | <0.02 | 0.06 | 0.27 | 1.2 | 377 |
| | RES-005I 1446.13-1449.13 | N | 1.9 | 0.17 | 1.9 | 99.9 | 4.23 | 29.1 | 730 | 10.65 | <0.02 | 0.1 | 0.44 | 1.9 | 90.7 |
| | RES-005I 1455.13-1458.13 | N | 3.1 | 0.3 | 2.1 | 100 | 5.32 | 18.5 | 540 | 5.47 | <0.02 | 0.06 | 0.56 | 0.9 | 193.5 |
| | RES-005I 1464.13-1467.13 | N | 2.2 | 0.4 | 1.2 | 99.9 | 4.91 | 19.1 | 450 | 5.27 | <0.02 | 0.08 | 0.48 | 0.5 | 81.1 |
| | RES-005I 1473.13-1476.13 | N | 1.7 | 0.83 | 1 | 99.9 | 3.85 | 17 | 1200 | 2.9 | 0.03 | 0.08 | 0.37 | 0.7 | 80.6 |
| | RES-005I 1481-1482.66 | N | 0.11 | 0.31 | 0.48 | 99.9 | 2.82 | 25.2 | 180 | 5.85 | <0.02 | 0.06 | 0.43 | 1.8 | 60.4 |
| | RES-005I 1485.5-1486.51 | N | 0.57 | 0.22 | -0.01 | 100 | 2.81 | 24.7 | 180 | 5.8 | 0.1 | 0.06 | 0.42 | 1.7 | 61.7 |
| | RES-005I 1487.1-1490.1 | N | 0.95 | 0.75 F | 1.5 F | 99.9 | 6.22 | 7.5 | 3630 | 2.19 | 0.02 | 0.07 | 0.71 | 0.6 | 144 |
| | RES-005I 1490.1-1493.1 | N | 0.73 | 0.61 F | 1.2 F | 99.9 | 6.15 | 13.8 | 820 | 2.45 | 0.02 | 0.07 | 0.79 | 0.6 | 82.1 |
| | RES-005I 1499-1502 | N | 1.2 | 0.73 F | 0.6 F | 99.9 | 7.03 | 11.4 | 500 | 1.22 | <0.02 | 0.07 | 0.95 | 0.5 | 41.7 |
| | RES-005I 1506.56-1509.47 | N | 1.9 | 0.54 F | 1.6 F | 99.9 | 6.41 | 8.6 | 530 | 0.86 | <0.02 | 0.13 | 0.86 | 0.6 | 64.4 |
| | RES-005I 1515.47-1518.47 | N | 1 | 0.84 F | 1.9 F | 100 | 6.69 | 4.6 | 580 | 1.65 | <0.02 | 0.08 | 0.84 | 0.6 | 59.5 |
| | RES-005I 1524.47-1527.47 | N | 1.5 | 0.66 F | 1.6 F | 99.9 | 6.56 | 15 | 750 | 2.74 | 0.02 | 0.03 | 0.87 | 0.5 | 5130 |
| | RES-005I 1532.98-1534.97 | N | 1 | 0.41 F | 1.6 F | 99.9 | 6.77 | 5.7 | 510 | 2.38 | <0.02 | 0.12 | 0.77 | 0.6 | 887 |
| | RES-005I 1544-1546.55 | N | 1.4 | 0.65 F | 1.7 F | 100 | 3.48 | 20.3 | 470 | 4.86 | <0.02 | 0.05 | 0.37 | 0.5 | 441 |
| | RES-005I 1552.55-1555.58 | N | 1.1 | 0.44 F | 0.58 F | 99.9 | 5.24 | 11.9 | 350 | 4.04 | <0.02 | 0.05 | 0.7 | 0.9 | 95.3 |
| | RES-005I 1559.46-1562.46 | N | 0.92 | 0.54 F | 0.06 F | 99.9 | 5.84 | 7.5 | 380 | 2.96 | <0.02 | 0.04 | 0.7 | 1.9 | 202 |
| | RES-005I 1568.46-1571.46 | N | 0.99 | 0.61 F | 0.52 F | 100 | 6.21 | 8.2 | 380 | 1.53 | 0.02 | 0.04 | 0.61 | 1 | 147 |
| | | FD | 0.99 | 0.59 F | 1.7 F | 99.9 | 4.78 | 10.8 | 370 | 3.4 | <0.02 | 0.04 | 0.59 | 2.5 | 69.4 |
| | RES-005I 1586.46-1589.46 | N | 0.67 | 0.53 F | 1.8 F | 99.9 | 6.4 | 12.9 | 610 | 1.89 | <0.02 | 0.04 | 0.66 | 1.4 | 230 |
| | RES-005I 1604.46-1607.46 | N | 2 | 0.79 F | 0.25 F | 100 | 6.9 | 6.3 | 640 | 1.77 | <0.02 | 0.05 | 0.74 | 1.2 | 37.6 |
| | RES-005I 1613.46-1616.46 | N | 1.1 | 0.53 F | 2.5 F | 100 | 7.41 | 15.7 | 620 | 1.96 | <0.02 | 0.05 | 0.73 | 2.2 | 40.4 |
| | RES-005I 1616.46-1619 | N | 1.6 | 0.75 F | 9.6 | 99.9 | 7.25 | 9.5 | 580 | 1.54 | <0.02 | 0.05 | 0.68 | 1.4 | 47 |
| | RES-005I 1626.54-1627.16 | N | 3.1 | 1.3 F | 3.7 | 100 | 2.29 | 84.3 | 570 | 9.77 | <0.02 | 0.04 | 0.61 | 1.4 | 158.5 |
| | RES-005I 1627.16-1630 | N | 1.1 | 0.41 F | 1.9 F | 100 | 7.02 | 21.4 | 570 | 2.09 | <0.02 | 0.03 | 0.78 | 2.1 | 630 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Radium 226 with alpha emitting isotopes PCI/G | Radium-228 PCI/G | Solids, Percent % | ALS Aluminum % | Arsenic PPM | Barium PPM | Bismuth PPM | Cadmium PPM | Calcium % | Cesium PPM | Cobalt PPM | Copper PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1630.5-1631.5 | N | 1.5 | 1.4 | 10 R1 | 99.8 | 7.2 | 17.8 | 580 | 2.15 | <0.02 | 0.02 | 0.79 | 2.1 | 280 |
| | RES-005I 1632.56-1635.56 | N | 0.78 | 1.9 | 5.8 | 99.8 | 7.2 | 2.4 | 250 | 0.79 | 0.23 | 0.01 | 0.76 | 20 | 3080 |
| | RES-005I 1638.37-1641 | N | 1.3 | 2.3 | 5.3 | 99.9 | 7.82 | 4.7 | 250 | 1.08 | 0.3 | 0.02 | 0.9 | 26.1 | 3930 |
| | RES-005I 1645.84-1648.08 | N | 0.82 | 1.5 | 7.7 | 99.9 | 7.33 | 34.9 | 640 | 3.77 | 0.19 | 0.04 | 1.02 | 5.9 | 1385 |
| | RES-005I 1652-1654.93 | N | 1.2 | 1.2 | 6.9 | 99.9 | 7.13 | 3.2 | 310 | 1.36 | 0.04 | 0.02 | 0.81 | 33.2 | 2320 |
| | RES-005I 1654.93-1657.3 | N | 0.43 | 2.2 | 5.2 | 100 | 5.92 | 7.4 | 130 | 4.42 | <0.02 | 0.06 | 0.61 | 29.5 | 10000 |
| | RES-005I 1677.8-1680.8 | N | 2.4 | 1.7 | 9.7 R1 | 100 | 7.89 | 55.7 | 370 | 8.29 | <0.02 | 0.02 | 1 | 36.6 | 10000 |
| | RES-005I 1695.23-1697.23 | N | 2.1 | 1.2 | 6.7 | 99.8 | 7.78 | 98.7 | 550 | 1.39 | 0.39 | 0.02 | 0.92 | 15.4 | 10000 |
| | RES-005I 1711.23-1713.23 | N | 1.4 | 1.5 | 5.6 | 100 | 6.21 | 15.4 | 270 | 2.52 | <0.02 | <0.01 | 0.68 | 28 | 10000 |
| | RES-005I 1727.23-1729.23 | N | 2.8 | 0.9 | 6.2 | 99.9 | 6.88 | 286 | 540 | 1.38 | <0.02 | 0.05 | 0.78 | 15 | 10000 |
| | RES-005I 1730.5-1731.5 | N | 1.8 | 1.4 | 8.3 | 100 | 6.71 | 290 | 540 | 1.23 | <0.02 | 0.05 | 0.76 | 14.4 | 10000 |
| | RES-005I 1743.23-1745.23 | N | 1.3 | 2.3 | 5 | 99.7 | 6.35 | 51.1 | 220 | 1.5 | <0.02 | 0.01 | 0.63 | 16.7 | 10000 |
| | RES-005I 1759.23-1761.23 | N | 3 | 1.1 | 6.6 | 99.7 | 6.45 | 57.9 | 210 | 6.5 | 0.08 | 0.01 | 0.78 | 14.8 | 10000 |
| | RES-005I 1775.23-1778.23 | N | 3.6 | 0.87 | 6.9 | 100 | 7.11 | 46.7 | 320 | 1.26 | <0.02 | 0.02 | 0.72 | 14.8 | 9560 |
| | RES-005I 1794.36-1796.3 | N | 2.5 | 0.42 N1 | 7 | 100 | 6.54 | 49.8 | 240 | 2.12 | <0.02 | 0.02 | 0.71 | 11.8 | 10000 |
| | RES-005I 1811.3-1814.3 | N | 2.8 | 1.5 | 8.2 | 100 | 7.34 | 72.9 | 270 | 0.73 | 1.46 | 0.01 | 1.01 | 20.1 | 10000 |
| | RES-005I 1830.5-1831.5 | N | 3.5 | 1.8 | 2.2 | 99.9 | 6.39 | 77.1 | 230 | 0.66 | 1.4 | <0.01 | 0.89 | 17.1 | 10000 |
| | RES-005I 1835.3-1838.3 | N | 1.1 | 0.72 | 4.5 | 99.9 | 6.57 | 9.4 | 290 | 0.47 | 1.29 | 0.01 | 0.95 | 13.7 | 7710 |
| | RES-005I 1855.91-1858.91 | N | 3 | 0.66 | 4.2 | 99.9 | 7.22 | 1.8 | 400 | 0.49 | 2.48 | 0.03 | 1.07 | 11.5 | 5820 |
| | RES-005I 1872.9-1875.38 | N | 2.4 | 0.93 | 3.2 | 100 | 6.9 | 1.3 | 340 | 0.56 | 0.86 | 0.02 | 0.87 | 17.8 | 8810 |
| | RES-005I 1875.38-1878.2 | N | 2.4 | 0.49 | 3.2 | 99.8 | 6.21 | 3.1 | 260 | 1.77 | 2.46 | 0.03 | 0.77 | 31.2 | 10000 |
| | RES-005I 1884-1887 | N | 2.7 | 0.67 | 1.5 | 100 | 7.15 | 10 | 250 | 3.59 | <0.02 | 0.57 | 5.6 | 66.6 | 10000 |
| | RES-005I 1895-1897.06 | N | 12 | 2.4 | 3.3 | 99.8 | 5.46 | 2.2 | 400 | 0.54 | 2.3 | 0.05 | 0.66 | 42.5 | 7250 |
| | RES-005I 1901.49-1902.36 | N | 1.1 | 0.32 | 3.7 | 100 | 6.66 | 2.3 | 180 | 0.53 | 0.06 | 0.11 | 1.21 | 46.7 | 8200 |
| | RES-005I 1917.29-1919.1 | N | 1.2 | 0.42 | 5.8 R1 | 99.7 | 7.39 | 0.8 | 200 | 1.03 | <0.02 | 0.36 | 7.62 | 53.6 | 9990 |
| | RES-005I 1923.1-1925.3 | N | 2.1 | 0.58 | 2.9 | 99.9 | 7.45 | 2.9 | 180 | 1.91 | 1.28 | 0.4 | 6.61 | 74.3 | 10000 |
| | RES-005I 1955.06-195.06 | N | 3.4 | 0.26 | 3.7 | 99.1 | 8.17 | 2.9 | 110 | 0.46 | <0.02 | 0.39 | 12.25 | 55.1 | 8610 |
| | RES-005I 1960.5-1961.5 | N | 0 | 0.39 | 3.6 | 99.3 | 7.93 | <0.2 | 110 | 0.5 | <0.02 | 0.4 | 13.65 | 66.2 | 9060 |
| | RES-005I 1979.06-1982.06 | N | 0.07 | 0.3 | 4.2 | 99.4 | 7.49 | <0.2 | 110 | 0.72 | <0.02 | 0.46 | 15.55 | 60.6 | 7560 |
| | RES-005I 2008.11-2011.11 | N | 0.62 | 0.57 | 3.1 | 99.3 | 8.75 | 1.1 | 180 | 0.6 | <0.02 | 0.86 | 10.25 | 51 | 10000 |
| | RES-005I 2032.11-2035.11 | N | 0.24 | 0.61 | 2.3 | 99.8 | 7.75 | 1.2 | 290 | 5.22 | <0.02 | 0.57 | 7.96 | 59.6 | 10000 |
| | RES-005I 2049.84-2052.84 | N | 1.9 | 0.58 | 4.7 | 99.9 | 7.35 | 0.5 | 1020 | 0.61 | <0.02 | 0.14 | 2.01 | 11.2 | 10000 |
| | RES-005I 2061.84-2064.84 | N | 1.8 | 0.52 | 7.5 | 99.9 | 6.83 | 0.8 | 560 | 0.87 | <0.02 | 0.11 | 1.7 | 16.4 | 6120 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Gallium PPM | Germanium PPM | Indium PPM | Iron % | Lead PPM | Lithium PPM | Nickel PPM | Potassium % | Selenium PPM | Tantalum PPM | Tin PPM | Titanium % | Zinc PPM | Manganese PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1011.88-1012.45 | N | 18.55 | 0.17 | 0.705 | 6.94 | 49.9 | 18.3 | 60 | 2.22 | 2 | 0.39 | 2.5 | 0.55 | 965 | 1975 |
| | RES-005I 1322.73-1323.23 | N | 15.75 | 0.14 | 0.705 | 4.85 | 139.5 | 7.2 | 30.5 | 1.92 | 2 | 0.27 | 5.2 | 0.328 | 679 | 2380 |
| | RES-005I 1353-1353.49 | N | 18.15 | 0.23 | 1.325 | 5.56 | 120 | 12.4 | 38.9 | 2.38 | 3 | 0.26 | 5.9 | 0.35 | 872 | 1910 |
| | RES-005I 1360.5-1361.51 | N | 24.2 | 0.23 | 0.999 | 5.32 | 109 | 12.2 | 35.9 | 3.18 | 3 | 0.37 | 9 | 0.431 | 690 | 1350 |
| | RES-005I 1370.93-1374 | N | 14.9 | 0.19 | 0.469 | 5.02 | 49.6 | 1.3 | 3.1 | 1.76 | 11 | 0.25 | 11.8 | 0.163 | 31 | 48 |
| | RES-005I 1380-1383 | N | 17.8 | 0.28 | 1.2 | 10.75 | 678 | 1.7 | 1.6 | 0.92 | 21 | 0.21 | 13.5 | 0.155 | 25 | 41 |
| | RES-005I 1389-1391.57 | N | 12.5 | 0.34 | 0.286 | 5.27 | 196.5 | 3.3 | 1.8 | 0.37 | 49 | 0.42 | 16 | 0.171 | 17 | 49 |
| | RES-005I 1396.3-1399.3 | N | 20.3 | 0.41 | 1.42 | 17.85 | 111.5 | 4.3 | 4.7 | 0.23 | 20 | 0.26 | 12.4 | 0.145 | 46 | 45 |
| | RES-005I 1405-1406.67 | N | 42.8 | 0.35 | 1.11 | 10.4 | 7270 | 1 | 3.1 | 0.49 | 25 | 0.24 | 14.2 | 0.178 | 48 | 73 |
| | RES-005I 1410.18-1413.18 | N | 11.65 | 0.32 | 0.735 | 11.35 | 241 | 1.5 | 2.4 | 0.37 | 28 | 0.16 | 12.9 | 0.199 | 31 | 46 |
| | RES-005I 1419.18-1422.18 | N | 21.2 | 0.38 | 1.495 | 15.45 | 490 | 0.7 | 5.8 | 0.24 | 26 | 0.17 | 14.6 | 0.175 | 46 | 54 |
| | RES-005I 1425.5-1426.51 | N | 14.5 | 0.25 | 1.055 | 15.9 | 493 | 0.4 | 3.9 | 0.24 | 18 | 0.12 | 10.1 | 0.18 | 47 | 56 |
| | RES-005I 1428.18-1431.18 | N | 28.3 | 0.24 | 2.66 | 10.9 | 230 | 0.8 | 1.9 | 0.13 | 9 | 0.17 | 17.4 | 0.229 | 23 | 58 |
| | RES-005I 1437.13-1440.13 | N | 18.35 | 0.22 | 0.345 | 6.37 | 141.5 | 0.8 | 1.5 | 0.75 | 15 | 0.28 | 21.7 | 0.2 | 19 | 63 |
| | RES-005I 1446.13-1449.13 | N | 24.8 | 0.22 | 0.297 | 2.9 | 415 | 0.8 | 5.9 | 1.87 | 15 | 0.28 | 15.8 | 0.121 | 25 | 27 |
| | RES-005I 1455.13-1458.13 | N | 31.7 | 0.24 | 0.322 | 3.81 | 288 | 0.8 | 1.7 | 2.35 | 17 | 0.28 | 15.8 | 0.127 | 28 | 38 |
| | RES-005I 1464.13-1467.13 | N | 23.6 | 0.26 | 0.241 | 3.67 | 156 | 1.2 | 1.1 | 2.14 | 15 | 0.25 | 10.4 | 0.089 | 18 | 48 |
| | RES-005I 1473.13-1476.13 | N | 11.9 | 0.2 | 0.111 | 5.45 | 14.8 | 0.7 | 2.2 | 1.67 | 8 | 0.23 | 7.7 | 0.089 | 19 | 51 |
| | RES-005I 1481-1482.66 | N | 12.05 | 0.22 | 0.107 | 6 | 121 | 0.8 | 6 | 1.22 | 9 | 0.27 | 11.6 | 0.109 | 17 | 34 |
| | RES-005I 1485.5-1486.51 | N | 11.95 | 0.21 | 0.106 | 5.96 | 119 | 0.8 | 5.7 | 1.18 | 9 | 0.26 | 11.4 | 0.104 | 17 | 32 |
| | RES-005I 1487.1-1490.1 | N | 23.1 | 0.19 | 0.332 | 2.81 | 15.8 | 0.9 | 1.5 | 2.87 | 4 | 0.31 | 7.8 | 0.112 | 23 | 43 |
| | RES-005I 1490.1-1493.1 | N | 24.4 | 0.23 | 0.16 | 4.33 | 55.4 | 0.9 | 1.5 | 2.87 | 6 | 0.3 | 8.8 | 0.105 | 25 | 40 |
| | RES-005I 1499-1502 | N | 25.4 | 0.21 | 0.115 | 2.61 | 48.3 | 1.4 | 1.4 | 3.27 | 7 | 0.35 | 7.3 | 0.131 | 24 | 38 |
| | RES-005I 1506.56-1509.47 | N | 21.6 | 0.23 | 0.201 | 2.28 | 44.1 | 1.1 | 1.7 | 2.97 | 11 | 0.39 | 7.8 | 0.237 | 28 | 37 |
| | RES-005I 1515.47-1518.47 | N | 24.8 | 0.2 | 0.157 | 1.82 | 26.1 | 1 | 1.6 | 3.06 | 7 | 0.42 | 7.5 | 0.129 | 26 | 41 |
| | RES-005I 1524.47-1527.47 | N | 24.4 | 0.25 | 0.112 | 3.2 | 12.6 | 1 | 1.9 | 2.96 | 9 | 0.32 | 9.2 | 0.103 | 21 | 41 |
| | RES-005I 1532.98-1534.97 | N | 24 | 0.18 | 0.108 | 1.39 | 81.8 | 0.8 | 1.3 | 3.21 | 3 | 0.42 | 11.5 | 0.128 | 30 | 43 |
| | RES-005I 1544-1546.55 | N | 19.6 | 0.24 | 0.237 | 3.1 | 392 | 4.9 | 1.3 | 1.26 | 8 | 0.38 | 26 | 0.136 | 15 | 49 |
| | RES-005I 1552.55-1555.58 | N | 23 | 0.29 | 0.18 | 4.71 | 64.7 | 2.1 | 2.2 | 2.24 | 8 | 0.28 | 16 | 0.105 | 26 | 52 |
| | RES-005I 1559.46-1562.46 | N | 25.5 | 0.24 | 0.134 | 3.43 | 41.9 | 0.9 | 2.1 | 2.64 | 10 | 0.32 | 12.5 | 0.104 | 31 | 64 |
| | RES-005I 1568.46-1571.46 | N | 22.4 | 0.18 | 0.118 | 3.56 | 20.1 | 1 | 3.1 | 2.84 | 11 | 0.27 | 10.8 | 0.098 | 26 | 61 |
| | | FD | 26.8 | 0.1 | 0.184 | 4.03 | 71.9 | 1.8 | 7.1 | 2.16 | 11 | 0.22 | 11.2 | 0.098 | 32 | 22 |
| | RES-005I 1586.46-1589.46 | N | 26 | 0.09 | 0.155 | 3.78 | 22.8 | 1.2 | 3 | 2.96 | 10 | 0.24 | 10.3 | 0.094 | 35 | 43 |
| | RES-005I 1604.46-1607.46 | N | 31.1 | 0.08 | 0.194 | 1.58 | 60.5 | 1.1 | 2 | 3.24 | 9 | 0.32 | 11.5 | 0.116 | 22 | 41 |
| | RES-005I 1613.46-1616.46 | N | 32.9 | 0.09 | 0.317 | 2.16 | 31 | 1 | 5.7 | 3.49 | 8 | 0.29 | 13.1 | 0.112 | 22 | 15 |
| | RES-005I 1616.46-1619 | N | 34.3 | 0.08 | 0.409 | 1.47 | 32 | 0.9 | 2.2 | 3.4 | 7 | 0.35 | 12.2 | 0.113 | 31 | 26 |
| | RES-005I 1626.54-1627.16 | N | 18.8 | 0.18 | 1.285 | 8.86 | 72.8 | 1.8 | 3.5 | 0.96 | 24 | 0.18 | 10.3 | 0.089 | 24 | 90 |
| | RES-005I 1627.16-1630 | N | 27.9 | 0.09 | 0.268 | 2.4 | 7.5 | 2.9 | 5.5 | 3.35 | 14 | 0.27 | 11.6 | 0.101 | 21 | 39 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Gallium PPM | Germanium PPM | Indium PPM | Iron % | Lead PPM | Lithium PPM | Nickel PPM | Potassium % | Selenium PPM | Tantalum PPM | Tin PPM | Titanium % | Zinc PPM | Manganese PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1630.5-1631.5 | N | 28 | 0.17 | 0.257 | 2.68 | 7.7 | 3.1 | 5.5 | 3.42 | 13 | 0.27 | 12.1 | 0.104 | 14 | 31 |
| | RES-005I 1632.56-1635.56 | N | 24.7 | 0.24 | 0.097 | 4.85 | 4.2 | 3.3 | 6.3 | 3.55 | 18 | 0.27 | 10.4 | 0.091 | 53 | 39 |
| | RES-005I 1638.37-1641 | N | 26.8 | 0.28 | 0.115 | 5.85 | 4.6 | 4.3 | 11.7 | 3.87 | 19 | 0.22 | 11.6 | 0.156 | 61 | 31 |
| | RES-005I 1645.84-1648.08 | N | 35.6 | 0.54 | 0.518 | 3.59 | 48 | 2.8 | 3.2 | 3.46 | 109 | 0.28 | 10.7 | 0.097 | 25 | 49 |
| | RES-005I 1652-1654.93 | N | 27.2 | 0.39 | 0.163 | 5.83 | 43.7 | 2.7 | 6.2 | 3.41 | 53 | 0.29 | 10.3 | 0.098 | 2 | 50 |
| | RES-005I 1654.93-1657.3 | N | 26.9 | 0.62 | 0.237 | 6.4 | 304 | 3.2 | 8.1 | 2.56 | 116 | 0.27 | 15.1 | 0.095 | 7 | 48 |
| | RES-005I 1677.8-1680.8 | N | 36.9 | 0.31 | 0.409 | 5.11 | 73.8 | 5.4 | 11.1 | 3.75 | 26 | 0.32 | 13.1 | 0.104 | 28 | 35 |
| | RES-005I 1695.23-1697.23 | N | 27.7 | 0.24 | 0.148 | 3.13 | 4.6 | 3.4 | 9.5 | 3.83 | 15 | 0.24 | 17 | 0.144 | 25 | 30 |
| | RES-005I 1711.23-1713.23 | N | 20.4 | 0.26 | 0.103 | 5.06 | 3.6 | 2.6 | 6.8 | 2.96 | 20 | 0.24 | 15.3 | 0.082 | 4 | 60 |
| | RES-005I 1727.23-1729.23 | N | 22.9 | 0.21 | 0.09 | 3.05 | 12.5 | 2.8 | 9.2 | 3.26 | 11 | 0.26 | 14.6 | 0.092 | 5 | 24 |
| | RES-005I 1730.5-1731.5 | N | 22.3 | 0.2 | 0.086 | 2.92 | 12 | 2.8 | 8.9 | 3.17 | 11 | 0.24 | 14.3 | 0.087 | 4 | 22 |
| | RES-005I 1743.23-1745.23 | N | 24.4 | 0.26 | 0.078 | 4.21 | 9.1 | 4.5 | 6.8 | 2.96 | 22 | 0.24 | 19.5 | 0.096 | <2 | 18 |
| | RES-005I 1759.23-1761.23 | N | 25.9 | 0.25 | 0.223 | 4.9 | 4 | 3 | 12.8 | 3.15 | 17 | 0.24 | 16.9 | 0.087 | 17 | 23 |
| | RES-005I 1775.23-1778.23 | N | 23.7 | 0.23 | 0.131 | 4.23 | 34.2 | 6.2 | 6.6 | 3.28 | 13 | 0.23 | 15.2 | 0.087 | 4 | 62 |
| | RES-005I 1794.36-1796.3 | N | 24.4 | 0.26 | 0.129 | 4.96 | 104.5 | 10.3 | 8.3 | 2.61 | 17 | 0.19 | 18 | 0.08 | 2 | 62 |
| | RES-005I 1811.3-1814.3 | N | 24.7 | 0.31 | 0.228 | 5.28 | 2.3 | 7.8 | 14.8 | 3.57 | 23 | 0.15 | 20.9 | 0.099 | 6 | 23 |
| | RES-005I 1830.5-1831.5 | N | 21.7 | 0.23 | 0.196 | 4.62 | 2 | 6.4 | 12.5 | 3.08 | 20 | 0.12 | 18.1 | 0.082 | 7 | 19 |
| | RES-005I 1835.3-1838.3 | N | 22.7 | 0.22 | 0.522 | 4.38 | 8.3 | 9.7 | 10 | 2.98 | 15 | 0.19 | 14.2 | 0.09 | 31 | 61 |
| | RES-005I 1855.91-1858.91 | N | 25.6 | 0.21 | 0.329 | 3.37 | 7.9 | 12.2 | 7.4 | 3.07 | 9 | 0.24 | 14.3 | 0.103 | 139 | 49 |
| | RES-005I 1872.9-1875.38 | N | 24.4 | 0.21 | 0.214 | 3.97 | 3 | 9.2 | 11.5 | 3.21 | 12 | 0.2 | 18.9 | 0.102 | 444 | 59 |
| | RES-005I 1875.38-1878.2 | N | 24.4 | 0.27 | 1.41 | 5.21 | 76.7 | 10.3 | 27.3 | 2.66 | 18 | 0.13 | 21.2 | 0.137 | 3170 | 29 |
| | RES-005I 1884-1887 | N | 34.9 | 0.36 | 3.34 | 7.54 | 19.2 | 12.7 | 41.1 | 3.82 | 20 | 0.26 | 11.8 | 0.651 | 142 | 240 |
| | RES-005I 1895-1897.06 | N | 21.2 | 0.23 | 0.246 | 3.71 | 16.3 | 8.9 | 36.5 | 2.49 | 11 | 0.22 | 16.2 | 0.12 | 1040 | 72 |
| | RES-005I 1901.49-1902.36 | N | 23.2 | 0.29 | 0.155 | 5.96 | 20.3 | 13.2 | 24.2 | 2.99 | 17 | 0.09 | 16.4 | 0.127 | 1140 | 66 |
| | RES-005I 1917.29-1919.1 | N | 28.4 | 0.33 | 0.225 | 7.59 | 4.1 | 19.5 | 96.8 | 4.86 | 18 | 0.15 | 10.8 | 0.495 | 283 | 262 |
| | RES-005I 1923.1-1925.3 | N | 28.6 | 0.36 | 0.56 | 10.2 | 91.2 | 17.9 | 104.5 | 4.66 | 24 | 0.16 | 9.6 | 0.5 | 930 | 312 |
| | RES-005I 1955.06-195.06 | N | 22.1 | 0.49 | 0.175 | 8.5 | 14.8 | 29.8 | 167.5 | 4.36 | 9 | 0.18 | 5.1 | 0.513 | 868 | 975 |
| | RES-005I 1960.5-1961.5 | N | 24 | 0.53 | 0.215 | 8.66 | 11.8 | 33.6 | 176.5 | 4.35 | 10 | 0.2 | 5.9 | 0.529 | 901 | 1000 |
| | RES-005I 1979.06-1982.06 | N | 24.2 | 0.45 | 0.27 | 8.99 | 4.3 | 31.5 | 194.5 | 3.82 | 10 | 0.19 | 5.9 | 0.511 | 170 | 906 |
| | RES-005I 2008.11-2011.11 | N | 24.9 | 0.28 | 0.345 | 7.93 | 5.6 | 27.3 | 104.5 | 4.61 | 13 | 0.23 | 8.3 | 0.529 | 207 | 746 |
| | RES-005I 2032.11-2035.11 | N | 31 | 0.37 | 0.917 | 9.19 | 2.9 | 22 | 76.6 | 5.15 | 23 | 0.17 | 13.1 | 0.618 | 182 | 762 |
| | RES-005I 2049.84-2052.84 | N | 23.9 | 0.23 | 0.167 | 2.71 | 18.2 | 10.7 | 14.4 | 4.91 | 12 | 0.21 | 12.8 | 0.139 | 126 | 144 |
| | RES-005I 2061.84-2064.84 | N | 26.4 | 0.24 | 0.207 | 3.59 | 7.4 | 17.1 | 12.8 | 4.01 | 11 | 0.18 | 15.6 | 0.132 | 215 | 104 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Molybdenum PPM | Niobium PPM | Phosphorus, Total (as P) PPM | Rhenium PPM | Rubidium PPM | Silver PPM | Sodium % | Strontium PPM | Tellurium PPM | Thallium PPM | Thorium PPM | Uranium PPM | Vanadium PPM | Yttrium PPM | Zirconium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1011.88-1012.45 | N | 7.46 | 6.1 | 830 | <0.002 | 79.2 | 1.39 | 0.78 | 135.5 | 0.83 | 0.49 | 4.2 | 1.2 | 134 | 18.4 | 56.6 |
| | RES-005I 1322.73-1323.23 | N | 8.19 | 4 | 580 | <0.002 | 78.3 | 7.26 | 0.06 | 57.4 | 1.2 | 0.46 | 3.2 | 1.6 | 80 | 13.6 | 32.2 |
| | RES-005I 1353-1353.49 | N | 13.4 | 4 | 730 | 0.002 | 113 | 0.68 | 0.06 | 58.2 | 2.52 | 0.6 | 3.6 | 1.5 | 83 | 16.2 | 36.5 |
| | RES-005I 1360.5-1361.51 | N | 13.6 | 5.9 | 830 | <0.002 | 148.5 | 1.97 | 0.09 | 67.5 | 2.24 | 0.77 | 4.2 | 1.7 | 99 | 15.7 | 58.4 |
| | RES-005I 1370.93-1374 | N | 24.6 | 3.6 | 640 | <0.002 | 66 | 3.41 | 0.04 | 148 | 10.9 | 0.27 | 5 | 1.5 | 39 | 4.1 | 30.5 |
| | RES-005I 1380-1383 | N | 32.1 | 3 | 1100 | <0.002 | 40.7 | 7.72 | 0.03 | 445 | 53.9 | 0.13 | 5.3 | 1.7 | 52 | 4.3 | 21.5 |
| | RES-005I 1389-1391.57 | N | 18.5 | 5.9 | 840 | <0.002 | 22 | 10.3 | 0.02 | 316 | 31.2 | 0.08 | 7.9 | 1.6 | 19 | 5.7 | 41.7 |
| | RES-005I 1396.3-1399.3 | N | 34.5 | 3.7 | 600 | <0.002 | 13.1 | 6.25 | 0.02 | 101 | 35.5 | 0.05 | 5.4 | 1.5 | 111 | 4 | 23.6 |
| | RES-005I 1405-1406.67 | N | 51 | 4 | 1790 | <0.002 | 28.4 | 6.76 | 0.02 | 362 | 145.5 | 0.09 | 7.7 | 1.7 | 60 | 4.8 | 24.7 |
| | RES-005I 1410.18-1413.18 | N | 36.3 | 2.9 | 450 | <0.002 | 18.6 | 9.56 | 0.02 | 207 | 49 | 0.07 | 3.4 | 1.5 | 27 | 4 | 21.1 |
| | RES-005I 1419.18-1422.18 | N | 53.2 | 2.9 | 1040 | 0.002 | 11.4 | 5.49 | 0.03 | 283 | 69.3 | 0.04 | 2.7 | 1.7 | 74 | 4.6 | 23.4 |
| | RES-005I 1425.5-1426.51 | N | 38 | 2.1 | 1080 | <0.002 | 7.8 | 3.81 | 0.03 | 287 | 48.4 | 0.03 | 1.9 | 1.2 | 76 | 3.2 | 16.9 |
| | RES-005I 1428.18-1431.18 | N | 26.6 | 3.3 | 560 | <0.002 | 6.6 | 2.8 | 0.02 | 346 | 159 | 0.03 | 3.4 | 1.4 | 36 | 4.4 | 27.6 |
| | RES-005I 1437.13-1440.13 | N | 21.5 | 4.3 | 550 | <0.002 | 36.5 | 2.08 | 0.02 | 217 | 51.2 | 0.09 | 4.5 | 1.2 | 27 | 3.4 | 27.4 |
| | RES-005I 1446.13-1449.13 | N | 21.7 | 3.4 | 890 | <0.002 | 75 | 3.96 | 0.03 | 333 | 12.2 | 0.2 | 5.2 | 0.8 | 31 | 2.9 | 19.2 |
| | RES-005I 1455.13-1458.13 | N | 26.7 | 3.5 | 680 | <0.002 | 92 | 2.46 | 0.04 | 281 | 6.53 | 0.26 | 4.6 | 0.9 | 47 | 3.7 | 23.7 |
| | RES-005I 1464.13-1467.13 | N | 22.1 | 3 | 620 | <0.002 | 83 | 12.65 | 0.04 | 306 | 2.49 | 0.26 | 4.7 | 0.8 | 36 | 2.8 | 18.2 |
| | RES-005I 1473.13-1476.13 | N | 70.5 | 2.9 | 270 | <0.002 | 62.9 | 2.79 | 0.04 | 42.6 | 2.86 | 0.21 | 3.7 | 0.9 | 35 | 2.2 | 18.5 |
| | RES-005I 1481-1482.66 | N | 35.5 | 3.3 | 460 | <0.002 | 59.6 | 3.48 | 0.03 | 115 | 4.18 | 0.17 | 4.5 | 0.8 | 23 | 2.2 | 18.1 |
| | RES-005I 1485.5-1486.51 | N | 35.1 | 3.1 | 440 | <0.002 | 58.7 | 5.04 | 0.03 | 113.5 | 4.08 | 0.17 | 4.5 | 0.8 | 22 | 2.1 | 17.6 |
| | RES-005I 1487.1-1490.1 | N | 29.6 | 3.8 | 410 | <0.002 | 120 | 3.44 | 0.06 | 52.9 | 1.28 | 0.41 | 4.4 | 1.1 | 35 | 3.3 | 17.4 |
| | RES-005I 1490.1-1493.1 | N | 51 | 3.4 | 430 | <0.002 | 121 | 2.35 | 0.05 | 84.1 | 1.9 | 0.4 | 4.5 | 1.1 | 38 | 3 | 19.8 |
| | RES-005I 1499-1502 | N | 19.1 | 4.4 | 510 | <0.002 | 138.5 | 1.84 | 0.05 | 120 | 0.61 | 0.5 | 4.4 | 1.1 | 47 | 3.3 | 29.6 |
| | RES-005I 1506.56-1509.47 | N | 18.4 | 5.8 | 800 | <0.002 | 122.5 | 2.8 | 0.05 | 111.5 | 2.77 | 0.42 | 6 | 1.2 | 91 | 4.4 | 33.1 |
| | RES-005I 1515.47-1518.47 | N | 14.5 | 5.3 | 440 | <0.002 | 130.5 | 1.43 | 0.05 | 96.1 | 0.88 | 0.43 | 4.8 | 0.9 | 37 | 3.1 | 16.1 |
| | RES-005I 1524.47-1527.47 | N | 33 | 3.9 | 290 | 0.002 | 126.5 | 3.91 | 0.05 | 56.6 | 1.38 | 0.4 | 4 | 0.8 | 37 | 2.2 | 12.7 |
| | RES-005I 1532.98-1534.97 | N | 9.26 | 5.3 | 380 | <0.002 | 132 | 3.94 | 0.06 | 116 | 0.67 | 0.39 | 4 | 0.8 | 38 | 2.4 | 15.8 |
| | RES-005I 1544-1546.55 | N | 23.7 | 5 | 710 | <0.002 | 60.7 | 22.8 | 0.03 | 611 | 2.28 | 0.16 | 6.2 | 1 | 31 | 1.9 | 15.8 |
| | RES-005I 1552.55-1555.58 | N | 34.1 | 3.9 | 450 | <0.002 | 98.7 | 4.02 | 0.05 | 184 | 1.22 | 0.3 | 5 | 0.8 | 41 | 2.3 | 13.4 |
| | RES-005I 1559.46-1562.46 | N | 32.2 | 4.2 | 330 | <0.002 | 111 | 2.1 | 0.05 | 117.5 | 1.37 | 0.31 | 3.9 | 0.8 | 44 | 2.4 | 14.7 |
| | RES-005I 1568.46-1571.46 | N | 33.3 | 3.3 | 390 | <0.002 | 112.5 | 1.29 | 0.05 | 85.6 | 0.75 | 0.3 | 3.8 | 0.8 | 40 | 2.2 | 14.8 |
| | | FD | 34.5 | 2.5 | 400 | 0.002 | 86.7 | 1.84 | 0.04 | 180 | 1.16 | 0.27 | 4.9 | 0.8 | 50 | 1.9 | 14.1 |
| | RES-005I 1586.46-1589.46 | N | 25.1 | 2.8 | 390 | 0.002 | 118 | 6.77 | 0.05 | 110 | 1.43 | 0.35 | 3.8 | 0.8 | 51 | 2.6 | 15.5 |
| | RES-005I 1604.46-1607.46 | N | 13.8 | 3.9 | 530 | <0.002 | 128.5 | 7.53 | 0.06 | 210 | 1.11 | 0.36 | 4.5 | 0.8 | 55 | 2.8 | 15.1 |
| | RES-005I 1613.46-1616.46 | N | 29.5 | 3.3 | 590 | 0.002 | 137.5 | 1.59 | 0.06 | 186.5 | 2.01 | 0.37 | 4.5 | 1 | 60 | 2.7 | 15.6 |
| | RES-005I 1616.46-1619 | N | 14.25 | 4 | 630 | <0.002 | 127.5 | 0.91 | 0.05 | 287 | 9.54 | 0.35 | 4.9 | 1 | 60 | 3.1 | 14.5 |
| | RES-005I 1626.54-1627.16 | N | 144.5 | 2.6 | 630 | 0.003 | 37.6 | 3.2 | 0.02 | 327 | 45.5 | 0.15 | 5.3 | 1.5 | 63 | 2.6 | 20.3 |
| | RES-005I 1627.16-1630 | N | 30.6 | 3.1 | 380 | 0.002 | 130.5 | 0.61 | 0.06 | 112 | 1.76 | 0.38 | 3.5 | 0.7 | 60 | 2.1 | 14.8 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Molybdenum PPM | Niobium PPM | Phosphorus, Total (as P) PPM | Rhenium PPM | Rubidium PPM | Silver PPM | Sodium % | Strontium PPM | Tellurium PPM | Thallium PPM | Thorium PPM | Uranium PPM | Vanadium PPM | Yttrium PPM | Zirconium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I | RES-005I 1630.5-1631.5 | N | 36 | 3.2 | 390 | <0.002 | 122.5 | 0.49 | 0.05 | 117.5 | 1.87 | 0.39 | 3.7 | 0.8 | 60 | 2.2 | 15.6 |
| | RES-005I 1632.56-1635.56 | N | 28.2 | 3.4 | 300 | 0.053 | 122.5 | 0.91 | 0.04 | 131.5 | 0.56 | 0.35 | 3.8 | 1.1 | 43 | 3.5 | 17 |
| | RES-005I 1638.37-1641 | N | 65.6 | 3 | 390 | 0.101 | 133 | 2.74 | 0.04 | 237 | 0.47 | 0.41 | 5.4 | 1.7 | 74 | 5.6 | 53.2 |
| | RES-005I 1645.84-1648.08 | N | 32.1 | 3.6 | 470 | 0.121 | 128.5 | 33.6 | 0.04 | 238 | 4.07 | 0.45 | 4.6 | 1 | 64 | 2.7 | 14.7 |
| | RES-005I 1652-1654.93 | N | 60.4 | 3.8 | 370 | 0.163 | 122 | 1.67 | 0.03 | 99.5 | 0.63 | 0.4 | 4.2 | 1.2 | 50 | 3 | 16.1 |
| | RES-005I 1654.93-1657.3 | N | 223 | 3.6 | 680 | 0.764 | 91.4 | 7.72 | 0.02 | 475 | 1.07 | 0.31 | 5.7 | 2.1 | 53 | 2.4 | 17.1 |
| | RES-005I 1677.8-1680.8 | N | 414 | 3.6 | 520 | 0.734 | 146.5 | 1.43 | 0.04 | 205 | 1.91 | 0.48 | 4 | 1.6 | 96 | 3.5 | 18.8 |
| | RES-005I 1695.23-1697.23 | N | 166 | 3.5 | 520 | 0.949 | 130 | 1.86 | 0.04 | 194.5 | 5.37 | 0.41 | 4.8 | 2 | 84 | 4 | 51.5 |
| | RES-005I 1711.23-1713.23 | N | 160.5 | 3 | 240 | 0.473 | 103.5 | 1 | 0.03 | 119 | 0.97 | 0.33 | 2.8 | 1 | 64 | 2.2 | 12.8 |
| | RES-005I 1727.23-1729.23 | N | 133.5 | 3 | 380 | 0.336 | 112 | 0.99 | 0.04 | 110.5 | 1.47 | 0.33 | 3.9 | 1.4 | 65 | 2.8 | 15.3 |
| | RES-005I 1730.5-1731.5 | N | 133 | 2.9 | 370 | 0.322 | 110 | 0.95 | 0.04 | 106.5 | 1.42 | 0.33 | 3.7 | 1.4 | 63 | 2.7 | 14.8 |
| | RES-005I 1743.23-1745.23 | N | 318 | 3.1 | 360 | 0.632 | 104.5 | 1.81 | 0.03 | 124 | 0.63 | 0.49 | 3 | 1.2 | 82 | 1.2 | 11.4 |
| | RES-005I 1759.23-1761.23 | N | 81.7 | 2.8 | 350 | 1.3 | 110.5 | 0.67 | 0.03 | 112 | 2.72 | 0.66 | 3 | 1.4 | 55 | 4.3 | 15.5 |
| | RES-005I 1775.23-1778.23 | N | 327 | 2.8 | 430 | 0.884 | 110 | 0.68 | 0.03 | 193 | 1.02 | 0.55 | 3.6 | 1.7 | 65 | 2.5 | 15.8 |
| | RES-005I 1794.36-1796.3 | N | 273 | 2.5 | 460 | 1.105 | 93.2 | 0.94 | 0.03 | 158.5 | 0.71 | 0.35 | 3.8 | 1.5 | 62 | 4 | 14.7 |
| | RES-005I 1811.3-1814.3 | N | 259 | 1.9 | 370 | 1.715 | 123.5 | 1.16 | 0.05 | 284 | 2.47 | 0.78 | 3.8 | 2.5 | 77 | 2.3 | 26.8 |
| | RES-005I 1830.5-1831.5 | N | 221 | 1.5 | 310 | 1.47 | 106.5 | 1.01 | 0.04 | 246 | 2.08 | 0.61 | 3.2 | 2 | 66 | 1.9 | 21.9 |
| | RES-005I 1835.3-1838.3 | N | 217 | 2.4 | 330 | 0.431 | 107.5 | 0.74 | 0.05 | 214 | 2.62 | 0.34 | 3.6 | 1.9 | 63 | 2.7 | 27.5 |
| | RES-005I 1855.91-1858.91 | N | 183.5 | 2.9 | 480 | 0.381 | 113 | 0.72 | 0.05 | 296 | 0.28 | 0.32 | 4.2 | 2.9 | 57 | 3.8 | 29.7 |
| | RES-005I 1872.9-1875.38 | N | 186.5 | 2.4 | 490 | 0.246 | 117 | 0.85 | 0.04 | 219 | 0.33 | 0.32 | 4.1 | 2.3 | 72 | 4.7 | 31.8 |
| | RES-005I 1875.38-1878.2 | N | 301 | 1.7 | 570 | 0.444 | 98.5 | 1.94 | 0.03 | 370 | 0.45 | 0.31 | 3.9 | 3.2 | 112 | 7.7 | 31 |
| | RES-005I 1884-1887 | N | 406 | 3.2 | 2710 | 0.749 | 191.5 | 2.9 | 0.04 | 150.5 | 0.94 | 1.05 | 1.5 | 3.3 | 269 | 33.9 | 23.1 |
| | RES-005I 1895-1897.06 | N | 298 | 3.1 | 220 | 0.413 | 88.9 | 0.97 | 0.04 | 69.2 | 0.3 | 0.36 | 8.6 | 12.2 | 66 | 9.2 | 27.3 |
| | RES-005I 1901.49-1902.36 | N | 217 | 1.4 | 600 | 0.392 | 105.5 | 0.96 | 0.04 | 67.9 | 0.31 | 0.36 | 2.2 | 1 | 104 | 4.8 | 19.7 |
| | RES-005I 1917.29-1919.1 | N | 357 | 1.7 | 1660 | 0.58 | 152 | 2.09 | 0.06 | 52.9 | 2.18 | 1.19 | 0.4 | 1.4 | 228 | 19.5 | 19 |
| | RES-005I 1923.1-1925.3 | N | 204 | 1.9 | 1980 | 0.393 | 131.5 | 2.86 | 0.06 | 99.6 | 1.09 | 1.24 | 0.5 | 1.6 | 230 | 17.9 | 19.3 |
| | RES-005I 1955.06-195.06 | N | 668 | 1.9 | 1390 | 1.395 | 324 | 1.6 | 0.03 | 44.3 | 0.4 | 1.38 | 0.8 | 0.9 | 190 | 13.2 | 29.8 |
| | RES-005I 1960.5-1961.5 | N | 713 | 2 | 1460 | 1.655 | 369 | 1.93 | 0.03 | 48.7 | 0.55 | 1.5 | 0.9 | 1 | 196 | 15.4 | 18.5 |
| | RES-005I 1979.06-1982.06 | N | 534 | 2.4 | 1210 | 1.11 | 388 | 1.52 | 0.04 | 49.3 | 0.52 | 1.58 | 0.6 | 1.2 | 159 | 12 | 26.4 |
| | RES-005I 2008.11-2011.11 | N | 208 | 2.8 | 1700 | 0.408 | 118 | 2.83 | 0.04 | 65 | 0.43 | 1.45 | 0.3 | 0.9 | 194 | 11.2 | 13.5 |
| | RES-005I 2032.11-2035.11 | N | 396 | 2.1 | 2020 | 0.833 | 136.5 | 4.81 | 0.07 | 45.6 | 1.01 | 1.42 | 0.5 | 1.8 | 268 | 16.2 | 12.9 |
| | RES-005I 2049.84-2052.84 | N | 270 | 2.6 | 780 | 0.498 | 115 | 1.43 | 0.15 | 138 | 0.2 | 0.9 | 3.6 | 1 | 74 | 7.6 | 12 |
| | RES-005I 2061.84-2064.84 | N | 493 | 2.4 | 590 | 0.802 | 145.5 | 0.74 | 0.06 | 47.9 | 0.24 | 0.56 | 3.1 | 0.9 | 87 | 6.4 | 15.9 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Radium 226 with alpha emitting isotopes PCI/G | Radium-228 PCI/G | Solids, Percent % | ALS Aluminum % | Arsenic PPM | Barium PPM | Bismuth PPM | Cadmium PPM | Calcium % | Cesium PPM | Cobalt PPM | Copper PPM | Gallium PPM | Germanium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005J | RES-005J 1660.4-1668.47 | N | 2.3 | 0.47 | 11 | 99.8 | 6.47 | 162 | 230 | 4.37 | 0.65 | 0.01 | 0.74 | 32.3 | 10000 | 24.9 | 0.25 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Indium PPM | Iron % | Lead PPM | Lithium PPM | Nickel PPM | Potassium % | Selenium PPM | Tantalum PPM | Tin PPM | Titanium % | Zinc PPM | Manganese PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005J | RES-005J 1660.4-1668.47 | N | 0.157 | 4.83 | 2.2 | 3.7 | 12.7 | 3.15 | 19 | 0.31 | 15.7 | 0.097 | 59 | 39 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Molybdenum PPM | Niobium PPM | Phosphorus, Total (as P) PPM | Rhenium PPM | Rubidium PPM | Silver PPM | Sodium % | Strontium PPM | Tellurium PPM | Thallium PPM | Thorium PPM | Uranium PPM | Vanadium PPM | Yttrium PPM | Zirconium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-005J | RES-005J 1660.4-1668.47 | N | 170.5 | 3.4 | 310 | 1 | 112 | 1.56 | 0.04 | 150.5 | 1.05 | 0.49 | 3.7 | 1.5 | 63 | 2.8 | 15 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

**APPENDIS D**
**ICP-MS WHOLE ROCK ANALYSIS**

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Radium 226 with alpha emitting isotopes PCI/G | Radium-228 PCI/G | Temperature pH taken at DEG C | ALS Aluminum % | Arsenic PPM | Barium PPM | Bismuth PPM | Cadmium PPM | Calcium % | Cesium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-006D | RES-006D 1247.48-1250.48 | N | <2.5 | 0.36 | 5.1 | 21.4 | 8.84 | 3.4 | 330 | 6.54 | 1.95 | 2.63 | 1.53 |
| | RES-006D 1405.47-1408.44 | N | 0.47 | 0.36 | 5 | 21.4 | 8.16 | 3.2 | 560 | 6.73 | 0.06 | 0.7 | 2.35 |
| | RES-006D 1450.44-1453.44 | N | 3.4 | 0.93 | 7.3 | 21.4 | 7.11 | 7.9 | 130 | 19.15 | 0.07 | 1.21 | 2.17 |
| | RES-006D 1495.44-1498.44 | N | 2.6 | 0.54 | 5.6 | 21.4 | 6.48 | 3.2 | 220 | 31.4 | 2.58 | 0.71 | 2.41 |
| | RES-006D 1532.81-1535.81 | N | 2 | 0.87 | 6.2 | 21.4 | 7.48 | 1.5 | 270 | 9.07 | 0.02 | 0.43 | 1.87 |
| | RES-006D 1577.43-1580.43 | N | 0.41 | 0.61 | 7.9 | 21.4 | 8.28 | 1.2 | 580 | 7.28 | 0.03 | 0.83 | 4.91 |
| | RES-006D 1600.5-1601.5 | N | 3.4 | 0.44 | 14 | 21.4 | 8.76 | 1 | 590 | 8.3 | 0.06 | 0.86 | 5.13 |
| | RES-006D 1622.43-1625.43 | N | 1.7 | 0.46 | 5 | 21.4 | 7.66 | 0.9 | 210 | 5.29 | <0.02 | 0.24 | 4.31 |
| | RES-006D 1667.43-1670.43 | N | 2 | 0.49 | 5.8 | 21.4 | 8.05 | 1 | 310 | 2.08 | <0.02 | 0.23 | 2.46 |
| | RES-006D 1705.4-1708.4 | N | 1.4 | 0.25 | 7.4 | 21.4 | 6.68 | 1.4 | 130 | 4.98 | <0.02 | 0.14 | 1.26 |
| | RES-006D 1750.4-1753.4 | N | <1.4 | 1.1 | 9.3 | 21.4 | 7.3 | 3.2 | 80 | 0.84 | <0.02 | 0.16 | 0.89 |
| | RES-006D 1798.4-1801.4 | N | 2.5 | 0.89 | 7.8 | 21.4 | 6.49 | 1.9 | 110 | 0.73 | <0.02 | 0.16 | 1.09 |
| | RES-006D 1843.4-1846.4 | N | 2.1 | 1 | 7.6 | 21.4 | 6.76 | 5.4 | 100 | 1.18 | <0.02 | 0.11 | 0.59 |
| | RES-006D 1898.21-1901.09 | N | 4.2 | 1.8 | 6.6 | 21.4 | 5.91 | 1.1 | 140 | 0.69 | <0.02 | 0.18 | 0.56 |
| | RES-006D 1927.23-1930.23 | N | 2.6 | 0.71 | 7.7 | 21.4 | 5.67 | 31.1 | 170 | 32 | 3.9 | 0.09 | 0.25 |
| | | FD | 2.5 | 1 | 7.6 | 21.4 | 5.55 | 31.6 | 170 | 32.3 | 3.98 | 0.09 | 0.25 |
| | RES-006D 1952.56-1954.83 | N | 0.82 | 1 | 6.3 | 21.4 | 1.33 | 3.7 | 40 | 1.88 | <0.02 | 0.03 | 0.13 |
| | RES-006D 1954.83-1972 | N | 1.5 | 0.36 | 9.8 | 23 | 5.2 | 18.5 | 160 | 20.6 | <0.02 | 0.07 | 0.5 |
| | RES-006D 1980.6-1983.6 | N | 2.7 | 0.69 | 24 | 21.4 | 3.96 | 3.6 | 90 | 2.28 | 3.53 | 0.11 | 0.46 |
| | RES-006D 1995.6-1998.6 | N | 7.9 | 1.5 | 12 | 21.4 | 3.97 | 0.8 | 110 | 8 | <0.02 | 0.28 | 0.47 |
| | RES-006D 2022.66-2025.66 | N | 1.1 | 0.33 | 16 | 21.4 | 6.24 | <0.2 | 120 | 4.01 | <0.02 | 0.22 | 0.82 |
| | RES-006D 2040.66-2043.66 | N | 1.9 | 0.59 | 11 | 21.4 | 7.77 | 1.4 | 170 | 1.36 | <0.02 | 0.28 | 2.35 |
| | RES-006D 2058.16-2061.16 | N | <2.3 | 0.39 | 8.8 | 21.4 | 7.29 | 1.3 | 150 | 0.9 | <0.02 | 0.66 | 5.91 |
| | RES-006D 2073.13-2076.13 | N | <2.1 | 0.31 | 8.8 | 21.4 | 6.17 | 2 | 160 | 1.38 | 0.5 | 0.47 | 4.93 |
| | | FD | 1.5 | 0.25 | 12 | 21.4 | 6.04 | 1.6 | 150 | 1.47 | 0.46 | 0.46 | 4.77 |
| | RES-006D 2091.13-2094.13 | N | 1.6 | 0.37 | 13 | 21.4 | 8.4 | 0.7 | 250 | 0.42 | <0.02 | 0.56 | 8.04 |
| | RES-006D 2115.47-2118.47 | N | 2.4 | 0.49 | 11 | 21.4 | 5.06 | <0.2 | 150 | 37.5 | 0.26 | 0.22 | 0.6 |
| | RES-006D 2125.45-2128.42 | N | 1.7 | 0.58 | 8.7 | 21.4 | 5.54 | <0.2 | 310 | 5.56 | <0.02 | 0.11 | 0.56 |
| | RES-006D 2137.08-2138.5 | N | 6.6 | 0.6 | 13 | 21.4 | 5.81 | 5.1 | 110 | 34.4 | <0.02 | 0.45 | 0.12 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

**APPENDIS D**
**ICP-MS WHOLE ROCK ANALYSIS**

| Hole ID | Sample ID | Type | Cobalt PPM | Copper PPM | Gallium PPM | Germanium PPM | Indium PPM | Iron % | Lead PPM | Lithium PPM | Nickel PPM | Potassium % | Selenium PPM | Tantalum PPM | Tin PPM | Titanium % | Zinc PPM | Manganese PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-006D | RES-006D 1247.48-1250.48 | N | 23.7 | 611 | 24.6 | 0.19 | 0.701 | 6.33 | 25.8 | 14.2 | 7 | 2.65 | 3 | 0.29 | 2.3 | 0.522 | 1270 | 2080 |
| | RES-006D 1405.47-1408.44 | N | 10.8 | 805 | 23.1 | 0.21 | 1.42 | 5.16 | 14.5 | 6.2 | 5.3 | 5.26 | 3 | 0.49 | 4.5 | 0.41 | 273 | 1120 |
| | RES-006D 1450.44-1453.44 | N | 30.8 | 4650 | 34.6 | 0.28 | 2.12 | 9.96 | 12.5 | 10.7 | 15.1 | 3.28 | 6 | 0.3 | 11.1 | 0.391 | 1225 | 1340 |
| | RES-006D 1495.44-1498.44 | N | 26.4 | 6850 | 28.8 | 0.25 | 5.03 | 9.69 | 25.2 | 11.8 | 10.1 | 3.19 | 4 | 0.33 | 10.4 | 0.42 | 2300 | 1635 |
| | RES-006D 1532.81-1535.81 | N | 13.4 | 2950 | 27 | 0.24 | 1.245 | 7.63 | 6.7 | 5.3 | 4 | 3.9 | 5 | 0.31 | 12.2 | 0.424 | 690 | 486 |
| | RES-006D 1577.43-1580.43 | N | 16.8 | 3390 | 29.6 | 0.22 | 1.065 | 6.49 | 6.6 | 22.2 | 17.8 | 4.25 | 4 | 0.47 | 9.5 | 0.503 | 761 | 1160 |
| | RES-006D 1600.5-1601.5 | N | 16.7 | 3420 | 29.3 | 0.22 | 1.085 | 6.64 | 6.8 | 22 | 17.6 | 4.3 | 4 | 0.49 | 9.9 | 0.518 | 763 | 1175 |
| | RES-006D 1622.43-1625.43 | N | 16.4 | 3420 | 27.3 | 0.23 | 0.606 | 7.42 | 4.1 | 10.6 | 16.3 | 3.89 | 6 | 0.24 | 12.7 | 0.283 | 641 | 393 |
| | RES-006D 1667.43-1670.43 | N | 16 | 1150 | 27.3 | 0.21 | 0.131 | 5.84 | 2.2 | 2.5 | 8.9 | 4.2 | 8 | 0.15 | 15.2 | 0.198 | 586 | 43 |
| | RES-006D 1705.4-1708.4 | N | 23.8 | 1930 | 21.2 | 0.32 | 0.157 | 11.25 | 2 | 2.6 | 15.5 | 3.11 | 19 | 0.18 | 14.4 | 0.201 | 274 | 41 |
| | RES-006D 1750.4-1753.4 | N | 28.4 | 441 | 19.9 | 0.32 | 0.091 | 10.7 | 3 | 2.4 | 10.5 | 3.37 | 21 | 0.15 | 7.8 | 0.182 | 426 | 27 |
| | RES-006D 1798.4-1801.4 | N | 27.6 | 1210 | 20.2 | 0.31 | 0.053 | 9.8 | 2.3 | 2.8 | 12.9 | 3.16 | 24 | 0.16 | 11.6 | 0.194 | 378 | 30 |
| | RES-006D 1843.4-1846.4 | N | 155 | 665 | 20.5 | 0.32 | 0.081 | 10.25 | 8.8 | 2.8 | 23 | 3.09 | 24 | 0.31 | 11.8 | 0.184 | 328 | 26 |
| | RES-006D 1898.21-1901.09 | N | 55.4 | 2020 | 14.8 | 0.27 | 0.368 | 6.07 | 24.7 | 10 | 15.6 | 2.17 | 20 | 0.32 | 11.6 | 0.151 | 7 | 48 |
| | RES-006D 1927.23-1930.23 | N | 27.9 | 8570 | 27.8 | 0.21 | 0.895 | 5.24 | 303 | 19 | 14.1 | 1.14 | 16 | 0.16 | 16.3 | 0.079 | 9 | 24 |
| | | FD | 27.3 | 8610 | 27.7 | 0.21 | 0.887 | 5.13 | 305 | 19.1 | 12.9 | 1.13 | 16 | 0.16 | 16.4 | 0.078 | 10 | 21 |
| | RES-006D 1952.56-1954.83 | N | 10.6 | 566 | 4.81 | 0.11 | 0.191 | 2.37 | 128.5 | 1.6 | 3.6 | 0.52 | 9 | 0.1 | 5.4 | 0.039 | <2 | 58 |
| | RES-006D 1954.83-1972 | N | 21 | 6170 | 25.4 | 0.22 | 0.57 | 4.35 | 284 | 8.8 | 14.3 | 2.05 | 13 | 0.33 | 18.6 | 0.144 | 7 | 46 |
| | RES-006D 1980.6-1983.6 | N | 80.5 | 4190 | 18.75 | 0.35 | 1.06 | 12.15 | 271 | 4.5 | 30.5 | 1.61 | 31 | 0.12 | 13.6 | 0.082 | 345 | 75 |
| | RES-006D 1995.6-1998.6 | N | 86.5 | 10000 | 21.4 | 0.48 | 4.36 | 10.35 | 322 | 5.6 | 35.3 | 1.22 | 39 | 0.14 | 22.5 | 0.082 | 443 | 82 |
| | RES-006D 2022.66-2025.66 | N | 80.6 | 10000 | 20.8 | 0.96 | 0.755 | 9.05 | 60 | 6.1 | 83.4 | 2.79 | 49 | <0.05 | 65.3 | 0.142 | 213 | 70 |
| | RES-006D 2040.66-2043.66 | N | 55.1 | 10000 | 21.6 | 0.36 | 0.903 | 6.42 | 92.1 | 6.8 | 46.5 | 3.76 | 27 | 0.1 | 21.7 | 0.261 | 374 | 148 |
| | RES-006D 2058.16-2061.16 | N | 46.7 | 10000 | 23.4 | 0.27 | 0.308 | 6.97 | 7.6 | 22.2 | 67.5 | 4.01 | 22 | 0.16 | 14.1 | 0.48 | 96 | 289 |
| | RES-006D 2073.13-2076.13 | N | 43.8 | 10000 | 22.5 | 0.33 | 0.755 | 8.45 | 19.6 | 11.9 | 64.5 | 4.04 | 38 | 0.12 | 21.4 | 0.382 | 394 | 410 |
| | | FD | 42.2 | 10000 | 22.3 | 0.32 | 0.759 | 8.15 | 20 | 11.6 | 63.6 | 3.99 | 37 | 0.12 | 21.2 | 0.362 | 379 | 396 |
| | RES-006D 2091.13-2094.13 | N | 30.5 | 10000 | 24.7 | 0.26 | 0.467 | 5.67 | 17.7 | 26.6 | 61.6 | 4.94 | 20 | 0.14 | 15.5 | 0.463 | 151 | 489 |
| | RES-006D 2115.47-2118.47 | N | 12.4 | 8870 | 15.7 | 0.43 | 0.639 | 4.46 | 147 | 6.5 | 19.1 | 2.19 | 21 | 0.16 | 22.9 | 0.089 | 26 | 67 |
| | RES-006D 2125.45-2128.42 | N | 18.9 | 6140 | 18 | 0.38 | 0.282 | 3.55 | 154 | 5.9 | 15.7 | 2.62 | 14 | 0.22 | 23.1 | 0.112 | 30 | 53 |
| | RES-006D 2137.08-2138.5 | N | 35 | 6620 | 36.7 | 0.35 | 0.462 | 9.49 | 2350 | 36.1 | 19.3 | 0.51 | 19 | 0.19 | 40.9 | 0.089 | 6 | 35 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIS D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Molybdenum PPM | Niobium PPM | Phosphorus, Total (as P) PPM | Rhenium PPM | Rubidium PPM | Silver PPM | Sodium % | Strontium PPM | Tellurium PPM | Thallium PPM | Thorium PPM | Uranium PPM | Vanadium PPM | Yttrium PPM | Zirconium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-006D | RES-006D 1247.48-1250.48 | N | 2.72 | 4.5 | 740 | 0.003 | 122.5 | 1.15 | 2.03 | 364 | 2.18 | 1.09 | 1.7 | 0.8 | 175 | 19.4 | 23.4 |
| | RES-006D 1405.47-1408.44 | N | 4.21 | 8.1 | 1440 | 0.012 | 171.5 | 0.72 | 0.05 | 110 | 3.97 | 1.46 | 3.7 | 1.2 | 81 | 18.2 | 20.2 |
| | RES-006D 1450.44-1453.44 | N | 2.66 | 5.2 | 1430 | 0.002 | 122.5 | 2.95 | 0.11 | 81 | 15.9 | 0.98 | 2.4 | 3.8 | 125 | 18 | 38.5 |
| | RES-006D 1495.44-1498.44 | N | 1.46 | 5.8 | 1180 | 0.002 | 115 | 4.83 | 0.03 | 81.7 | 20.9 | 0.97 | 2.3 | 3.1 | 90 | 18.5 | 66.8 |
| | RES-006D 1532.81-1535.81 | N | 2.41 | 6 | 1540 | <0.002 | 138 | 1.18 | 0.02 | 33 | 5.44 | 0.92 | 1.7 | 3 | 103 | 16.4 | 19.7 |
| | RES-006D 1577.43-1580.43 | N | 1.32 | 7.8 | 1210 | 0.002 | 173.5 | 1.45 | 0.05 | 94.7 | 3.87 | 1.54 | 2.8 | 2.3 | 111 | 20.9 | 25.2 |
| | RES-006D 1600.5-1601.5 | N | 1.18 | 8.2 | 1250 | 0.002 | 208 | 1.67 | 0.05 | 96.4 | 4.46 | 1.61 | 3.4 | 2.5 | 110 | 23 | 26.6 |
| | RES-006D 1622.43-1625.43 | N | 15.9 | 3.8 | 1020 | 0.017 | 153 | 1.16 | 0.04 | 43.5 | 2.72 | 1.09 | 1.8 | 2.6 | 129 | 13.7 | 16.1 |
| | RES-006D 1667.43-1670.43 | N | 31.9 | 2.4 | 1010 | 0.044 | 170.5 | 0.19 | 0.03 | 57 | 1.32 | 0.73 | 2.1 | 2.4 | 98 | 15.5 | 11.7 |
| | RES-006D 1705.4-1708.4 | N | 41.7 | 2.4 | 440 | 0.067 | 116.5 | 0.39 | 0.03 | 26.6 | 2.86 | 0.52 | 1.8 | 2.3 | 119 | 14 | 20.2 |
| | RES-006D 1750.4-1753.4 | N | 55.3 | 2.3 | 730 | 0.082 | 114 | 0.1 | 0.04 | 210 | 0.9 | 0.52 | 1.9 | 1.2 | 66 | 15.3 | 21.1 |
| | RES-006D 1798.4-1801.4 | N | 90.5 | 2.3 | 470 | 0.118 | 121 | 0.15 | 0.04 | 54 | 0.8 | 0.46 | 3.5 | 2.1 | 113 | 19.6 | 34.2 |
| | RES-006D 1843.4-1846.4 | N | 334 | 4.1 | 800 | 0.446 | 107 | 0.28 | 0.04 | 113.5 | 0.7 | 0.38 | 4 | 1.6 | 108 | 8.2 | 28.7 |
| | RES-006D 1898.21-1901.09 | N | 393 | 4.9 | 510 | 0.551 | 79.2 | 0.32 | 0.03 | 274 | 0.63 | 0.25 | 10.6 | 3 | 103 | 9.5 | 33.9 |
| | RES-006D 1927.23-1930.23 | N | 175 | 2 | 660 | 0.364 | 43 | 6.82 | 0.02 | 699 | 1.33 | 0.13 | 2.6 | 2.8 | 88 | 2.1 | 5.4 |
| | | FD | 173.5 | 2.1 | 650 | 0.381 | 42.3 | 6.64 | 0.02 | 704 | 1.34 | 0.12 | 2.5 | 2.9 | 87 | 2.1 | 5.1 |
| | RES-006D 1952.56-1954.83 | N | 277 | 1.9 | 180 | 0.562 | 20.9 | 0.73 | 0.01 | 95.2 | 0.26 | 0.05 | 1.4 | 0.6 | 45 | 1.7 | 7.6 |
| | RES-006D 1954.83-1972 | N | 347 | 3.7 | 500 | 0.63 | 76.7 | 2.81 | 0.01 | 271 | 0.98 | 0.17 | 3.9 | 1.6 | 118 | 5.1 | 27.3 |
| | RES-006D 1980.6-1983.6 | N | 440 | 2.6 | 610 | 0.872 | 65.1 | 1.32 | 0.02 | 138.5 | 0.76 | 0.21 | 4.5 | 2.5 | 122 | 6.9 | 13.7 |
| | RES-006D 1995.6-1998.6 | N | 1530 | 2.9 | 980 | 3.4 | 57.7 | 4.97 | 0.02 | 179.5 | 3.14 | 0.24 | 4.1 | 5.6 | 107 | 9.2 | 15.3 |
| | RES-006D 2022.66-2025.66 | N | 5980 | 2.2 | 1130 | 11.75 | 135 | 3.03 | 0.04 | 301 | 1.92 | 0.44 | 0.5 | 1.2 | 167 | 11.6 | 7 |
| | RES-006D 2040.66-2043.66 | N | 661 | 1.6 | 1220 | 1.22 | 181 | 2.29 | 0.07 | 154.5 | 0.31 | 0.59 | 0.5 | 1.9 | 202 | 46.6 | 27.7 |
| | RES-006D 2058.16-2061.16 | N | 101.5 | 2.2 | 1700 | 0.267 | 163.5 | 2.83 | 0.08 | 31.7 | 1.54 | 1.1 | 0.5 | 0.6 | 211 | 11 | 11.5 |
| | RES-006D 2073.13-2076.13 | N | 120.5 | 1.5 | 1540 | 0.24 | 134 | 2.95 | 0.08 | 20.5 | 0.32 | 0.96 | 0.4 | 0.8 | 204 | 11 | 10.7 |
| | | FD | 132 | 1.3 | 1520 | 0.265 | 128 | 2.88 | 0.08 | 20.2 | 0.3 | 0.95 | 0.4 | 0.8 | 201 | 10.4 | 10.1 |
| | RES-006D 2091.13-2094.13 | N | 417 | 1.8 | 1730 | 1.235 | 292 | 2.59 | 0.08 | 59.2 | 0.33 | 1.23 | 0.6 | 0.7 | 204 | 12.3 | 12.9 |
| | RES-006D 2115.47-2118.47 | N | 595 | 2.1 | 310 | 1.08 | 87.7 | 7.69 | 0.05 | 84.6 | 1.39 | 0.25 | 8.4 | 1.5 | 98 | 8.4 | 18 |
| | RES-006D 2125.45-2128.42 | N | 556 | 3.3 | 400 | 0.849 | 101 | 3.38 | 0.04 | 93.1 | 0.62 | 0.28 | 9.1 | 1.7 | 101 | 9.4 | 18 |
| | RES-006D 2137.08-2138.5 | N | 361 | 3.1 | 2080 | 0.569 | 18.1 | 5.36 | 0.02 | 1820 | 6.83 | 0.06 | 10.3 | 3.2 | 104 | 7.9 | 24.6 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Iron MG/L | Lead MG/L | Magnesium MG/L | Manganese MG/L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009 | RES-009 7.43-7.96 | N | 7.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 199.18-199.78 | N | 6.1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 199.78-200.3 | N | 7.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | FD | -- | <0.8 D3 | 0.0006 F | 0.0009 F | <0.08 D3 | <0.05 D3 | 0.06 FD3 | <0.0005 | 3 FD3 | <0.3 D3 | <0.3 D3 | <0.3 D3 | <0.3 D3 | 0.001 | <5 D3 | 0.55 D3 |
| | RES-009 281.14-281.64 | N | 5.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 348.3-348.83 | N | 5.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 447.23-447.8 | N | 6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 485.12-485.71 | N | 0.89 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 557.06-557.56 | N | 9.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 647.52-648.1 | N | 5.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 718-718.58 | N | 5.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 810.42-810.98 | N | 1.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 906.08-906.58 | N | 1.5 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 987.9-988.45 | N | 2.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 994.67-997.67 | N | 8.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 1012.16-1014.16 | N | 8.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 1027.38-1030.3 | N | 5.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 1045.3-1048.3 | N | 8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 105.16-105.73 | N | 5.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 1063.3-1066.3 | N | 4.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 1081.3-1084.3 | N | 3.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 1098.34-1100.96 | N | 5.2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Molybdenum MG/L | Potassium MG/L | Radium 226 with alpha emitting PCI/G | Selenium MG/L | Silica MG/L | Sodium MG/L | Solids, Percent % | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L | Calcium % | Magnesium % | Potassium % | Sodium % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009 | RES-009 7.43-7.96 | N | -- | -- | 1.7 | -- | -- | -- | 99.5 | -- | -- | -- | -- | 1.41 | 0.31 | 3.07 | 2.57 |
| | RES-009 199.18-199.78 | N | -- | -- | 2.2 | -- | -- | -- | 99.4 | -- | -- | -- | -- | 1.59 | 0.48 | 2.76 | 2.66 |
| | RES-009 199.78-200.3 | N | -- | -- | 2.7 | -- | -- | -- | 99.3 | -- | -- | -- | -- | 1.61 | 0.5 | 2.78 | 2.68 |
| | | FD | <0.3 D3 | 3 D3 | -- | <0.005 | 16 D3 | 7 FD3 | -- | <0.0005 | 0.0014 | <0.1 D3 | 0.06 FD3 | -- | -- | -- | -- |
| | RES-009 281.14-281.64 | N | -- | -- | 1.7 | -- | -- | -- | 98.9 | -- | -- | -- | -- | 1.62 | 0.53 | 2.76 | 2.48 |
| | RES-009 348.3-348.83 | N | -- | -- | 2.2 | -- | -- | -- | 99.8 | -- | -- | -- | -- | 1.7 | 0.42 | 2.9 | 2.96 |
| | RES-009 447.23-447.8 | N | -- | -- | 2 | -- | -- | -- | 98.7 | -- | -- | -- | -- | 3.91 | 1.71 | 2.38 | 1.63 |
| | RES-009 485.12-485.71 | N | -- | -- | 2.4 | -- | -- | -- | 99.3 | -- | -- | -- | -- | 7.23 | 1.72 | 1.92 | 1.34 |
| | RES-009 557.06-557.56 | N | -- | -- | 3.5 | -- | -- | -- | 97.1 | -- | -- | -- | -- | 0.87 | 1.48 | 3.73 | 0.59 |
| | RES-009 647.52-648.1 | N | -- | -- | 2.6 | -- | -- | -- | 98.5 | -- | -- | -- | -- | 3.4 | 2.22 | 2.03 | 1.24 |
| | RES-009 718-718.58 | N | -- | -- | 3 | -- | -- | -- | 99.7 | -- | -- | -- | -- | 0.27 | 0.33 | 3.27 | 0.11 |
| | RES-009 810.42-810.98 | N | -- | -- | 1.7 | -- | -- | -- | 98.5 | -- | -- | -- | -- | 4.93 | 3.23 | 1.56 | 0.9 |
| | RES-009 906.08-906.58 | N | -- | -- | 1.9 | -- | -- | -- | 98.8 | -- | -- | -- | -- | 4.69 | 2.51 | 2.14 | 0.73 |
| | RES-009 987.9-988.45 | N | -- | -- | 1.4 | -- | -- | -- | 99.3 | -- | -- | -- | -- | 0.6 | 0.84 | 1.9 | 0.1 |
| | RES-009 994.67-997.67 | N | -- | -- | 3.1 | -- | -- | -- | 99.1 | -- | -- | -- | -- | 0.32 | 0.44 | 5.3 | 0.11 |
| | RES-009 1012.16-1014.16 | N | -- | -- | 2.2 | -- | -- | -- | 99.2 | -- | -- | -- | -- | 0.31 | 0.41 | 5.05 | 0.37 |
| | RES-009 1027.38-1030.3 | N | -- | -- | 1.7 | -- | -- | -- | 99.2 | -- | -- | -- | -- | 0.85 | 0.35 | 3.83 | 1.66 |
| | RES-009 1045.3-1048.3 | N | -- | -- | 1.8 | -- | -- | -- | 99.6 | -- | -- | -- | -- | 0.29 | 0.47 | 3.96 | 2.12 |
| | RES-009 105.16-105.73 | N | -- | -- | 1.1 | -- | -- | -- | 99.4 | -- | -- | -- | -- | 1.61 | 0.49 | 2.85 | 2.7 |
| | RES-009 1063.3-1066.3 | N | -- | -- | 2 | -- | -- | -- | 99.2 | -- | -- | -- | -- | 0.37 | 0.49 | 4.51 | 1.86 |
| | RES-009 1081.3-1084.3 | N | -- | -- | 2.3 | -- | -- | -- | 99.2 | -- | -- | -- | -- | 0.33 | 0.44 | 4.28 | 1.97 |
| | RES-009 1098.34-1100.96 | N | -- | -- | 1.5 | -- | -- | -- | 99 | -- | -- | -- | -- | 0.38 | 0.61 | 4.8 | 1.51 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Sulfide % | Titanium % | Antimony PPM | Arsenic PPM | Barium PPM | Beryllium PPM | Bismuth PPM | Cadmium PPM | Cerium PPM | Cesium PPM | Chromium, Total PPM | Cobalt PPM | Copper PPM | Gallium PPM | Germanium PPM | Indium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009 | RES-009 7.43-7.96 | N | 0.02 | 0.238 | 0.28 | 1 | 1080 | 3.08 | 0.04 | 0.05 | 99.4 | 4.12 | 145 | 4.7 | 24.2 | 20.2 | 0.2 | 0.058 |
| | RES-009 199.18-199.78 | N | <0.01 | 0.259 | 0.23 | 1.4 | 990 | 2.44 | 0.08 | 0.11 | 103.5 | 3.52 | 133 | 4.6 | 8.6 | 20.1 | 0.15 | 0.051 |
| | RES-009 199.78-200.3 | N | <0.01 | 0.266 | 0.23 | 1.1 | 1000 | 2.51 | 0.08 | 0.12 | 102.5 | 3.6 | 140 | 4.7 | 9.2 | 20.4 | 0.15 | 0.05 |
| | | FD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 281.14-281.64 | N | <0.01 | 0.238 | 0.23 | 1.2 | 990 | 2.57 | 0.09 | 0.06 | 102 | 4.09 | 139 | 5 | 8.5 | 20.6 | 0.15 | 0.051 |
| | RES-009 348.3-348.83 | N | <0.01 | 0.263 | 0.25 | 1.6 | 1040 | 2.62 | 0.1 | 0.06 | 100 | 2.95 | 247 | 5.2 | 9.8 | 20.9 | 0.16 | 0.051 |
| | RES-009 447.23-447.8 | N | <0.01 | 0.499 | 0.91 | 7.3 | 710 | 1.72 | 0.27 | 0.22 | 67.5 | 11.25 | 165 | 22.4 | 63.8 | 18.55 | 0.17 | 0.095 |
| | RES-009 485.12-485.71 | N | 0.01 | 0.508 | 0.96 | 8.8 | 430 | 1.23 | 0.31 | 0.37 | 46.7 | 4.05 | 181 | 22.6 | 108.5 | 15.65 | 0.16 | 0.163 |
| | RES-009 557.06-557.56 | N | 0.02 | 0.242 | 1.66 | 26.5 | 700 | 4.69 | 1.89 | 0.19 | 81.8 | 14.5 | 82 | 26.4 | 2610 | 37 | 0.15 | 0.583 |
| | RES-009 647.52-648.1 | N | 0.01 | 0.838 | 1.65 | 8.4 | 330 | 1.88 | 0.76 | 0.45 | 60.1 | 6.89 | 179 | 34.3 | 714 | 20.9 | 0.15 | 0.284 |
| | RES-009 718-718.58 | N | 0.02 | 0.382 | 0.51 | 14.8 | 350 | 2.35 | 1.8 | 0.03 | 70.9 | 7.73 | 390 | 6.3 | 1480 | 24.5 | 0.21 | 0.908 |
| | RES-009 810.42-810.98 | N | 0.02 | 0.705 | 1.47 | 7.5 | 240 | 1.44 | 1.92 | 0.9 | 44.6 | 3.76 | 165 | 31.6 | 404 | 20 | 0.15 | 0.871 |
| | RES-009 906.08-906.58 | N | 0.02 | 0.55 | 0.84 | 4.1 | 330 | 1.49 | 1.11 | 0.43 | 40.4 | 2.36 | 199 | 27.1 | 406 | 20.1 | 0.18 | 0.553 |
| | RES-009 987.9-988.45 | N | 0.06 | 0.362 | 1.86 | 34.6 | 210 | 1.94 | 6.27 | 0.27 | 44.9 | 1.73 | 242 | 46.8 | 1210 | 33.5 | 0.22 | 1.385 |
| | RES-009 994.67-997.67 | N | 0.02 | 0.182 | 0.95 | 25.9 | 990 | 3.27 | 2.64 | 0.15 | 45.6 | 2.29 | 265 | 6.7 | 784 | 27.4 | 0.15 | 2.36 |
| | RES-009 1012.16-1014.16 | N | 0.01 | 0.176 | 0.71 | 33 | 1050 | 2.44 | 2.13 | 0.1 | 51.7 | 1.92 | 267 | 5.1 | 934 | 23.8 | 0.14 | 1.76 |
| | RES-009 1027.38-1030.3 | N | 0.02 | 0.179 | 0.69 | 43.5 | 1010 | 2.01 | 0.96 | 0.13 | 57.4 | 1.58 | 270 | 7 | 1180 | 24.9 | 0.15 | 0.62 |
| | RES-009 1045.3-1048.3 | N | 1 | 0.178 | 0.4 | 12.9 | 920 | 1.72 | 0.53 | 0.02 | 57.6 | 1.01 | 244 | 6.5 | 2600 | 26.1 | 0.14 | 0.712 |
| | RES-009 105.16-105.73 | N | <0.01 | 0.258 | 0.26 | 1.2 | 1040 | 2.45 | 0.08 | 0.08 | 100.5 | 4.58 | 151 | 5 | 10.1 | 20.2 | 0.14 | 0.053 |
| | RES-009 1063.3-1066.3 | N | 1.03 | 0.186 | 0.31 | 16.4 | 940 | 1.6 | 0.67 | 0.11 | 46 | 0.96 | 306 | 6.8 | 3300 | 23.8 | 0.15 | 0.362 |
| | RES-009 1081.3-1084.3 | N | 0.86 | 0.17 | 0.52 | 12.4 | 1030 | 2.04 | 0.68 | 10.4 | 49.8 | 1 | 365 | 5.9 | 1600 | 24.6 | 0.15 | 0.219 |
| | RES-009 1098.34-1100.96 | N | 1.33 | 0.178 | 0.54 | 20.9 | 930 | 1.63 | 2.06 | 1.78 | 39.7 | 0.92 | 336 | 7.5 | 590 | 23.7 | 0.12 | 0.154 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Lead PPM | Lithium PPM | Manganese PPM | Molybdenum PPM | Nickel PPM | Niobium PPM | Phosphorus, Total (as P) PPM | Rhenium PPM | Rubidium PPM | Selenium PPM | Silver PPM | Strontium PPM | Tantalum PPM | Tellurium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009 | RES-009 7.43-7.96 | N | 20.9 | 25 | 655 | 1.58 | 4.9 | 17.2 | 580 | <0.002 | 114.5 | 3 | 0.01 | 348 | 1.28 | <0.05 |
| | RES-009 199.18-199.78 | N | 18.7 | 41.8 | 638 | 1.52 | 4.1 | 20 | 580 | <0.002 | 106.5 | 2 | 0.06 | 373 | 1.21 | <0.05 |
| | RES-009 199.78-200.3 | N | 19.4 | 43 | 647 | 1.49 | 4.6 | 20.4 | 590 | <0.002 | 110.5 | 2 | 0.05 | 376 | 1.26 | <0.05 |
| | | FD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 281.14-281.64 | N | 20 | 40.2 | 638 | 1.05 | 4.6 | 19.4 | 570 | <0.002 | 109 | 2 | 0.06 | 609 | 1.23 | <0.05 |
| | RES-009 348.3-348.83 | N | 20.1 | 42.7 | 722 | 1.44 | 6.3 | 20.1 | 620 | <0.002 | 110 | 2 | 0.04 | 408 | 1.21 | <0.05 |
| | RES-009 447.23-447.8 | N | 29.9 | 65.1 | 770 | 1.22 | 41.3 | 12.5 | 910 | <0.002 | 97.3 | 2 | 0.21 | 541 | 0.77 | 0.26 |
| | RES-009 485.12-485.71 | N | 31.4 | 24.6 | 1110 | 3.71 | 45.6 | 8 | 840 | <0.002 | 68.2 | 2 | 0.14 | 508 | 0.49 | 0.21 |
| | RES-009 557.06-557.56 | N | 34.8 | 45.9 | 549 | 57.3 | 40.8 | 9.6 | 940 | 0.006 | 190 | 3 | 0.6 | 117 | 0.69 | 0.96 |
| | RES-009 647.52-648.1 | N | 33.6 | 44.5 | 1275 | 13.05 | 58.5 | 9.5 | 1030 | 0.003 | 101 | 3 | 0.24 | 219 | 0.63 | 0.6 |
| | RES-009 718-718.58 | N | 56.9 | 8.6 | 341 | 71.6 | 16 | 4.8 | 1260 | 0.004 | 130.5 | 3 | 0.17 | 95.4 | 0.33 | 2.12 |
| | RES-009 810.42-810.98 | N | 69.9 | 17.6 | 1665 | 9.73 | 70.4 | 6.6 | 1330 | <0.002 | 78 | 2 | 0.2 | 230 | 0.42 | 1.92 |
| | RES-009 906.08-906.58 | N | 39.6 | 12.8 | 1650 | 5.02 | 58 | 5.6 | 840 | <0.002 | 93.2 | 2 | 0.41 | 170 | 0.35 | 0.79 |
| | RES-009 987.9-988.45 | N | 151 | 5.3 | 641 | 19.85 | 30.9 | 3.9 | 830 | <0.002 | 94.5 | 7 | 2.72 | 106 | 0.25 | 6.43 |
| | RES-009 994.67-997.67 | N | 87.5 | 5.1 | 698 | 8.34 | 12.5 | 8 | 410 | <0.002 | 251 | 2 | 0.39 | 151 | 0.56 | 1.33 |
| | RES-009 1012.16-1014.16 | N | 132.5 | 4.1 | 717 | 4.83 | 10.5 | 7.3 | 420 | <0.002 | 226 | 1 | 0.6 | 174 | 0.5 | 0.86 |
| | RES-009 1027.38-1030.3 | N | 42.9 | 4.7 | 1165 | 4.97 | 9.9 | 8.1 | 620 | <0.002 | 157 | 2 | 0.67 | 442 | 0.56 | 0.59 |
| | RES-009 1045.3-1048.3 | N | 19.1 | 5.5 | 343 | 2.66 | 10.9 | 7.8 | 320 | <0.002 | 161.5 | 2 | 1.47 | 488 | 0.53 | 0.98 |
| | RES-009 105.16-105.73 | N | 19.2 | 39.3 | 662 | 1.45 | 5.3 | 19.3 | 610 | <0.002 | 106 | 2 | 0.04 | 379 | 1.2 | <0.05 |
| | RES-009 1063.3-1066.3 | N | 13 | 5.2 | 252 | 3.04 | 12.4 | 7.5 | 450 | <0.002 | 163.5 | 3 | 0.85 | 345 | 0.5 | 0.64 |
| | RES-009 1081.3-1084.3 | N | 11.6 | 5.4 | 223 | 2.51 | 16 | 7.7 | 470 | <0.002 | 168.5 | 2 | 0.66 | 321 | 0.53 | 0.62 |
| | RES-009 1098.34-1100.96 | N | 9.4 | 6.1 | 207 | 4.36 | 12.9 | 7.4 | 500 | 0.002 | 171 | 2 | 1.37 | 257 | 0.49 | 2.38 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Thallium PPM | Thorium PPM | Tin PPM | Tungsten PPM | Uranium PPM | Vanadium PPM | Yttrium PPM | Zinc PPM | Zirconium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009 | RES-009 7.43-7.96 | N | 0.6 | 12.2 | 1.9 | 1.1 | 2.3 | 26 | 29.9 | 67 | 53 |
| | RES-009 199.18-199.78 | N | 0.42 | 10.2 | 1.8 | 1.2 | 2.4 | 27 | 27.9 | 62 | 49.4 |
| | RES-009 199.78-200.3 | N | 0.44 | 10.6 | 1.9 | 1.2 | 2.5 | 28 | 28.5 | 62 | 50.6 |
| | | FD | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | RES-009 281.14-281.64 | N | 0.46 | 10.2 | 1.8 | 1 | 2.5 | 26 | 28.6 | 64 | 54.8 |
| | RES-009 348.3-348.83 | N | 0.5 | 10.2 | 1.9 | 1.1 | 2.4 | 29 | 28 | 64 | 50.3 |
| | RES-009 447.23-447.8 | N | 0.46 | 6.8 | 1.6 | 1.9 | 1.8 | 85 | 24.1 | 136 | 83.9 |
| | RES-009 485.12-485.71 | N | 0.39 | 4.4 | 1.5 | 2.3 | 2.9 | 96 | 19.8 | 186 | 70.9 |
| | RES-009 557.06-557.56 | N | 1.06 | 11.1 | 12.3 | 14.9 | 3.4 | 90 | 17.6 | 184 | 47.1 |
| | RES-009 647.52-648.1 | N | 0.56 | 6.4 | 3.1 | 5.2 | 1.7 | 158 | 21.9 | 286 | 60.8 |
| | RES-009 718-718.58 | N | 0.59 | 10.4 | 7.9 | 9.4 | 3.2 | 124 | 11.3 | 87 | 46 |
| | RES-009 810.42-810.98 | N | 0.51 | 4.2 | 4 | 5.1 | 1.3 | 149 | 23.4 | 547 | 58.9 |
| | RES-009 906.08-906.58 | N | 0.61 | 3.6 | 3.9 | 5.8 | 1.2 | 141 | 19 | 416 | 66.2 |
| | RES-009 987.9-988.45 | N | 0.57 | 4.7 | 16.4 | 24.2 | 2.6 | 147 | 11.6 | 498 | 39.9 |
| | RES-009 994.67-997.67 | N | 2.24 | 5.1 | 2.1 | 6.6 | 3.4 | 51 | 9.4 | 454 | 23.8 |
| | RES-009 1012.16-1014.16 | N | 2.03 | 4.4 | 1.4 | 6.6 | 2.3 | 34 | 7.6 | 946 | 18 |
| | RES-009 1027.38-1030.3 | N | 1.27 | 4.5 | 1.4 | 6.8 | 2.7 | 34 | 11 | 649 | 21.5 |
| | RES-009 1045.3-1048.3 | N | 1.08 | 4.7 | 1.3 | 3.9 | 2.7 | 34 | 28.2 | 579 | 20.6 |
| | RES-009 105.16-105.73 | N | 0.43 | 10 | 1.9 | 1.2 | 2.3 | 29 | 27.8 | 66 | 51.7 |
| | RES-009 1063.3-1066.3 | N | 1.09 | 4.4 | 1.3 | 13.1 | 1.8 | 37 | 10.2 | 951 | 21.3 |
| | RES-009 1081.3-1084.3 | N | 1.02 | 4.6 | 1.5 | 8.1 | 1.5 | 33 | 6.5 | 564 | 23 |
| | RES-009 1098.34-1100.96 | N | 1.16 | 4.3 | 1.3 | 9.8 | 1.4 | 34 | 6.7 | 748 | 21.8 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Radium 226 with alpha emitting isotopes PCI/G | Radium-228 PCI/G | Solids, Percent % | ALS Aluminum % | Calcium % | Iron % | Magnesium % | Potassium % | Sodium % | Sulfide % | Titanium % | Antimony PPM | Arsenic PPM | Barium PPM | Beryllium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009D | RES-009D 1119.32-1122.42 | N | 4.7 | 1.8 | 0.74 | 99 | 7.2 | 0.37 | 2.18 | 0.42 | 3.57 | 2.5 | 0.84 | 0.223 | 0.74 | 17.1 | 770 | 2.2 |
| | | FD | 2 | 0.59 | 6 | 98.9 | 7.29 | 0.4 | 2.33 | 0.45 | 3.74 | 2.69 | 0.82 | 0.231 | 0.84 | 14.3 | 790 | 2.54 |
| | RES-009D 1128.62-1131.72 | N | 2.7 | 0.93 | 2.1 | 99.5 | 7.14 | 0.44 | 2.35 | 0.74 | 3.24 | 3.12 | 1.07 | 0.234 | 0.56 | 20.6 | 540 | 2.09 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Bismuth PPM | Cadmium PPM | Cerium PPM | Cesium PPM | Chromium, Total PPM | Cobalt PPM | Copper PPM | Gallium PPM | Germanium PPM | Indium PPM | Lanthanum PPM | Lead PPM | Lithium PPM | Manganese PPM | Molybdenum PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009D | RES-009D 1119.32-1122.42 | N | 1.54 | 3.71 | 43.5 | 1.3 | 244 | 7.5 | 946 | 20.3 | 0.17 | 0.349 | 19.6 | 13.7 | 4.8 | 165 | 2.72 |
| | | FD | 1.9 | 4.19 | 47.9 | 1.46 | 235 | 7.9 | 1000 | 20.8 | 0.16 | 0.382 | 23 | 15.9 | 5.1 | 174 | 2.88 |
| | RES-009D 1128.62-1131.72 | N | 2.29 | 2.06 | 47.8 | 0.99 | 242 | 11.5 | 594 | 22.3 | 0.16 | 0.291 | 23.7 | 35 | 5.3 | 398 | 3.37 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Nickel PPM | Niobium PPM | Phosphorus, Total (as P) PPM | Rhenium PPM | Rubidium PPM | Selenium PPM | Silver PPM | Strontium PPM | Tantalum PPM | Tellurium PPM | Thallium PPM | Thorium PPM | Tin PPM | Tungsten PPM | Uranium PPM | Vanadium PPM | Yttrium PPM | Zinc PPM | Zirconium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009D | RES-009D 1119.32-1122.42 | N | 11.7 | 6.3 | 460 | <0.002 | 140 | 10 | 1.4 | 351 | 0.41 | 1.73 | 0.89 | 3.8 | 1.5 | 11.7 | 1.2 | 40 | 8.4 | 724 | 15.7 |
| | | FD | 12.5 | 6.9 | 460 | 0.002 | 144 | 10 | 1.47 | 360 | 0.48 | 1.79 | 0.87 | 4.5 | 1.6 | 12.4 | 1.4 | 41 | 9 | 750 | 17.7 |
| | RES-009D 1128.62-1131.72 | N | 18.5 | 6.9 | 480 | 0.003 | 124 | 9 | 0.78 | 314 | 0.48 | 2.21 | 0.73 | 4.6 | 1.6 | 10.9 | 1.3 | 43 | 11.4 | 879 | 17.9 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Radium 226 with alpha emitting isotopes PCI/G | Radium-228 PCI/G | Solids, Percent % | ALS Aluminum % | Calcium % | Iron % | Magnesium % | Potassium % | Sodium % | Sulfide % | Titanium % | Antimony PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E | RES-009E 1307.1-1310.1 | N | 2.4 | 0.61 | 2.7 | 99.8 | 6.54 | 0.07 | 11.15 | 0.35 | 3.04 | 0.03 | 10 | 0.129 | 0.46 |
| | RES-009E 1319.1-1322.1 | N | 1.7 | 0.8 | 2.2 | 99.8 | 6.9 | 0.04 | 3.66 | 0.48 | 3.59 | 0.02 | 3.54 | 0.131 | 0.27 |
| | RES-009E 1335.41-1338.16 | N | 1.8 | 0.69 | 1.8 | 99.8 | 7.05 | 0.06 | 5.3 | 0.31 | 3.34 | 0.03 | 5.6 | 0.114 | 0.8 |
| | RES-009E 1351.03-1354.03 | N | 1.4 | 0.49 | 3.6 | 99.9 | 7.39 | 0.05 | 4.97 | 0.37 | 3.55 | 0.03 | 5.27 | 0.124 | 0.24 |
| | RES-009E 1368.07-1370.69 | N | 2.5 | 0.76 | 0.71 | 99.9 | 6.47 | 0.06 | 8.75 | 0.29 | 3.07 | 0.02 | 9.38 | 0.117 | 0.23 |
| | RES-009E 1385.61-1388.61 | N | 2 | 0.7 | 1.7 | 99.9 | 5.89 | 0.05 | 6.83 | 0.29 | 2.84 | 0.02 | 7.13 | 0.106 | 0.18 |
| | RES-009E 1402.22-1404.53 | N | 0.98 | 0.35 | 1.8 | 100 | 6.53 | 0.05 | 5.31 | 0.36 | 3.27 | 0.02 | 5.56 | 0.128 | 0.19 |
| | RES-009E 1410.5-1411.5 | N | 1.9 | 0.33 | 1.6 | 99.9 | 6.65 | 0.06 | 5.31 | 0.36 | 3.28 | 0.03 | 5.6 | 0.131 | 0.24 |
| | RES-009E 1418.16-1419.8 | N | 1.8 | 0.51 | 0.41 | 99.9 | 6.97 | 0.07 | 6.83 | 0.37 | 3.41 | 0.03 | 7.24 | 0.149 | 0.23 |
| | RES-009E 1431.42-1433.8 | N | 2.7 | 0.86 | 0.37 | 99.9 | 6.18 | 0.09 | 6.87 | 0.24 | 2.8 | 0.03 | 7.46 | 0.103 | 0.95 |
| | RES-009E 1446.41-1449.41 | N | 2.4 | 0.87 | 1 | 99.8 | 8.29 | 0.11 | 10.15 | 0.4 | 3.52 | 0.02 | 10 | 0.303 | 0.69 |
| | RES-009E 1464.41-1467.41 | N | 4.2 | 0.76 | 1.2 | 99.9 | 8.13 | 0.15 | 8.61 | 0.48 | 3.78 | 0.03 | 9.04 | 0.256 | 0.18 |
| | RES-009E 1478.13-1481.13 | N | 3.7 | 0.91 | -0.14 | 99.8 | 7.65 | 0.09 | 9.36 | 0.46 | 3.32 | 0.02 | 9.85 | 0.23 | 0.25 |
| | RES-009E 1496.13-1499.13 | N | 4 | 1.3 | 0.22 | 99.9 | 6.59 | 0.18 | 9.81 | 0.36 | 2.77 | 0.02 | 10 | 0.205 | 0.29 |
| | RES-009E 1510.74-1527.19 | N | 4.4 | 0.53 | 8.8 | 99.7 | 7.09 | 0.17 | 9.64 | 0.37 | 3.33 | 0.03 | 10 | 0.18 | 0.25 |
| | RES-009E 1514.13-1517.13 | N | 0.7 | 0.53 | 0.11 | 100 | 7.28 | 0.09 | 9.57 | 0.39 | 3.5 | 0.03 | 10 | 0.168 | 0.19 |
| | RES-009E 1532.4-1534.49 | N | 1.1 | 0.23 | -0.58 | 99.9 | 6.51 | 0.13 | 10 | 0.29 | 2.83 | 0.03 | 10 | 0.184 | 0.25 |
| | RES-009E 1540.5-1541.5 | N | 2.1 | 0.62 | 0.01 | 99.8 | 6.58 | 0.13 | 10 | 0.29 | 2.85 | 0.03 | 10 | 0.179 | 0.19 |
| | RES-009E 1547.47-1550.47 | N | 2.8 | 0.54 | -0.32 | 99.9 | 5.09 | 0.17 | 9.39 | 0.38 | 1.57 | 0.02 | 10 | 0.202 | 0.22 |
| | RES-009E 1565.47-1568.47 | N | 3.4 | 1.1 | 0.65 | 99.8 | 5.66 | 0.03 | 11.9 | 0.31 | 2.74 | 0.03 | 10 | 0.179 | 0.34 |
| | RES-009E 1597.32-1599.88 | N | 1.6 | 0.49 M2 | 1.5 | 99.8 | 3.73 | 0.1 | 13.95 | 0.04 | 0.37 | 0.01 | 10 | 0.11 | 2.22 |
| | RES-009E 1602.44-1605 | N | 1.9 | 0.16 | 2.1 | 99.8 | 6.65 | 0.11 | 10.6 | 0.12 | 1.13 | 0.02 | 10 | 0.186 | 0.53 |
| | RES-009E 1617.38-1619.14 | N | 5.3 | 0.77 | 2 | 99.6 | 7.29 | 0.26 | 4.62 | 0.68 | 2.54 | 0.02 | 4.18 | 0.291 | 0.13 |
| | RES-009E 1634.46-1637.47 | N | 3.3 | 0.88 | 0.21 | 99.9 | 6.38 | 0.1 | 8.33 | 0.38 | 2.98 | 0.04 | 8.69 | 0.123 | 0.37 |
| | RES-009E 1650.14-1652.81 | N | 3 | 0.25 | 0.69 | 99.5 | 5.53 | 0.15 | 9.06 | 0.08 | 0.59 | 0.01 | 9.97 | 0.239 | 0.74 |
| | | FD | 1.5 | 0.61 | 0.63 | 99.7 | 5.51 | 0.14 | 9.14 | 0.08 | 0.59 | 0.01 | 10 | 0.245 | 0.83 |
| | RES-009E 1669.07-1672.07 | N | 1.7 | 0.43 | 4.2 | 99.9 | 7.93 | 0.04 | 4.53 | 0.45 | 3.6 | 0.05 | 4.47 | 0.213 | 0.12 |
| | RES-009E 1685.09-1687.47 | N | 1.6 | 0.06 | 3.8 | 100 | 6.45 | 0.03 | 3.03 | 0.37 | 3.31 | 0.03 | 3.28 | 0.115 | 0.12 |
| | RES-009E 1697.61-1700.61 | N | 4 | 0.22 | 3.3 | 99.9 | 6.45 | 0.05 | 5.35 | 0.33 | 2.79 | 0.03 | 5.68 | 0.189 | 0.26 |
| | RES-009E 1718.61-1721.61 | N | 2 | 0.29 | 2.5 | 99.8 | 5.8 | 0.01 | 3.62 | 0.24 | 2.08 | 0.02 | 3.73 | 0.162 | 22.9 |
| | RES-009E 1739.63-1742.63 | N | 1 | 0.22 | 3.2 | 100 | 2.22 | 0.01 | 2.99 | <0.01 | 0.03 | <0.01 | 2.88 | 0.054 | 1.18 |
| | | FD | 1.5 | 0.32 | 2.5 | 100 | 3.99 | 0.03 | 2.6 | 0.15 | 1.42 | 0.02 | 2.73 | 0.126 | 0.46 |
| | RES-009E 1789.83-1792.31 | N | <0.51 | 0.34 | 2.8 | 99.9 | 4.87 | 0.2 | 3.43 | 0.22 | 1.98 | 0.02 | 3.59 | 0.154 | 0.39 |
| | RES-009E 1801.42-1804.15 | N | <1.6 | 2.1 | 2.8 | 99.9 | 4.43 | 0.07 | 9.71 | 0.15 | 1.24 | 0.02 | 10 | 0.11 | 0.39 |
| | RES-009E 1818.62-1821.62 | N | <2.2 | 2.4 | 1.3 | 99.9 | 4.22 | 0.66 | 11.4 | 0.48 | 1.34 | 0.01 | 10 | 0.174 | 0.11 |
| | RES-009E 1829.95-1832.48 | N | <2.2 | 3.5 | 0.6 | 99.9 | 2.53 | 0.54 | 12.7 | 1.61 | 0.93 | 0.03 | 8.33 | 0.115 | 0.3 |
| | RES-009E 1846.66-1849.66 | N | 9.4 | 5.7 | 2.8 | 99.9 | 2.03 | 3.62 | 16.15 | 1.23 | 0.34 | 0.01 | 10 | 0.13 | 0.58 |
| | RES-009E 1862.15-1865.15 | N | 8.7 | 2 | 3.6 | 99.4 | 1.85 | 10.75 | 12.85 | 1.51 | 0.24 | 0.01 | 10 | 0.131 | 0.31 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Alpha, Gross PCI/G | Radium 226 with alpha emitting isotopes PCI/G | Radium-228 PCI/G | Solids, Percent % | ALS Aluminum % | Calcium % | Iron % | Magnesium % | Potassium % | Sodium % | Sulfide % | Titanium % | Antimony PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E | RES-009E 1867.87-188 | N | 7.6 | 3.3 | 5.9 | 99.8 | 1.63 | 15.6 | 13.4 | 1.56 | 0.31 | <0.01 | 9.26 | 0.089 | 0.6 |
| | RES-009E 1880.15-1882.37 | N | 8.9 | 2.5 | 2.3 | 99.1 | 0.94 | 13.8 | 10.9 | 1.22 | 0.2 | 0.01 | 7.36 | 0.059 | 0.63 |
| | RES-009E 1885.5-1886.5 | N | 10 | 3.2 | 5.8 | 99.2 | 0.92 | 13.95 | 11.25 | 1.2 | 0.19 | 0.01 | 7.77 | 0.058 | 0.65 |
| | RES-009E 1899-1901.88 | N | 3.4 | 0.91 | 2.7 | 99.6 | 3.03 | 3.05 | 8.84 | 1.14 | 1.07 | 0.02 | 6.71 | 0.151 | 0.12 |
| | RES-009E 1929.76-1932.58 | N | 3.9 | 0.97 | 2.1 | 99.7 | 0.64 | 6.33 | 14.5 | 0.59 | 0.14 | 0.01 | 8.43 | 0.039 | 0.18 |
| | RES-009E 1947.67-1950.67 | N | 6.4 | 0.58 | 4.7 | 99.8 | 4.1 | 4.05 | 7.32 | 5.07 | 2.33 | 0.03 | 6.14 | 0.165 | 0.48 |
| | RES-009E 1954.6-1956 | N | 4.6 | 0.48 | 3.9 | 99.8 | 3.9 | 2.46 | 4.67 | 3.52 | 2.42 | 0.03 | 3.45 | 0.111 | 0.45 |
| | RES-009E 1967.76-1969.72 | N | 3.1 | 0.07 | 5.2 | 99.6 | 6.61 | 0.23 | 2.54 | 1.22 | 5.35 | 0.07 | 1.7 | 0.149 | 0.13 |
| | RES-009E 1974.78-1977.89 | N | 5.3 M2 | 1.2 | 9 | 99.6 | 1.76 | 13.5 | 6.67 | 10.7 | 0.38 | 0.02 | 3.45 | 0.069 | 0.27 |
| | RES-009E 1984.74-1987.74 | N | <0.53 | 0.2 | 5.3 | 99.9 | 0.21 | 0.96 | 2.8 | 0.02 | 0.01 | <0.01 | 3.38 | 0.014 | 1.44 |
| | RES-009E 2056.38-2075 | N | 6.1 | 1.4 | 6.5 | 100 | 6.35 | 3.33 | 5.71 | 2.67 | 4.44 | 0.02 | 5.99 | 0.432 | 0.12 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Arsenic PPM | Barium PPM | Beryllium PPM | Bismuth PPM | Cadmium PPM | Cerium PPM | Cesium PPM | Chromium, Total PPM | Cobalt PPM | Copper PPM | Gallium PPM | Germanium PPM | Indium PPM | Lanthanum PPM | Lead PPM | Lithium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E | RES-009E 1307.1-1310.1 | N | 8.1 | 110 | 1.83 | 10.85 | 0.21 | 29.4 | 0.89 | 14 | 13.7 | 6240 | 28.1 | 0.27 | 0.224 | 13 | 8.7 | 1.3 |
| | RES-009E 1319.1-1322.1 | N | 6.4 | 320 | 2.26 | 2.48 | 0.53 | 41.5 | 1.19 | 13 | 6.8 | 1535 | 24.2 | 0.16 | 0.42 | 20 | 4.1 | 0.9 |
| | RES-009E 1335.41-1338.16 | N | 7.4 | 210 | 2.33 | 3.9 | 0.07 | 35.1 | 0.87 | 10 | 10 | 592 | 29.2 | 0.18 | 0.149 | 16.8 | 20.2 | 1.7 |
| | RES-009E 1351.03-1354.03 | N | 6 | 190 | 2.2 | 6.13 | 0.13 | 26.1 | 0.91 | 9 | 8.9 | 2560 | 27 | 0.17 | 0.29 | 12.5 | 2.9 | 1.8 |
| | RES-009E 1368.07-1370.69 | N | 2 | 130 | 1.87 | 2.19 | <0.02 | 21.6 | 0.54 | 13 | 14.2 | 472 | 19.35 | 0.22 | 0.149 | 9.9 | 6.7 | 1.8 |
| | RES-009E 1385.61-1388.61 | N | 2.5 | 110 | 1.89 | 1.98 | 0.58 | 30.7 | 0.84 | 11 | 13 | 314 | 18.75 | 0.21 | 0.222 | 14.6 | 4 | 2.1 |
| | RES-009E 1402.22-1404.53 | N | 8.8 | 180 | 2.27 | 2.9 | <0.02 | 36 | 0.82 | 342 | 10 | 1395 | 23.3 | 0.17 | 0.305 | 17 | 6.9 | 1.6 |
| | RES-009E 1410.5-1411.5 | N | 8.4 | 190 | 2.31 | 3.08 | 0.03 | 35.6 | 0.82 | 305 | 9.9 | 1470 | 22.9 | 0.19 | 0.304 | 16.7 | 6.9 | 2.3 |
| | RES-009E 1418.16-1419.8 | N | 5.1 | 80 | 2.43 | 4.05 | <0.02 | 30.9 | 1.15 | 15 | 13.6 | 2510 | 24.8 | 0.2 | 0.119 | 13.4 | 3.7 | 1.8 |
| | RES-009E 1431.42-1433.8 | N | 30.8 | 80 | 2.07 | 1.87 | 0.25 | 24.4 | 0.56 | 291 | 15.6 | 7930 | 20.3 | 0.18 | 0.047 | 10.8 | 12.4 | 2.3 |
| | RES-009E 1446.41-1449.41 | N | 18.8 | 60 | 3.02 | 8.19 | 0.85 | 31.3 | 1.33 | 11 | 27.5 | 3060 | 25.9 | 0.29 | 0.228 | 13.2 | 1.8 | 4.3 |
| | RES-009E 1464.41-1467.41 | N | 4.7 | 100 | 3.2 | 3.28 | 0.36 | 47.6 | 1.3 | 11 | 22.3 | 2240 | 24.4 | 0.25 | 0.899 | 22.1 | 2.8 | 2.6 |
| | RES-009E 1478.13-1481.13 | N | 17.5 | 80 | 3.38 | 6.7 | 0.63 | 40.4 | 1.22 | 7 | 15.4 | 6530 | 24.9 | 0.28 | 0.569 | 18 | 3.4 | 3.7 |
| | RES-009E 1496.13-1499.13 | N | 2.2 | 80 | 3.16 | 6.43 | 0.22 | 36.6 | 1.13 | 15 | 17.3 | 4840 | 27 | 0.25 | 0.645 | 16.7 | 2 | 4.8 |
| | RES-009E 1510.74-1527.19 | N | 1.9 | 70 | 2.46 | 2.96 | 0.22 | 28.9 | 0.87 | 519 | 23.4 | 2020 | 24.3 | 0.27 | 0.328 | 13.3 | 3.8 | 2.8 |
| | RES-009E 1514.13-1517.13 | N | 2 | 90 | 2.65 | 2.33 | 0.04 | 30.6 | 0.93 | 17 | 20.9 | 1820 | 24.3 | 0.25 | 0.273 | 14.9 | 1.6 | 2.5 |
| | RES-009E 1532.4-1534.49 | N | 2 | 180 | 2.05 | 3.54 | 0.49 | 23.3 | 0.77 | 309 | 35.5 | 2250 | 23.3 | 0.2 | 0.285 | 10.1 | 7.6 | 3.9 |
| | RES-009E 1540.5-1541.5 | N | 1.7 | 170 | 2 | 3.47 | 0.48 | 23.2 | 0.77 | 318 | 34.8 | 2270 | 23.6 | 0.21 | 0.274 | 10 | 7 | 4.2 |
| | RES-009E 1547.47-1550.47 | N | 3.9 | 160 | 2.42 | 11.1 | 8.95 | 28.5 | 0.76 | 36 | 34.4 | 5290 | 20.3 | 0.2 | 1.13 | 12.8 | 13.5 | 8.9 |
| | RES-009E 1565.47-1568.47 | N | 2.7 | 140 | 2.15 | 5 | 0.47 | 26.4 | 0.67 | 22 | 30.2 | 1060 | 21 | 0.22 | 0.117 | 11.8 | 5.4 | 3.7 |
| | RES-009E 1597.32-1599.88 | N | 15.6 | 100 | 0.45 | 4.74 | 0.07 | 22.7 | 0.13 | 10 | 42.5 | 1355 | 8.31 | 0.2 | 0.132 | 10.3 | 344 | 24 |
| | RES-009E 1602.44-1605 | N | 3.5 | 100 | 1.16 | 2.08 | 0.1 | 31.9 | 0.39 | 5 | 53.6 | 1105 | 18.2 | 0.2 | 0.527 | 14.1 | 676 | 39.1 |
| | RES-009E 1617.38-1619.14 | N | 1.2 | 370 | 3.78 | 1.01 | 0.47 | 43.1 | 2.62 | 92 | 22.6 | 1720 | 21.1 | 0.15 | 0.176 | 20.9 | 12.9 | 15.4 |
| | RES-009E 1634.46-1637.47 | N | 3.2 | 230 | 2.95 | 2.41 | 0.17 | 42.9 | 1.11 | 25 | 31.9 | 9060 | 21.4 | 0.18 | 1.515 | 21.9 | 4.9 | 5.2 |
| | RES-009E 1650.14-1652.81 | N | 5.6 | 130 | 1.26 | 8.58 | 0.13 | 29.6 | 0.43 | 147 | 60.2 | 10000 | 29.1 | 0.16 | 2.93 | 15.6 | 114 | 29.1 |
| | | FD | 6.6 | 130 | 1.02 | 9.05 | 0.09 | 28.4 | 0.44 | 151 | 58 | 10000 | 30.1 | 0.19 | 3.06 | 15.1 | 119 | 19.3 |
| | RES-009E 1669.07-1672.07 | N | 2.8 | 320 | 4.67 | 1.38 | 1.01 | 54.8 | 1.32 | 9 | 21.3 | 9940 | 27 | 0.18 | 0.214 | 25.5 | 3.9 | 12.1 |
| | RES-009E 1685.09-1687.47 | N | 103 | 550 | 4.18 | 1.99 | 0.21 | 39.3 | 0.91 | 240 | 16.2 | 10000 | 30.9 | 0.12 | 0.664 | 19 | 219 | 3.5 |
| | RES-009E 1697.61-1700.61 | N | 6.5 | 160 | 3.27 | 1.74 | 0.13 | 68.3 | 0.82 | 24 | 52.3 | 5400 | 25.2 | 0.2 | 0.239 | 32.4 | 113.5 | 9.5 |
| | RES-009E 1718.61-1721.61 | N | 174 | 390 | 2.63 | 7.93 | 0.78 | 84.4 | 0.55 | 19 | 18.4 | 5090 | 31.7 | 0.18 | 0.605 | 40 | 334 | 20 |
| | RES-009E 1739.63-1742.63 | N | 13.4 | 90 | 0.26 | 25.5 | 0.21 | 22.9 | <0.05 | 12 | 14.5 | 5480 | 15.3 | 0.12 | 0.421 | 10.3 | 279 | 16.4 |
| | | FD | 130.5 | 180 | 2.12 | 3.43 | 0.93 | 44 | 0.34 | 160 | 11.1 | 6230 | 21.1 | 0.13 | 0.196 | 20.7 | 110.5 | 7.9 |
| | RES-009E 1789.83-1792.31 | N | 54.4 | 170 | 2.76 | 2.22 | 1.03 | 41.4 | 0.44 | 21 | 15.1 | 8600 | 21.9 | 0.12 | 0.697 | 20 | 44.8 | 7.9 |
| | RES-009E 1801.42-1804.15 | N | 4.2 | 100 | 1.84 | 6.98 | 0.86 | 44.1 | 0.45 | 42 | 43 | 10000 | 33.8 | 0.23 | 0.673 | 24.3 | 2.7 | 8.8 |
| | RES-009E 1818.62-1821.62 | N | <0.2 | 90 | 3.4 | 4.52 | 0.18 | 51.7 | 1.28 | 51 | 32.2 | 10000 | 35.6 | 0.52 | 1.71 | 24.5 | 9.7 | 16.9 |
| | RES-009E 1829.95-1832.48 | N | 1.8 | 40 | 3.6 | 2.76 | 0.74 | 29.2 | 1.4 | 33 | 50.2 | 10000 | 33.4 | 0.26 | 3.34 | 14.8 | 9 | 11.2 |
| | RES-009E 1846.66-1849.66 | N | 4.1 | 20 | 4.68 | 3.04 | 5.82 | 26.7 | 1.1 | 42 | 52.1 | 10000 | 35.4 | 0.27 | 4.47 | 15.7 | 7.9 | 8 |
| | RES-009E 1862.15-1865.15 | N | 11 | 10 | 3.43 | 3.55 | 0.34 | 25.1 | 1.15 | 36 | 39.3 | 10000 | 27.5 | 0.4 | 1.825 | 16.5 | 14.5 | 9.6 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Arsenic PPM | Barium PPM | Beryllium PPM | Bismuth PPM | Cadmium PPM | Cerium PPM | Cesium PPM | Chromium, Total PPM | Cobalt PPM | Copper PPM | Gallium PPM | Germanium PPM | Indium PPM | Lanthanum PPM | Lead PPM | Lithium PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E | RES-009E 1867.87-188 | N | 6 | 100 | 3.03 | 4.89 | 5.26 | 20.9 | 1.02 | 431 | 50.5 | 10000 | 37.9 | 0.41 | 4.19 | 16 | 3.3 | 11.5 |
| | RES-009E 1880.15-1882.37 | N | 5 | 10 | 3.68 | 3.31 | 3.32 | 17.3 | 0.63 | 161 | 38.4 | 10000 | 33 | 0.34 | 3.52 | 13.5 | 4.8 | 15.4 |
| | RES-009E 1885.5-1886.5 | N | 5 | 10 | 3.96 | 3.35 | 3.43 | 17.45 | 0.65 | 140 | 41.4 | 10000 | 33.8 | 0.35 | 3.74 | 13.8 | 3.2 | 16.8 |
| | RES-009E 1899-1901.88 | N | 2 | 70 | 3.45 | 0.65 | 0.44 | 22.2 | 1.93 | 55 | 49.7 | 10000 | 26.5 | 0.41 | 1.335 | 9.7 | 2.5 | 12 |
| | RES-009E 1929.76-1932.58 | N | 12.8 | 10 | 2.6 | 2.83 | 3.57 | 10 | 0.32 | 11 | 41 | 10000 | 24.7 | 0.39 | 3.49 | 5.5 | 2.5 | 7.9 |
| | RES-009E 1947.67-1950.67 | N | <0.2 | 80 | 4.19 | 4.48 | 0.05 | 39.7 | 3.77 | 29 | 51.3 | 10000 | 22.3 | 0.3 | 0.905 | 18.8 | 3.5 | 11.4 |
| | RES-009E 1954.6-1956 | N | 1.2 | 260 | 3.78 | 0.83 | <0.02 | 32 | 2.22 | 13 | 28.2 | 10000 | 24 | 0.23 | 0.597 | 16.9 | 2.7 | 23.5 |
| | RES-009E 1967.76-1969.72 | N | 1 | 580 | 5.52 | 0.38 | 0.02 | 39.1 | 2.24 | 11 | 18.9 | 9650 | 27 | 0.18 | 0.31 | 20.7 | 4.2 | 12 |
| | RES-009E 1974.78-1977.89 | N | <5 | 10 | 4.47 | 1.81 | 2.64 | 18.95 | 1.02 | 13 | 19.3 | 10000 | 25.6 | 0.2 | 3.45 | 8.7 | 7.4 | 3.5 |
| | RES-009E 1984.74-1987.74 | N | 1.8 | 10 | 0.21 | 503 | <0.02 | 5.55 | <0.05 | 4 | 7 | 10000 | 0.91 | 0.27 | 0.598 | 2.2 | 36 | 1.2 |
| | RES-009E 2056.38-2075 | N | 1.2 | 220 | 4.47 | 1.01 | <0.02 | 33.8 | 5.77 | 519 | 28.2 | 10000 | 27.9 | 0.29 | 0.281 | 13.8 | 2.5 | 11.3 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Manganese PPM | Molybdenum PPM | Nickel PPM | Niobium PPM | Phosphorus, Total (as P) PPM | Rhenium PPM | Rubidium PPM | Selenium PPM | Silver PPM | Strontium PPM | Tantalum PPM | Tellurium PPM | Thallium PPM | Thorium PPM | Tin PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E | RES-009E 1307.1-1310.1 | N | 41 | 17.05 | 13.2 | 2.7 | 450 | 0.071 | 106 | 15 | 0.85 | 151.5 | 0.18 | 11.5 | 0.49 | 2.9 | 12.7 |
| | RES-009E 1319.1-1322.1 | N | 36 | 1.28 | 10.8 | 3.1 | 370 | 0.063 | 141.5 | 5 | 0.58 | 147.5 | 0.23 | 5.1 | 0.53 | 4.1 | 7.7 |
| | RES-009E 1335.41-1338.16 | N | 48 | 2.16 | 8.1 | 3.1 | 480 | 0.008 | 124.5 | 6 | 2.57 | 157.5 | 0.22 | 4.33 | 0.47 | 3.6 | 15.3 |
| | RES-009E 1351.03-1354.03 | N | 33 | 1.41 | 10 | 3.3 | 380 | 0.07 | 132.5 | 7 | 0.6 | 163 | 0.24 | 2.94 | 0.53 | 2.4 | 12.4 |
| | RES-009E 1368.07-1370.69 | N | 37 | 6.91 | 13.5 | 2.3 | 570 | 0.014 | 99.2 | 14 | 0.16 | 187 | 0.15 | 2.18 | 0.39 | 2.3 | 9.3 |
| | RES-009E 1385.61-1388.61 | N | 40 | 11.1 | 8.9 | 2.8 | 290 | 0.051 | 102.5 | 11 | 0.18 | 72.9 | 0.21 | 1.83 | 0.37 | 3.5 | 9.8 |
| | RES-009E 1402.22-1404.53 | N | 24 | 21.6 | 14.2 | 3 | 350 | 0.13 | 118.5 | 10 | 0.68 | 97.3 | 0.24 | 3.98 | 0.42 | 3.9 | 11.8 |
| | RES-009E 1410.5-1411.5 | N | 23 | 20.6 | 13.4 | 3.1 | 340 | 0.124 | 117 | 10 | 0.69 | 96.8 | 0.24 | 4.04 | 0.43 | 3.8 | 11.5 |
| | RES-009E 1418.16-1419.8 | N | 27 | 2.48 | 9.8 | 3.4 | 480 | 0.019 | 132.5 | 9 | 0.46 | 124.5 | 0.24 | 3.92 | 0.45 | 3.7 | 12.1 |
| | RES-009E 1431.42-1433.8 | N | 19 | 8.89 | 9.2 | 3 | 670 | 0.118 | 97.7 | 11 | 1.16 | 165.5 | 0.22 | 12.4 | 0.48 | 2.4 | 14.9 |
| | RES-009E 1446.41-1449.41 | N | 30 | 10.3 | 8.7 | 3 | 1210 | 0.194 | 153 | 14 | 0.74 | 338 | 0.2 | 9.3 | 0.69 | 2.1 | 14.4 |
| | RES-009E 1464.41-1467.41 | N | 34 | 2.19 | 9.8 | 2.7 | 1420 | 0.012 | 151.5 | 12 | 0.41 | 464 | 0.16 | 5.59 | 0.59 | 2.6 | 12.3 |
| | RES-009E 1478.13-1481.13 | N | 40 | 3.24 | 4.2 | 2.8 | 860 | 0.049 | 127 | 15 | 1.21 | 245 | 0.16 | 8.88 | 0.57 | 2 | 10.7 |
| | RES-009E 1496.13-1499.13 | N | 58 | 3.08 | 7.9 | 2.5 | 1220 | 0.01 | 115.5 | 17 | 0.56 | 278 | 0.13 | 6.69 | 0.48 | 2.1 | 11.4 |
| | RES-009E 1510.74-1527.19 | N | 47 | 8.5 | 16.9 | 2.1 | 900 | 0.011 | 109 | 17 | 0.3 | 101 | 0.16 | 4.72 | 0.48 | 2.1 | 13 |
| | RES-009E 1514.13-1517.13 | N | 35 | 7.14 | 11.2 | 2.3 | 650 | 0.011 | 131 | 16 | 0.22 | 111.5 | 0.16 | 3.9 | 0.48 | 2.1 | 11.3 |
| | RES-009E 1532.4-1534.49 | N | 23 | 10.15 | 24.9 | 1.8 | 790 | 0.022 | 88.3 | 20 | 0.56 | 73.6 | 0.12 | 5.19 | 0.4 | 1.6 | 10.3 |
| | RES-009E 1540.5-1541.5 | N | 22 | 10.25 | 23.1 | 1.8 | 800 | 0.022 | 87.8 | 19 | 0.53 | 71.9 | 0.12 | 5.28 | 0.38 | 1.5 | 10.2 |
| | RES-009E 1547.47-1550.47 | N | 82 | 15.1 | 28.7 | 2.2 | 670 | 0.012 | 68.6 | 24 | 2.85 | 45.6 | 0.14 | 12.55 | 0.31 | 2 | 12.3 |
| | RES-009E 1565.47-1568.47 | N | 52 | 13.8 | 14 | 2.5 | 320 | 0.015 | 90.1 | 21 | 0.51 | 56.2 | 0.17 | 2.81 | 0.35 | 2.2 | 11.9 |
| | RES-009E 1597.32-1599.88 | N | 32 | 60.4 | 8.1 | 1.5 | 980 | 0.058 | 13.7 | 19 | 2.84 | 267 | 0.07 | 3.77 | 0.05 | 1.4 | 17.1 |
| | RES-009E 1602.44-1605 | N | 25 | 27.7 | 10.4 | 2.4 | 1300 | 0.04 | 42.4 | 16 | 2.15 | 354 | 0.13 | 3.97 | 0.16 | 2 | 10.7 |
| | RES-009E 1617.38-1619.14 | N | 162 | 18.35 | 14.8 | 4 | 910 | 0.037 | 120 | 9 | 0.63 | 120.5 | 0.29 | 0.71 | 0.71 | 3.6 | 5.4 |
| | RES-009E 1634.46-1637.47 | N | 43 | 12.05 | 14.7 | 3.4 | 820 | 0.022 | 112.5 | 12 | 2.42 | 135.5 | 0.24 | 1.81 | 0.45 | 5.3 | 15.1 |
| | RES-009E 1650.14-1652.81 | N | 49 | 25.8 | 23.4 | 5.2 | 920 | 0.043 | 24.2 | 16 | 14.65 | 185.5 | 0.32 | 7.58 | 0.18 | 3.2 | 16.5 |
| | | FD | 51 | 29.1 | 23 | 5.7 | 910 | 0.048 | 27 | 18 | 12.55 | 191.5 | 0.36 | 6.23 | 0.22 | 3.6 | 17 |
| | RES-009E 1669.07-1672.07 | N | 26 | 118 | 8.7 | 3.7 | 740 | 0.153 | 137 | 15 | 1.4 | 283 | 0.24 | 0.53 | 0.47 | 4 | 20.4 |
| | RES-009E 1685.09-1687.47 | N | 18 | 168 | 9.8 | 3.2 | 640 | 0.371 | 121.5 | 9 | 4.52 | 109.5 | 0.22 | 0.86 | 0.44 | 3.8 | 24.3 |
| | RES-009E 1697.61-1700.61 | N | 33 | 252 | 15.3 | 6.1 | 740 | 0.509 | 102.5 | 14 | 5.38 | 174.5 | 0.39 | 0.44 | 0.27 | 11.2 | 19.7 |
| | RES-009E 1718.61-1721.61 | N | 48 | 308 | 8.4 | 4.9 | 640 | 0.527 | 75.5 | 10 | 9.15 | 357 | 0.35 | 1.99 | 0.2 | 9.1 | 243 |
| | RES-009E 1739.63-1742.63 | N | 67 | 395 | 5.7 | 2.1 | 270 | 0.668 | 1 | 6 | 11.55 | 217 | 0.1 | 3.51 | <0.02 | 2.5 | 6.3 |
| | | FD | 30 | 343 | 6.5 | 4 | 460 | 0.5 | 55.7 | 9 | 3.1 | 177.5 | 0.27 | 1.49 | 0.14 | 5.5 | 14.8 |
| | RES-009E 1789.83-1792.31 | N | 43 | 419 | 9.6 | 4.6 | 320 | 0.803 | 80.5 | 11 | 1.67 | 131 | 0.28 | 1.43 | 0.2 | 5.5 | 16.8 |
| | RES-009E 1801.42-1804.15 | N | 56 | 341 | 22.3 | 3 | 390 | 0.635 | 55 | 31 | 2.86 | 374 | 0.18 | 3.6 | 0.66 | 4.7 | 29 |
| | RES-009E 1818.62-1821.62 | N | 219 | 581 | 35.6 | 5.7 | 660 | 0.945 | 76.3 | 23 | 2.76 | 6.1 | 0.3 | 1.88 | 0.31 | 5.5 | 35.4 |
| | RES-009E 1829.95-1832.48 | N | 608 | 291 | 31.6 | 4.1 | 490 | 0.537 | 63.3 | 43 | 5.25 | 6.3 | 0.24 | 2.83 | 0.33 | 3.6 | 28.6 |
| | RES-009E 1846.66-1849.66 | N | 1060 | 362 | 23.5 | 4.8 | 740 | 0.657 | 27.9 | 40 | 5.34 | 14.3 | 0.28 | 2.68 | 0.13 | 3.4 | 35.7 |
| | RES-009E 1862.15-1865.15 | N | 2580 | 389 | 10.8 | 4.4 | 760 | 0.442 | 25.2 | 33 | 3.94 | 22.6 | 0.27 | 2.57 | 0.09 | 2.9 | 26.3 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Manganese PPM | Molybdenum PPM | Nickel PPM | Niobium PPM | Phosphorus, Total (as P) PPM | Rhenium PPM | Rubidium PPM | Selenium PPM | Silver PPM | Strontium PPM | Tantalum PPM | Tellurium PPM | Thallium PPM | Thorium PPM | Tin PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E | RES-009E 1867.87-188 | N | 2660 | 439 | 27.5 | 3.1 | 980 | 0.796 | 32.6 | 39 | 5.93 | 48.7 | 0.2 | 4.04 | 0.11 | 2.5 | 31.8 |
| | RES-009E 1880.15-1882.37 | N | 2440 | 385 | 12.5 | 2 | 830 | 0.738 | 18.6 | 35 | 6.74 | 35.4 | 0.12 | 4.23 | 0.09 | 1.4 | 28.7 |
| | RES-009E 1885.5-1886.5 | N | 2470 | 389 | 13.4 | 2.1 | 820 | 0.772 | 19.4 | 38 | 7 | 37 | 0.12 | 4.36 | 0.09 | 1.4 | 29.8 |
| | RES-009E 1899-1901.88 | N | 705 | 316 | 36.2 | 4.5 | 320 | 0.622 | 67.4 | 54 | 4.35 | 16.8 | 0.28 | 0.98 | 0.21 | 4.5 | 20.7 |
| | RES-009E 1929.76-1932.58 | N | 1420 | 70.1 | 14.2 | 1.8 | 260 | 0.137 | 11.5 | 45 | 2.88 | 8.4 | 0.09 | 2.62 | 0.06 | 1 | 23.7 |
| | RES-009E 1947.67-1950.67 | N | 555 | 245 | 36.9 | 5.4 | 780 | 0.457 | 156.5 | 25 | 3.18 | 8.3 | 0.36 | 1.06 | 0.54 | 5.8 | 17.5 |
| | RES-009E 1954.6-1956 | N | 451 | 203 | 23.6 | 2.8 | 760 | 0.311 | 117.5 | 29 | 2.75 | 24 | 0.21 | 0.68 | 0.43 | 3.6 | 16.4 |
| | RES-009E 1967.76-1969.72 | N | 150 | 36.7 | 21.4 | 2.6 | 620 | 0.039 | 185.5 | 14 | 1.45 | 53.9 | 0.2 | 0.24 | 0.65 | 4.4 | 16.6 |
| | RES-009E 1974.78-1977.89 | N | 1755 | 63.2 | 18.5 | 2.8 | 450 | 0.079 | 34 | 20 | 3.33 | 26.2 | 0.19 | 1.17 | 0.17 | 2.5 | 19.9 |
| | RES-009E 1984.74-1987.74 | N | 88 | 643 | 11 | 1.3 | 40 | 1.135 | 1.1 | 7 | 25.9 | 42.7 | 0.08 | 1.56 | <0.02 | 1.1 | 15.7 |
| | RES-009E 2056.38-2075 | N | 212 | 202 | 82.9 | 2.3 | 1280 | 0.318 | 187 | 15 | 1 | 176 | 0.16 | 0.39 | 0.84 | 1 | 13.5 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

## APPENDIX D
## ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Tungsten PPM | Uranium PPM | Vanadium PPM | Yttrium PPM | Zinc PPM | Zirconium PPM |
|---|---|---|---|---|---|---|---|---|
| RES-009E | RES-009E 1307.1-1310.1 | N | 39.2 | 3.6 | 58 | 6.4 | 20 | 40.5 |
| | RES-009E 1319.1-1322.1 | N | 32.5 | 2 | 55 | 5.7 | 26 | 23.4 |
| | RES-009E 1335.41-1338.16 | N | 46.5 | 2 | 49 | 5.5 | 20 | 27.9 |
| | RES-009E 1351.03-1354.03 | N | 33.2 | 1.4 | 56 | 3.8 | 6 | 28 |
| | RES-009E 1368.07-1370.69 | N | 30.6 | 2.9 | 69 | 4.6 | 3 | 33.3 |
| | RES-009E 1385.61-1388.61 | N | 36.8 | 0.9 | 48 | 4.6 | 13 | 18.4 |
| | RES-009E 1402.22-1404.53 | N | 37.6 | 1.6 | 52 | 5.4 | 8 | 22.6 |
| | RES-009E 1410.5-1411.5 | N | 37.5 | 1.6 | 52 | 5.4 | 10 | 23 |
| | RES-009E 1418.16-1419.8 | N | 44.9 | 3 | 67 | 7.4 | 7 | 29.8 |
| | RES-009E 1431.42-1433.8 | N | 33.7 | 3.3 | 46 | 5.5 | 19 | 26.2 |
| | RES-009E 1446.41-1449.41 | N | 48.6 | 2.8 | 170 | 17.7 | 16 | 29.6 |
| | RES-009E 1464.41-1467.41 | N | 40.9 | 3.4 | 166 | 17.1 | 11 | 30.1 |
| | RES-009E 1478.13-1481.13 | N | 43 | 3.9 | 107 | 14.7 | 19 | 36.1 |
| | RES-009E 1496.13-1499.13 | N | 58.9 | 3.6 | 111 | 12.7 | 19 | 35.7 |
| | RES-009E 1510.74-1527.19 | N | 76 | 2.4 | 109 | 8 | 6 | 21.9 |
| | RES-009E 1514.13-1517.13 | N | 33.8 | 2 | 102 | 7 | 4 | 23.6 |
| | RES-009E 1532.4-1534.49 | N | 85.3 | 2.2 | 107 | 10 | 21 | 23.2 |
| | RES-009E 1540.5-1541.5 | N | 78.3 | 2.1 | 107 | 10 | 17 | 23 |
| | RES-009E 1547.47-1550.47 | N | 49.3 | 3.7 | 95 | 17.2 | 265 | 29.7 |
| | RES-009E 1565.47-1568.47 | N | 40.4 | 2 | 96 | 10.2 | 1645 | 25.2 |
| | RES-009E 1597.32-1599.88 | N | 81.4 | 1.4 | 40 | 4 | 1135 | 10.7 |
| | RES-009E 1602.44-1605 | N | 58.7 | 2.4 | 74 | 6.8 | 650 | 23.4 |
| | RES-009E 1617.38-1619.14 | N | 78.1 | 2.6 | 115 | 26.8 | 357 | 21.5 |
| | RES-009E 1634.46-1637.47 | N | 51.4 | 2.5 | 58 | 14.6 | 148 | 26.4 |
| | RES-009E 1650.14-1652.81 | N | 71.1 | 4.2 | 102 | 10.7 | 436 | 23.5 |
| | | FD | 83.3 | 4.7 | 103 | 12.3 | 441 | 24.6 |
| | RES-009E 1669.07-1672.07 | N | 47.3 | 3.1 | 150 | 7 | 1325 | 35 |
| | RES-009E 1685.09-1687.47 | N | 60.1 | 2.2 | 66 | 3.2 | 9 | 14.4 |
| | RES-009E 1697.61-1700.61 | N | 59.3 | 3.1 | 111 | 8.1 | 4 | 59.1 |
| | RES-009E 1718.61-1721.61 | N | 57.1 | 2.8 | 167 | 7.2 | 14 | 53.9 |
| | RES-009E 1739.63-1742.63 | N | 25.6 | 0.9 | 46 | 1.4 | 3 | 14.3 |
| | | FD | 40.4 | 1.3 | 73 | 5.2 | 41 | 20.9 |
| | RES-009E 1789.83-1792.31 | N | 39.7 | 2.1 | 107 | 5.6 | 4 | 39.8 |
| | RES-009E 1801.42-1804.15 | N | 45 | 8.3 | 132 | 7 | 974 | 18.5 |
| | RES-009E 1818.62-1821.62 | N | 70.9 | 8.3 | 123 | 15.9 | 197 | 25 |
| | RES-009E 1829.95-1832.48 | N | 111.5 | 10.8 | 138 | 9 | 305 | 17.7 |
| | RES-009E 1846.66-1849.66 | N | 169.5 | 15.5 | 125 | 12.9 | 2440 | 25.6 |
| | RES-009E 1862.15-1865.15 | N | 82 | 6.8 | 79 | 14.4 | 258 | 32.9 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX D
# ICP-MS WHOLE ROCK ANALYSIS

| Hole ID | Sample ID | Type | Tungsten PPM | Uranium PPM | Vanadium PPM | Yttrium PPM | Zinc PPM | Zirconium PPM |
|---|---|---|---|---|---|---|---|---|
| RES-009E | RES-009E 1867.87-188 | N | 119.5 | 11.7 | 111 | 14.8 | 2140 | 37.8 |
| | RES-009E 1880.15-1882.37 | N | 132.5 | 8.2 | 81 | 8.8 | 1200 | 20.1 |
| | RES-009E 1885.5-1886.5 | N | 139 | 8.6 | 80 | 9.3 | 1200 | 21 |
| | RES-009E 1899-1901.88 | N | 36.8 | 4.9 | 138 | 15.3 | 183 | 20.6 |
| | RES-009E 1929.76-1932.58 | N | 175.5 | 4.5 | 89 | 11.2 | 1590 | 8.3 |
| | RES-009E 1947.67-1950.67 | N | 39.9 | 3.9 | 109 | 14.3 | 82 | 39.2 |
| | RES-009E 1954.6-1956 | N | 31.4 | 3.3 | 119 | 10.8 | 78 | 18.3 |
| | RES-009E 1967.76-1969.72 | N | 24.3 | 1.3 | 117 | 6.6 | 30 | 16.2 |
| | RES-009E 1974.78-1977.89 | N | 123.5 | 4.3 | 48 | 9.1 | 773 | 17.7 |
| | RES-009E 1984.74-1987.74 | N | 3.7 | 0.3 | 5 | 2.1 | 177 | 3.7 |
| | RES-009E 2056.38-2075 | N | 23.4 | 3.7 | 239 | 12.8 | 60 | 11 |

| | |
|---|---|
| -- | Not requested. |
| KG H2SO4/T | kilograms sulfuric acid per ton. |
| MG/L | milligrams per liter. |
| PCI/G | picocuries per gram. |
| PPM | parts per million. |
| T CACOS/KT | tons calcium carbonates per kiloton |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | field duplicate. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| N | normal. |
| R1 | RPD exceeded the method control limit. |

# APPENDIX E
# X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS

# APPENDIX E
# X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS

| | | | Depth | | ALS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Aluminum Oxide | Barium Oxide | Calcium Oxide | Chromium Oxide | Iron Oxide | Magnesium Oxide | Manganese Oxide | Phosphorus Pentoxide |
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % | % | % |
| RES-001C | RES-001C 1502-1505 | N | 1502 | 1505 | 16.31 | 0.08 | 0.17 | 0.03 | 4.41 | 0.9 | 0.01 | 0.11 |
| | RES-001C 1530-1533 | N | 1530 | 1533 | 13.69 | 0.08 | 0.46 | 0.03 | 6.07 | 1.59 | 0.04 | 0.124 |
| | RES-001C 1557-1560 | N | 1557 | 1560 | 13.29 | 0.06 | 0.62 | 0.04 | 7.79 | 1.34 | 0.04 | 0.116 |
| | RES-001C 1584-1587 | N | 1584 | 1587 | 14.1 | 0.09 | 0.61 | 0.04 | 7.03 | 1.8 | 0.06 | 0.137 |
| | | FD | 1584 | 1587 | 14.12 | 0.08 | 0.61 | 0.04 | 7.3 | 1.79 | 0.06 | 0.135 |
| | RES-001C 1611-1614 | N | 1611 | 1614 | 12.91 | 0.06 | 1 | 0.03 | 6.7 | 1.5 | 0.09 | 0.128 |
| | RES-001C 1639-1642 | N | 1639 | 1642 | 13.71 | 0.07 | 0.79 | 0.04 | 7.96 | 1.73 | 0.32 | 0.115 |
| | RES-001C 1666-1669 | N | 1666 | 1669 | 13.54 | 0.06 | 0.91 | 0.03 | 6.33 | 1.66 | 0.2 | 0.126 |
| | RES-001C 1693-1696 | N | 1693 | 1696 | 13.98 | 0.07 | 0.74 | 0.03 | 5.77 | 1.95 | 0.14 | 0.116 |
| | RES-001C 1711-1714.96 | N | 1711 | 1714.96 | 16.53 | 0.07 | 3.93 | 0.03 | 5.95 | 2.11 | 0.08 | 0.193 |
| | RES-001C 1745-1748 | N | 1745 | 1748 | 13.98 | 0.06 | 5.75 | 0.05 | 5.48 | 2.79 | 0.1 | 0.162 |
| | RES-001C 1771.75-1791.4 | N | 1771.75 | 1791.4 | 1.72 | <0.01 | 26.1 | 0.04 | 10.67 | 10.69 | 0.51 | 0.109 |
| | RES-001C 1781-1784 | N | 1781 | 1784 | 1.25 | <0.01 | 23.9 | <0.01 | 2.7 | 16.86 | 0.38 | 0.085 |
| | RES-001C 1799-1802 | N | 1799 | 1802 | 1.27 | <0.01 | 31.08 | 0.03 | 21.26 | 4.08 | 0.49 | 0.077 |
| | | FD | 1799 | 1802 | 1.25 | <0.01 | 31.22 | <0.01 | 21.16 | 4.1 | 0.49 | 0.078 |
| | RES-001C 1814-1817 | N | 1814 | 1817 | 13.07 | 0.01 | 11.95 | 0.01 | 5.16 | 10.11 | 0.31 | 0.211 |
| | RES-001C 1837-1840 | N | 1837 | 1840 | 6.62 | <0.01 | 18.03 | 0.04 | 5.84 | 12.17 | 0.54 | 0.089 |
| | RES-001C 1855-1858 | N | 1855 | 1858 | 4.03 | <0.01 | 21.81 | 0.04 | 15.67 | 6.86 | 0.64 | 0.077 |
| | RES-001C 1873-1876 | N | 1873 | 1876 | 7.67 | 0.01 | 6.93 | 0.02 | 9.01 | 13.11 | 0.21 | 0.143 |
| | RES-001C 1892.5-1895 | N | 1892.5 | 1895 | 2.7 | <0.01 | 12.71 | 0.01 | 6.81 | 19.54 | 0.32 | 0.09 |
| | RES-001C 1934-1937 | N | 1934 | 1937 | 1.68 | <0.01 | 0.09 | 0.12 | 4.96 | 0.22 | 0.01 | 0.025 |
| | RES-001C 1987-1990 | N | 1987 | 1990 | 12.51 | 0.02 | 0.88 | 0.08 | 14.26 | 5.16 | 0.16 | 0.245 |
| | RES-001C 2007-2010 | N | 2007 | 2010 | 12.49 | 0.06 | 2.07 | 0.06 | 14.79 | 5.37 | 0.16 | 0.236 |
| | | FD | 2007 | 2010 | 12.49 | 0.05 | 2.04 | 0.06 | 14.65 | 5.35 | 0.16 | 0.235 |
| | RES-001C 2041-2044 | N | 2041 | 2044 | 14.55 | 0.09 | 2.86 | 0.06 | 11.73 | 6.48 | 0.15 | 0.255 |
| | RES-001C 2115-2118 | N | 2115 | 2118 | 7.4 | <0.01 | 11.56 | 0.02 | 10.84 | 8.52 | 0.3 | 0.16 |
| | RES-001C 2164.4-2166.3 | N | 2164.4 | 2166.3 | 1.18 | 0.01 | 0.18 | 0.07 | 51.5 | 0.04 | 0.01 | 0.06 |
| | RES-001C 2214-2215 | N | 2214 | 2215 | 0.79 | <0.01 | 15.45 | 0.03 | 10.58 | 14.64 | 0.41 | 0.038 |
| | RES-001C 2242-2244 | N | 2242 | 2244 | 10.98 | 0.03 | 4.47 | 0.07 | 14.62 | 3.54 | 0.06 | 0.681 |
| RES-002A | RES-002A 1007-1010 | N | 1007 | 1010 | 12.3 | 0.12 | 0.1 | 0.03 | 5.44 | 0.73 | 0.01 | 0.142 |
| | RES-002A 1058-1061 | N | 1058 | 1061 | 14.13 | 0.09 | 0.1 | 0.04 | 4.22 | 0.93 | 0.01 | 0.194 |
| | RES-002A 1109-1112 | N | 1109 | 1112 | 13.03 | 0.07 | 0.08 | 0.04 | 4.69 | 0.67 | 0.01 | 0.15 |
| | RES-002A 1154-1156 | N | 1154 | 1156 | 13.8 | 0.12 | 0.08 | <0.01 | 5.25 | 0.86 | 0.01 | 0.124 |
| | RES-002A 1201-1203 | N | 1201 | 1203 | 11.32 | 0.02 | 0.06 | 0.06 | 22.49 | 0.26 | 0.01 | 0.127 |
| | | FD | 1201 | 1203 | 11.32 | 0.02 | 0.06 | 0.05 | 23.09 | 0.26 | 0.01 | 0.13 |
| | RES-002A 1246-1249 | N | 1246 | 1249 | 13.61 | 0.07 | 0.07 | 0.04 | 8.29 | 0.29 | 0.01 | 0.167 |
| | RES-002A 1291-1292 | N | 1291 | 1292 | 12.55 | 0.05 | 0.04 | 0.05 | 8.45 | 0.13 | 0.01 | 0.111 |
| | RES-002A 1325-1328 | N | 1325 | 1328 | 12.09 | 0.07 | 0.07 | 0.04 | 13.38 | 0.35 | 0.01 | 0.192 |
| | RES-002A 1363-1366 | N | 1363 | 1366 | 12.93 | 0.05 | 0.07 | 0.05 | 9.3 | 0.34 | 0.01 | 0.149 |
| | RES-002A 1395-1397 | N | 1395 | 1397 | 7.96 | 0.02 | 0.03 | 0.07 | 15.39 | 0.18 | 0.01 | 0.07 |
| | RES-002A 1414.6-1417 | N | 1414.6 | 1417 | 13.4 | 0.05 | 0.08 | 0.04 | 10.05 | 0.65 | 0.01 | 0.152 |
| | RES-002A 1454-1457 | N | 1454 | 1457 | 12.67 | 0.05 | 0.07 | 0.01 | 11.74 | 0.66 | 0.01 | 0.156 |
| | RES-002A 1538-1541 | N | 1538 | 1541 | 14.38 | 0.05 | 0.06 | 0.04 | 6.37 | 0.78 | 0.01 | 0.075 |
| | RES-002A 1583-1586 | N | 1583 | 1586 | 13.97 | 0.06 | 0.02 | 0.04 | 6.4 | 0.8 | 0.01 | 0.076 |
| | RES-002A 1627-1630 | N | 1627 | 1630 | 14.03 | 0.06 | 0.04 | <0.01 | 4.21 | 0.77 | 0.01 | 0.095 |
| | RES-002A 1732-1735 | N | 1732 | 1735 | 15.57 | 0.02 | 0.54 | 0.02 | 9.97 | 4.49 | 0.09 | 0.359 |
| | | FD | 1732 | 1735 | 15.33 | 0.02 | 0.53 | 0.02 | 9.77 | 4.44 | 0.08 | 0.355 |
| | RES-002A 1781-1784 | N | 1781 | 1784 | 9.31 | 0.04 | 0.03 | <0.01 | 4.77 | 0.55 | 0.01 | 0.063 |

FD Field duplicate
N Normal
XRF X-Ray florescence

# APPENDIX E
# X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS

| | | | Depth | | ALS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Aluminum Oxide | Barium Oxide | Calcium Oxide | Chromium Oxide | Iron Oxide | Magnesium Oxide | Manganese Oxide | Phosphorus Pentoxide |
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % | % | % |
| RES-002A | RES-002A 1814-1817 | N | 1814 | 1817 | 6.76 | 0.02 | 0.06 | 0.04 | 4.22 | 0.43 | 0.01 | 0.052 |
| | RES-002A 1876-1879 | N | 1876 | 1879 | 10.66 | 0.02 | 3.8 | <0.01 | 13.2 | 3.13 | 0.04 | 0.175 |
| | RES-002A 1927-1930 | N | 1927 | 1930 | 11.67 | 0.02 | 5.21 | 0.04 | 10.99 | 4.28 | 0.06 | 0.151 |
| | RES-002A 1981-1984 | N | 1981 | 1984 | 13.39 | 0.02 | 4.08 | 0.03 | 11.32 | 5.5 | 0.08 | 0.25 |
| | RES-002A 858-861 | N | 858 | 861 | 17.73 | 0.15 | 0.06 | 0.02 | 2.29 | 0.58 | 0.02 | 0.06 |
| | RES-002A 888-891 | N | 888 | 891 | 13.04 | 0.15 | 0.05 | 0.04 | 6.04 | 0.72 | 0.02 | 0.093 |
| | RES-002A 927-930 | N | 927 | 930 | 14.77 | 0.18 | 0.05 | 0.02 | 4.99 | 1.01 | 0.02 | 0.058 |
| | RES-002A 965-968 | N | 965 | 968 | 14.02 | 0.09 | 0.07 | 0.04 | 3.91 | 0.85 | 0.01 | 0.101 |
| | RES-002A 992-995 | N | 992 | 995 | 11.63 | 0.07 | 0.11 | 0.03 | 4.74 | 0.54 | 0.01 | 0.188 |
| | | FD | 992 | 995 | 11.91 | 0.07 | 0.12 | 0.09 | 4.89 | 0.55 | 0.01 | 0.19 |
| RES-005I | RES-005I 1011.88-1012.45 | N | 1011.88 | 1012.45 | 14.02 | 0.03 | 3.71 | 0.03 | 10.18 | 4.79 | 0.28 | 0.2 |
| | RES-005I 1322.73-1323.23 | N | 1322.73 | 1323.23 | 8.66 | 0.01 | 11.65 | 0.03 | 7.19 | 3.89 | 0.33 | 0.149 |
| | RES-005I 1353-1353.49 | N | 1353 | 1353.49 | 8.64 | 0.02 | 8.63 | 0.03 | 7.99 | 4.38 | 0.26 | 0.175 |
| | RES-005I 1360.5-1361.51 | N | 1360.5 | 1361.51 | 11.44 | 0.03 | 4.48 | 0.04 | 7.69 | 4.08 | 0.19 | 0.196 |
| | RES-005I 1370.93-1374 | N | 1370.93 | 1374 | 8.53 | 0.04 | 0.19 | 0.01 | 7.09 | 0.38 | 0.01 | 0.154 |
| | RES-005I 1380-1383 | N | 1380 | 1383 | 5.22 | 0.03 | 0.41 | <0.01 | 15.16 | 0.21 | 0.01 | 0.268 |
| | RES-005I 1389-1391.57 | N | 1389 | 1391.57 | 3.82 | 0.02 | 0.21 | <0.01 | 7.14 | 0.11 | 0.01 | 0.195 |
| | RES-005I 1396.3-1399.3 | N | 1396.3 | 1399.3 | 5 | 0.01 | 0.49 | <0.01 | 26.02 | 0.09 | 0.01 | 0.156 |
| | RES-005I 1405-1406.67 | N | 1405 | 1406.67 | 3.54 | 0.04 | 0.26 | <0.01 | 14.35 | 0.13 | 0.01 | 0.4 |
| | RES-005I 1410.18-1413.18 | N | 1410.18 | 1413.18 | 2.47 | 0.29 | 0.04 | <0.01 | 16.26 | 0.11 | 0.01 | 0.115 |
| | RES-005I 1419.18-1422.18 | N | 1419.18 | 1422.18 | 1.59 | 0.25 | 0.12 | 0.06 | 22.69 | 0.08 | 0.01 | 0.252 |
| | RES-005I 1425.5-1426.51 | N | 1425.5 | 1426.51 | 1.54 | 0.25 | 0.11 | 0.06 | 22.49 | 0.08 | 0.01 | 0.247 |
| | RES-005I 1428.18-1431.18 | N | 1428.18 | 1431.18 | 0.95 | 0.15 | 0.06 | <0.01 | 15.1 | 0.08 | 0.01 | 0.137 |
| | RES-005I 1437.13-1440.13 | N | 1437.13 | 1440.13 | 3.4 | 0.05 | 0.07 | <0.01 | 8.79 | 0.18 | 0.01 | 0.131 |
| | RES-005I 1446.13-1449.13 | N | 1446.13 | 1449.13 | 8.59 | 0.08 | 0.13 | 0.06 | 4.07 | 0.37 | <0.01 | 0.215 |
| | RES-005I 1455.13-1458.13 | N | 1455.13 | 1458.13 | 10.42 | 0.05 | 0.07 | <0.01 | 5.24 | 0.37 | 0.01 | 0.159 |
| | RES-005I 1464.13-1467.13 | N | 1464.13 | 1467.13 | 9.89 | 0.04 | 0.1 | <0.01 | 5 | 0.35 | 0.01 | 0.148 |
| | RES-005I 1473.13-1476.13 | N | 1473.13 | 1476.13 | 7.47 | 0.13 | 0.09 | <0.01 | 7.44 | 0.23 | 0.01 | 0.073 |
| | RES-005I 1481-1482.66 | N | 1481 | 1482.66 | 5.48 | 0.01 | 0.06 | 0.06 | 8.35 | 0.19 | <0.01 | 0.113 |
| | RES-005I 1485.5-1486.51 | N | 1485.5 | 1486.51 | 5.58 | 0.02 | 0.07 | 0.06 | 8.35 | 0.2 | 0.01 | 0.114 |
| | RES-005I 1487.1-1490.1 | N | 1487.1 | 1490.1 | 12.1 | 0.42 | 0.08 | <0.01 | 3.82 | 0.5 | 0.01 | 0.1 |
| | RES-005I 1490.1-1493.1 | N | 1490.1 | 1493.1 | 12.35 | 0.09 | 0.08 | 0.03 | 6.13 | 0.52 | 0.01 | 0.109 |
| | RES-005I 1499-1502 | N | 1499 | 1502 | 14.1 | 0.05 | 0.08 | <0.01 | 3.64 | 0.69 | 0.01 | 0.125 |
| | RES-005I 1506.56-1509.47 | N | 1506.56 | 1509.47 | 12.69 | 0.05 | 0.16 | <0.01 | 3.08 | 0.57 | 0.01 | 0.186 |
| | RES-005I 1515.47-1518.47 | N | 1515.47 | 1518.47 | 14.07 | 0.05 | 0.11 | <0.01 | 2.52 | 0.56 | 0.01 | 0.115 |
| | RES-005I 1524.47-1527.47 | N | 1524.47 | 1527.47 | 12.98 | 0.08 | 0.03 | <0.01 | 4.43 | 0.47 | 0.01 | 0.076 |
| | RES-005I 1532.98-1534.97 | N | 1532.98 | 1534.97 | 13.76 | 0.05 | 0.15 | <0.01 | 1.91 | 0.51 | 0.01 | 0.097 |
| | RES-005I 1544-1546.55 | N | 1544 | 1546.55 | 6.74 | 0.05 | 0.06 | <0.01 | 4.17 | 0.23 | 0.01 | 0.163 |
| | RES-005I 1552.55-1555.58 | N | 1552.55 | 1555.58 | 10.26 | 0.03 | 0.06 | <0.01 | 6.35 | 0.39 | 0.01 | 0.109 |
| | RES-005I 1559.46-1562.46 | N | 1559.46 | 1562.46 | 11.48 | 0.04 | 0.04 | <0.01 | 4.72 | 0.43 | 0.01 | 0.083 |
| | RES-005I 1568.46-1571.46 | N | 1568.46 | 1571.46 | 12.83 | 0.04 | 0.04 | <0.01 | 5.19 | 0.48 | 0.01 | 0.098 |
| | RES-005I 1577.46-1580.46 | N | 1577.46 | 1580.46 | 9.41 | 0.03 | 0.04 | 0.05 | 5.78 | 0.38 | 0.01 | 0.092 |
| | | FD | 1577.46 | 1580.46 | 9.28 | 0.03 | 0.04 | 0.06 | 5.61 | 0.37 | <0.01 | 0.092 |
| | RES-005I 1586.46-1589.46 | N | 1586.46 | 1589.46 | 11.86 | 0.06 | 0.04 | <0.01 | 5.24 | 0.46 | 0.01 | 0.088 |
| | RES-005I 1595.46-1598.46 | N | 1595.46 | 1598.46 | 12.26 | 0.05 | 0.06 | <0.01 | 4.18 | 0.46 | 0.01 | 0.119 |
| | RES-005I 1604.46-1607.46 | N | 1604.46 | 1607.46 | 13.04 | 0.05 | 0.05 | 0.02 | 2.13 | 0.53 | 0.01 | 0.112 |
| | RES-005I 1613.46-1616.46 | N | 1613.46 | 1616.46 | 13.76 | 0.05 | 0.05 | 0.05 | 2.91 | 0.53 | <0.01 | 0.121 |
| | RES-005I 1616.46-1619 | N | 1616.46 | 1619 | 14.34 | 0.04 | 0.06 | <0.01 | 2.08 | 0.52 | 0.01 | 0.139 |

FD Field duplicate
N Normal
XRF X-Ray florescence

# APPENDIX E
# X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS

| | | | Depth | | ALS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Aluminum Oxide | Barium Oxide | Calcium Oxide | Chromium Oxide | Iron Oxide | Magnesium Oxide | Manganese Oxide | Phosphorus Pentoxide |
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % | % | % |
| RES-005I | RES-005I 1626.54-1627.16 | N | 1626.54 | 1627.16 | 4.16 | 0.05 | 0.04 | <0.01 | 12.74 | 0.19 | 0.01 | 0.134 |
| | RES-005I 1627.16-1630 | N | 1627.16 | 1630 | 13.57 | 0.05 | 0.02 | 0.05 | 3.4 | 0.53 | <0.01 | 0.089 |
| | RES-005I 1630.5-1631.5 | N | 1630.5 | 1631.5 | 13.31 | 0.05 | 0.02 | 0.06 | 3.4 | 0.52 | 0.01 | 0.086 |
| | RES-005I 1632.56-1635.56 | N | 1632.56 | 1635.56 | 14.22 | 0.06 | 0.02 | <0.01 | 6.44 | 0.53 | 0.01 | 0.072 |
| | RES-005I 1638.37-1641 | N | 1638.37 | 1641 | 14.08 | 0.04 | 0.02 | <0.01 | 6.98 | 0.65 | <0.01 | 0.083 |
| | RES-005I 1645.84-1648.08 | N | 1645.84 | 1648.08 | 13.48 | 0.05 | 0.05 | <0.01 | 4.52 | 0.56 | 0.01 | 0.101 |
| | RES-005I 1652-1654.93 | N | 1652 | 1654.93 | 12.62 | 0.03 | 0.04 | <0.01 | 7.02 | 0.53 | 0.01 | 0.079 |
| | RES-005I 1654.93-1657.3 | N | 1654.93 | 1657.3 | 10.3 | 0.05 | 0.09 | <0.01 | 7.77 | 0.42 | 0.01 | 0.138 |
| | RES-005I 1677.8-1680.8 | N | 1677.8 | 1680.8 | 14.06 | 0.04 | 0.03 | 0.05 | 6.19 | 0.59 | 0.01 | 0.106 |
| | RES-005I 1695.23-1697.23 | N | 1695.23 | 1697.23 | 15.01 | 0.08 | 0.03 | <0.01 | 4.32 | 0.63 | 0.01 | 0.116 |
| | RES-005I 1711.23-1713.23 | N | 1711.23 | 1713.23 | 12.29 | 0.03 | 0.01 | <0.01 | 7.07 | 0.51 | 0.01 | 0.063 |
| | RES-005I 1727.23-1729.23 | N | 1727.23 | 1729.23 | 13.83 | 0.07 | 0.08 | 0.06 | 4.11 | 0.54 | <0.01 | 0.09 |
| | RES-005I 1730.5-1731.5 | N | 1730.5 | 1731.5 | 13.61 | 0.07 | 0.07 | 0.05 | 3.96 | 0.54 | <0.01 | 0.089 |
| | RES-005I 1743.23-1745.23 | N | 1743.23 | 1745.23 | 11.98 | 0.04 | 0.02 | <0.01 | 5.55 | 0.47 | <0.01 | 0.082 |
| | RES-005I 1759.23-1761.23 | N | 1759.23 | 1761.23 | 12.65 | 0.06 | 0.03 | <0.01 | 6.54 | 0.56 | <0.01 | 0.08 |
| | RES-005I 1775.23-1778.23 | N | 1775.23 | 1778.23 | 14.02 | 0.08 | 0.03 | <0.01 | 5.59 | 0.53 | 0.01 | 0.095 |
| | RES-005I 1794.36-1796.3 | N | 1794.36 | 1796.3 | 12.7 | 0.06 | 0.07 | <0.01 | 6.49 | 0.62 | 0.01 | 0.107 |
| | RES-005I 1811.3-1814.3 | N | 1811.3 | 1814.3 | 13.29 | 0.06 | 0.02 | 0.05 | 6.61 | 0.62 | <0.01 | 0.082 |
| | RES-005I 1830.5-1831.5 | N | 1830.5 | 1831.5 | 13.31 | 0.06 | 0.02 | 0.05 | 6.78 | 0.64 | <0.01 | 0.08 |
| | RES-005I 1835.3-1838.3 | N | 1835.3 | 1838.3 | 13.84 | 0.07 | 0.01 | <0.01 | 6.3 | 0.65 | 0.01 | 0.081 |
| | RES-005I 1855.91-1858.91 | N | 1855.91 | 1858.91 | 15.33 | 0.07 | 0.05 | <0.01 | 4.79 | 0.71 | 0.01 | 0.111 |
| | RES-005I 1872.9-1875.38 | N | 1872.9 | 1875.38 | 13.95 | 0.07 | 0.04 | <0.01 | 5.49 | 0.73 | 0.01 | 0.112 |
| | RES-005I 1875.38-187 | N | 1875.38 | 1878.2 | 11.45 | 0.03 | 0.04 | 0.06 | 6.6 | 0.65 | <0.01 | 0.121 |
| | RES-005I 1884-1887 | N | 1884 | 1887 | 14.4 | 0.02 | 0.79 | 0.01 | 10.57 | 2.7 | 0.03 | 0.586 |
| | RES-005I 1895-1897.0 | N | 1895 | 1897.06 | 10.56 | 0.03 | 0.06 | <0.01 | 4.8 | 0.55 | 0.01 | 0.054 |
| | RES-005I 1901.49-190 | N | 1901.49 | 1902.36 | 12.09 | 0.05 | 0.15 | <0.01 | 7.43 | 0.63 | 0.01 | 0.122 |
| | RES-005I 1917.29-191 | N | 1917.29 | 1919.1 | 15.4 | 0.02 | 0.48 | 0.01 | 9.77 | 4.93 | 0.03 | 0.324 |
| | RES-005I 1923.1-1925 | N | 1923.1 | 1925.3 | 15.73 | 0.01 | 0.55 | 0.02 | 12.89 | 4.39 | 0.04 | 0.375 |
| | RES-005I 1955.06-195 | N | 1955.06 | 1958.06 | 17.33 | <0.01 | 0.51 | 0.04 | 11.34 | 7.41 | 0.12 | 0.27 |
| | RES-005I 1960.5-1961 | N | 1960.5 | 1961.5 | 17.25 | 0.01 | 0.52 | 0.04 | 11.4 | 7.36 | 0.13 | 0.275 |
| | RES-005I 1979.06-198 | N | 1979.06 | 1982.06 | 17.16 | <0.01 | 0.6 | 0.02 | 11.59 | 8.44 | 0.11 | 0.233 |
| | RES-005I 2008.11-201 | N | 2008.11 | 2011.11 | 17.12 | 0.02 | 1.06 | 0.01 | 10.27 | 6.91 | 0.1 | 0.327 |
| | RES-005I 2032.11-203 | N | 2032.11 | 2035.11 | 17.19 | 0.03 | 0.76 | 0.01 | 12.11 | 5.29 | 0.1 | 0.386 |
| | RES-005I 2049.84-205 | N | 2049.84 | 2052.84 | 13.85 | 0.1 | 0.17 | <0.01 | 3.26 | 1 | 0.02 | 0.148 |
| | RES-005I 2061.84-206 | N | 2061.84 | 2064.84 | 13.02 | 0.07 | 0.14 | <0.01 | 4.55 | 1.1 | 0.01 | 0.118 |
| RES-005J | RES-005J 1660.4-1668 | N | 1660.4 | 1668.47 | 12.16 | 0.04 | 0.02 | 0.07 | 6.04 | 0.48 | 0.01 | 0.07 |
| RES-006D | RES-006D 1247.48-1250.48 | N | 1247.48 | 1250.48 | 18.36 | 0.03 | 3.78 | <0.01 | 9.03 | 3.3 | 0.27 | 0.163 |
| | RES-006D 1405.47-1408.44 | N | 1405.47 | 1408.44 | 16.75 | 0.06 | 0.99 | 0.03 | 7.31 | 2.56 | 0.15 | 0.304 |
| | RES-006D 1450.44-1453.44 | N | 1450.44 | 1453.44 | 14.51 | 0.03 | 1.67 | 0.05 | 14.45 | 3.13 | 0.17 | 0.307 |
| | RES-006D 1495.44-1498.44 | N | 1495.44 | 1498.44 | 12.55 | 0.04 | 0.98 | <0.01 | 14.07 | 4.86 | 0.22 | 0.254 |
| | RES-006D 1532.81-1535.81 | N | 1532.81 | 1535.81 | 15.8 | 0.03 | 0.62 | <0.01 | 10.82 | 2.48 | 0.07 | 0.334 |
| | RES-006D 1577.43-1580.43 | N | 1577.43 | 1580.43 | 17.8 | 0.06 | 1.19 | 0.03 | 9.22 | 2.81 | 0.16 | 0.261 |
| | RES-006D 1600.5-1601.5 | N | 1600.5 | 1601.5 | 17.91 | 0.06 | 1.18 | 0.02 | 9.31 | 2.82 | 0.15 | 0.262 |
| | RES-006D 1622.43-1625.43 | N | 1622.43 | 1625.43 | 16.23 | 0.05 | 0.33 | <0.01 | 10.64 | 2.59 | 0.05 | 0.218 |
| | RES-006D 1667.43-1670.43 | N | 1667.43 | 1670.43 | 16.43 | 0.04 | 0.3 | 0.05 | 7.96 | 1.33 | 0.01 | 0.212 |
| | RES-006D 1705.4-1708.4 | N | 1705.4 | 1708.4 | 12.84 | 0.02 | 0.17 | 0.07 | 15.54 | 1.58 | <0.01 | 0.098 |
| | RES-006D 1750.4-1753.4 | N | 1750.4 | 1753.4 | 14.06 | 0.04 | 0.2 | 0.08 | 14.78 | 0.83 | <0.01 | 0.161 |
| | RES-006D 1798.4-1801.4 | N | 1798.4 | 1801.4 | 12.68 | 0.02 | 0.21 | 0.07 | 13.92 | 1.3 | <0.01 | 0.106 |

| | |
|---|---|
| FD | Field duplicate |
| N | Normal |
| XRF | X-Ray florescence |

# APPENDIX E
# X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS

| | | | Depth | | ALS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Aluminum Oxide | Barium Oxide | Calcium Oxide | Chromium Oxide | Iron Oxide | Magnesium Oxide | Manganese Oxide | Phosphorus Pentoxide |
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % | % | % |
| RES-006D | RES-006D 1843.4-1846.4 | N | 1843.4 | 1846.4 | 13.42 | 0.04 | 0.14 | 0.09 | 14.7 | 0.52 | <0.01 | 0.181 |
| | RES-006D 1898.21-1901.09 | N | 1898.21 | 1901.09 | 11.88 | 0.01 | 0.22 | <0.01 | 8.18 | 0.35 | 0.01 | 0.122 |
| | RES-006D 1927.23-1930.23 | N | 1927.23 | 1930.23 | 10.87 | 0.01 | 0.11 | 0.07 | 7.17 | 0.24 | 0.01 | 0.145 |
| | | FD | 1927.23 | 1930.23 | 11.03 | 0.01 | 0.12 | 0.06 | 7.08 | 0.24 | 0.01 | 0.149 |
| | RES-006D 1952.56-1954.83 | N | 1952.56 | 1954.83 | 2.83 | <0.01 | 0.03 | <0.01 | 3.15 | 0.15 | 0.01 | 0.05 |
| | RES-006D 1954.83-197 | N | 1954.83 | 1972 | 9.23 | 0.01 | 0.09 | 0.11 | 5.29 | 0.4 | 0.01 | 0.102 |
| | RES-006D 1980.6-1983.6 | N | 1980.6 | 1983.6 | 7.45 | <0.01 | 0.14 | 0.01 | 16.95 | 0.4 | 0.01 | 0.14 |
| | RES-006D 1995.6-1998.6 | N | 1995.6 | 1998.6 | 7.63 | <0.01 | 0.39 | 0.01 | 14.72 | 0.3 | 0.01 | 0.221 |
| | RES-006D 2022.66-2025.66 | N | 2022.66 | 2025.66 | 15.19 | 0.01 | 0.39 | 0.02 | 8.67 | 1.71 | 0.02 | 0.259 |
| | RES-006D 2040.66-2043.66 | N | 2040.66 | 2043.66 | 12.5 | 0.01 | 0.3 | 0.01 | 13.18 | 0.68 | 0.01 | 0.26 |
| | RES-006D 2058.16-2061.16 | N | 2058.16 | 2061.16 | 16.15 | 0.02 | 0.94 | 0.01 | 9.93 | 5.72 | 0.04 | 0.355 |
| | RES-006D 2073.13-2076.13 | N | 2073.13 | 2076.13 | 14.6 | 0.02 | 0.69 | 0.07 | 12.69 | 4.84 | 0.06 | 0.335 |
| | | FD | 2073.13 | 2076.13 | 14.96 | 0.02 | 0.7 | 0.06 | 12.67 | 4.88 | 0.06 | 0.337 |
| | RES-006D 2091.13-2094.13 | N | 2091.13 | 2094.13 | 16.69 | 0.03 | 0.78 | 0.01 | 8.14 | 6.6 | 0.07 | 0.371 |
| | RES-006D 2115.47-2118.47 | N | 2115.47 | 2118.47 | 10.25 | 0.01 | 0.28 | 0.08 | 6.22 | 0.52 | 0.01 | 0.082 |
| | RES-006D 2125.45-2128.42 | N | 2125.45 | 2128.42 | 11.4 | 0.03 | 0.14 | <0.01 | 4.96 | 0.61 | 0.01 | 0.102 |
| | RES-006D 2137.08-2138.5 | N | 2137.08 | 2138.5 | 12.83 | 0.12 | 0.63 | <0.01 | 13.91 | 0.15 | <0.01 | 0.465 |
| RES-009 | RES-009 1012.16-1014.16 | N | 1012.16 | 1014.16 | 15.86 | 0.12 | 0.42 | 0.05 | 3.52 | 0.85 | 0.1 | 0.099 |
| | RES-009 1027.38-1030.3 | N | 1027.38 | 1030.3 | 15.49 | 0.11 | 1.25 | 0.05 | 2.91 | 0.75 | 0.16 | 0.143 |
| | RES-009 1045.3-1048.3 | N | 1045.3 | 1048.3 | 15.72 | 0.11 | 0.42 | 0.04 | 2.63 | 0.98 | 0.05 | 0.078 |
| | RES-009 105.16-105.73 | N | 105.16 | 105.73 | 15.25 | 0.12 | 2.35 | 0.03 | 3.06 | 1 | 0.09 | 0.137 |
| | RES-009 1063.3-1066.3 | N | 1063.3 | 1066.3 | 15.62 | 0.1 | 0.52 | 0.05 | 2.83 | 0.99 | 0.04 | 0.108 |
| | RES-009 1081.3-1084.3 | N | 1081.3 | 1084.3 | 15.19 | 0.12 | 0.47 | 0.07 | 2.93 | 0.91 | 0.03 | 0.111 |
| | RES-009 1098.34-1100.96 | N | 1098.34 | 1100.96 | 15.3 | 0.11 | 0.55 | 0.06 | 3.01 | 1.24 | 0.03 | 0.115 |
| | RES-009 199.18-199.78 | N | 199.18 | 199.78 | 15.36 | 0.12 | 2.36 | 0.02 | 2.99 | 1.02 | 0.09 | 0.132 |
| | RES-009 199.78-200.3 | N | 199.78 | 200.3 | 15.19 | 0.11 | 2.36 | 0.02 | 2.97 | 1.03 | 0.09 | 0.131 |
| | RES-009 281.14-281.64 | N | 281.14 | 281.64 | 15.48 | 0.11 | 2.39 | 0.02 | 2.98 | 1.12 | 0.08 | 0.132 |
| | RES-009 348.3-348.83 | N | 348.3 | 348.83 | 15.65 | 0.11 | 2.44 | 0.05 | 3.19 | 0.86 | 0.1 | 0.135 |
| | RES-009 447.23-447.8 | N | 447.23 | 447.8 | 13.86 | 0.08 | 5.61 | 0.03 | 6.18 | 3.2 | 0.1 | 0.198 |
| | RES-009 485.12-485.71 | N | 485.12 | 485.71 | 12.16 | 0.04 | 10.75 | 0.04 | 6.36 | 3.28 | 0.15 | 0.192 |
| | RES-009 557.06-557.56 | N | 557.06 | 557.56 | 20.38 | 0.08 | 1.22 | 0.01 | 7 | 2.81 | 0.08 | 0.209 |
| | RES-009 647.52-648.1 | N | 647.52 | 648.1 | 14.69 | 0.03 | 4.75 | 0.03 | 9.91 | 3.97 | 0.17 | 0.221 |
| | RES-009 7.43-7.96 | N | 7.43 | 7.96 | 15.67 | 0.12 | 2.03 | 0.03 | 3.07 | 0.66 | 0.09 | 0.129 |
| | RES-009 718-718.58 | N | 718 | 718.58 | 20.11 | 0.05 | 0.71 | 0.06 | 23.32 | 1.29 | 0.05 | 0.513 |
| | RES-009 810.42-810.98 | N | 810.42 | 810.98 | 12.82 | 0.03 | 7.28 | 0.03 | 11.21 | 5.91 | 0.23 | 0.294 |
| | RES-009 906.08-906.58 | N | 906.08 | 906.58 | 12.7 | 0.03 | 6.62 | 0.04 | 8.41 | 4.46 | 0.22 | 0.183 |
| | RES-009 987.9-988.45 | N | 987.9 | 988.45 | 10.89 | 0.02 | 0.8 | 0.04 | 14.44 | 1.58 | 0.08 | 0.182 |
| | RES-009 994.67-997.67 | N | 994.67 | 997.67 | 15.72 | 0.11 | 0.42 | 0.05 | 3.73 | 0.9 | 0.09 | 0.098 |
| RES-009D | RES-009D 1119.32-1122.42 | N | 1119.32 | 1122.42 | 14.67 | 0.08 | 0.5 | 0.04 | 3.19 | 0.85 | 0.02 | 0.102 |
| | | FD | 1119.32 | 1122.42 | 14.55 | 0.08 | 0.5 | 0.04 | 3.11 | 0.86 | 0.02 | 0.103 |
| | RES-009D 1128.62-1131.72 | N | 1128.62 | 1131.72 | 14.37 | 0.05 | 0.57 | 0.04 | 3.19 | 1.37 | 0.05 | 0.107 |
| RES-009E | RES-009E 1307.1-1310.1 | N | 1307.1 | 1310.1 | 12.5 | 0.04 | 0.08 | <0.01 | 15.05 | 0.67 | <0.01 | 0.108 |
| | RES-009E 1319.1-1322.1 | N | 1319.1 | 1322.1 | 14.6 | 0.06 | 0.04 | <0.01 | 5.18 | 0.95 | 0.01 | 0.091 |
| | RES-009E 1335.41-1338.16 | N | 1335.41 | 1338.16 | 14.12 | 0.02 | 0.06 | <0.01 | 7.2 | 0.63 | 0.01 | 0.116 |
| | RES-009E 1351.03-1354.03 | N | 1351.03 | 1354.03 | 15.26 | 0.06 | 0.05 | <0.01 | 7.02 | 0.76 | <0.01 | 0.099 |
| | RES-009E 1368.07-1370.69 | N | 1368.07 | 1370.69 | 13.33 | 0.05 | 0.08 | <0.01 | 12.59 | 0.59 | 0.01 | 0.139 |
| | RES-009E 1385.61-1388.61 | N | 1385.61 | 1388.61 | 13.09 | 0.05 | 0.05 | 0.01 | 9.91 | 0.62 | 0.01 | 0.085 |
| | RES-009E 1402.22-1404.53 | N | 1402.22 | 1404.53 | 13.83 | 0.05 | 0.06 | 0.06 | 7.62 | 0.74 | <0.01 | 0.087 |

FD Field duplicate
N Normal
XRF X-Ray florescence

**APPENDIX E**
**X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS**

| | | | Depth | | ALS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Aluminum Oxide | Barium Oxide | Calcium Oxide | Chromium Oxide | Iron Oxide | Magnesium Oxide | Manganese Oxide | Phosphorus Pentoxide |
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % | % | % |
| | RES-009E 1410.5-1411.5 | N | 1410.5 | 1411.5 | 13.49 | 0.05 | 0.06 | 0.06 | 7.44 | 0.72 | <0.01 | 0.085 |
| | RES-009E 1418.16-1419.8 | N | 1418.16 | 1419.8 | 14.15 | 0.06 | 0.08 | 0.01 | 9.6 | 0.72 | 0.01 | 0.113 |
| | RES-009E 1431.42-1433.8 | N | 1431.42 | 1433.8 | 12.8 | 0.05 | 0.11 | 0.05 | 9.62 | 0.49 | <0.01 | 0.156 |
| | RES-009E 1446.41-1449.41 | N | 1446.41 | 1449.41 | 16.73 | 0.04 | 0.13 | 0.01 | 14.31 | 0.79 | <0.01 | 0.267 |
| | RES-009E 1464.41-1467.41 | N | 1464.41 | 1467.41 | 16.37 | 0.05 | 0.19 | 0.01 | 11.9 | 0.91 | <0.01 | 0.311 |
| | RES-009E 1478.13-1481.13 | N | 1478.13 | 1481.13 | 15.29 | 0.04 | 0.11 | 0.01 | 13.04 | 0.89 | 0.01 | 0.19 |
| | RES-009E 1496.13-1499.13 | N | 1496.13 | 1499.13 | 13.27 | 0.02 | 0.23 | <0.01 | 13.96 | 0.72 | 0.01 | 0.269 |
| | RES-009E 1510.74-1527.19 | N | 1510.74 | 1527.19 | 13.96 | 0.04 | 0.18 | 0.08 | 13.75 | 0.71 | 0.01 | 0.195 |
| | RES-009E 1514.13-1517.13 | N | 1514.13 | 1517.13 | 14.59 | 0.04 | 0.1 | <0.01 | 13.4 | 0.76 | 0.01 | 0.147 |
| | RES-009E 1532.4-1534.49 | N | 1532.4 | 1534.49 | 13.12 | 0.03 | 0.19 | 0.05 | 14.68 | 0.59 | <0.01 | 0.177 |
| | RES-009E 1540.5-1541.5 | N | 1540.5 | 1541.5 | 13.11 | 0.03 | 0.19 | 0.05 | 14.39 | 0.58 | <0.01 | 0.175 |
| | RES-009E 1547.47-1550.47 | N | 1547.47 | 1550.47 | 9.75 | 0.02 | 0.26 | 0.01 | 13.37 | 0.72 | 0.01 | 0.148 |
| | RES-009E 1565.47-1568.47 | N | 1565.47 | 1568.47 | 11.75 | 0.02 | 0.08 | <0.01 | 17.73 | 0.63 | 0.01 | 0.08 |
| | RES-009E 1597.32-1599.88 | N | 1597.32 | 1599.88 | 11.45 | 0.02 | 0.17 | <0.01 | 20.43 | 0.12 | <0.01 | 0.263 |
| | RES-009E 1602.44-1605 | N | 1602.44 | 1605 | 14.45 | 0.04 | 0.17 | <0.01 | 15.02 | 0.26 | <0.01 | 0.29 |
| | RES-009E 1617.38-1619.14 | N | 1617.38 | 1619.14 | 15.44 | 0.04 | 0.4 | 0.02 | 6.59 | 1.3 | 0.02 | 0.201 |
| | RES-009E 1634.46-1637.47 | N | 1634.46 | 1637.47 | 13.64 | 0.03 | 0.16 | <0.01 | 11.3 | 0.72 | 0.01 | 0.181 |
| | RES-009E 1650.14-1652.81 | N | 1650.14 | 1652.81 | 10.93 | 0.01 | 0.21 | 0.02 | 12.89 | 0.2 | 0.01 | 0.202 |
| | | FD | 1650.14 | 1652.81 | 10.99 | 0.01 | 0.22 | 0.02 | 13 | 0.19 | 0.01 | 0.202 |
| | RES-009E 1669.07-1672.07 | N | 1669.07 | 1672.07 | 17.98 | 0.09 | 0.08 | <0.01 | 6.64 | 0.91 | <0.01 | 0.169 |
| | RES-009E 1685.09-1687.47 | N | 1685.09 | 1687.47 | 13.88 | 0.06 | 0.08 | 0.04 | 4.29 | 0.74 | <0.01 | 0.146 |
| | RES-009E 1697.61-1700.61 | N | 1697.61 | 1700.61 | 13.83 | 0.08 | 0.09 | 0.01 | 7.49 | 0.65 | 0.01 | 0.168 |
| | RES-009E 1718.61-1721.61 | N | 1718.61 | 1721.61 | 12.55 | 0.05 | 0.05 | <0.01 | 5.22 | 0.49 | 0.01 | 0.152 |
| | RES-009E 1739.63-1742.63 | N | 1739.63 | 1742.63 | 5.01 | <0.01 | 0.04 | <0.01 | 4.08 | 0.05 | 0.01 | 0.07 |
| | RES-009E 1760.86-1763.86 | N | 1760.86 | 1763.86 | 8.76 | 0.01 | 0.08 | 0.03 | 3.69 | 0.33 | <0.01 | 0.115 |
| | | FD | 1760.86 | 1763.86 | 8.71 | 0.02 | 0.09 | 0.03 | 3.7 | 0.33 | 0.01 | 0.115 |
| | RES-009E 1789.83-1792.31 | N | 1789.83 | 1792.31 | 10.3 | 0.01 | 0.3 | 0.01 | 4.93 | 0.46 | 0.01 | 0.077 |
| | RES-009E 1798.16-1799.79 | N | 1798.16 | 1799.79 | 7.91 | <0.01 | 0.14 | <0.01 | 6.17 | 0.35 | 0.01 | 0.088 |
| | RES-009E 1801.42-1804.15 | N | 1801.42 | 1804.15 | 8.63 | <0.01 | 0.12 | 0.01 | 13.9 | 0.32 | 0.01 | 0.092 |
| | RES-009E 1818.62-1821.62 | N | 1818.62 | 1821.62 | 7.94 | <0.01 | 0.92 | 0.01 | 15.92 | 0.9 | 0.03 | 0.15 |
| | RES-009E 1829.95-1832.48 | N | 1829.95 | 1832.48 | 4.93 | <0.01 | 0.79 | 0.01 | 18.51 | 2.87 | 0.08 | 0.114 |
| | RES-009E 1846.66-1849.66 | N | 1846.66 | 1849.66 | 3.85 | <0.01 | 5.2 | 0.01 | 24.32 | 2.18 | 0.14 | 0.163 |
| | RES-009E 1862.15-1865.15 | N | 1862.15 | 1865.15 | 3.16 | <0.01 | 15.07 | 0.01 | 18.74 | 2.58 | 0.34 | 0.159 |
| | RES-009E 1867.87-188 | N | 1867.87 | 1884.35 | 2.46 | <0.01 | 20.68 | 0.07 | 17.83 | 2.48 | 0.36 | 0.19 |
| | RES-009E 1880.15-1882.37 | N | 1880.15 | 1882.37 | 1.64 | <0.01 | 19.94 | 0.03 | 16.77 | 2.14 | 0.33 | 0.177 |
| | RES-009E 1885.5-1886.5 | N | 1885.5 | 1886.5 | 1.57 | <0.01 | 19.5 | 0.02 | 16.59 | 2.03 | 0.32 | 0.168 |
| | RES-009E 1899-1901.88 | N | 1899 | 1901.88 | 5.51 | 0.01 | 4.09 | 0.01 | 12.76 | 1.99 | 0.09 | 0.073 |
| | RES-009E 1929.76-1932.58 | N | 1929.76 | 1932.58 | 1.13 | <0.01 | 8.27 | <0.01 | 20.52 | 1.06 | 0.18 | 0.06 |
| | RES-009E 1947.67-1950.67 | N | 1947.67 | 1950.67 | 7.05 | <0.01 | 5.34 | <0.01 | 10.25 | 8.08 | 0.07 | 0.161 |
| | RES-009E 1954.6-1956 | N | 1954.6 | 1956 | 7.13 | 0.02 | 3.42 | <0.01 | 6.49 | 5.83 | 0.06 | 0.163 |
| | RES-009E 1967.76-1969.72 | N | 1967.76 | 1969.72 | 13.35 | 0.06 | 0.27 | <0.01 | 3.51 | 2.13 | 0.02 | 0.136 |
| | RES-009E 1974.78-1977.89 | N | 1974.78 | 1977.89 | 2.99 | <0.01 | 18.94 | <0.01 | 9.48 | 16.79 | 0.23 | 0.101 |
| | RES-009E 1984.74-1987.74 | N | 1984.74 | 1987.74 | 0.43 | <0.01 | 1.22 | <0.01 | 3.78 | 0.06 | 0.01 | 0.018 |
| | RES-009E 2056.38-207 | N | 2056.38 | 2075 | 12.24 | 0.02 | 4.15 | 0.09 | 7.4 | 4.36 | 0.03 | 0.244 |

| | |
|---|---|
| FD | Field duplicate |
| N | Normal |
| XRF | X-Ray florescence |

**APPENDIX E**
**X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS**

| | | | Depth | | Potassium Oxide | Sodium Oxide | Strontium Oxide | Titanium Dioxide | Total Metals by XRF | Loss On Ignition |
|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % |
| RES-001C | RES-001C 1502-1505 | N | 1502 | 1505 | 4.76 | 0.14 | 0.02 | 0.56 | 99.67 | 5.24 |
| | RES-001C 1530-1533 | N | 1530 | 1533 | 5.22 | 0.56 | 0.02 | 0.5 | 99.68 | 4.6 |
| | RES-001C 1557-1560 | N | 1557 | 1560 | 4.5 | 0.73 | 0.01 | 0.46 | 99.49 | 5.26 |
| | RES-001C 1584-1587 | N | 1584 | 1587 | 4.91 | 0.66 | 0.02 | 0.5 | 99.61 | 4.69 |
| | | FD | 1584 | 1587 | 4.86 | 0.66 | 0.02 | 0.5 | 99.42 | 4.87 |
| | RES-001C 1611-1614 | N | 1611 | 1614 | 4.24 | 0.42 | 0.02 | 0.46 | 98.88 | 4.76 |
| | RES-001C 1639-1642 | N | 1639 | 1642 | 4.5 | 0.47 | 0.02 | 0.44 | 99.33 | 5.1 |
| | RES-001C 1666-1669 | N | 1666 | 1669 | 4.73 | 0.39 | 0.01 | 0.5 | 98.93 | 4.72 |
| | RES-001C 1693-1696 | N | 1693 | 1696 | 5.05 | 0.2 | 0.01 | 0.46 | 99.94 | 4.42 |
| | RES-001C 1711-1714.96 | N | 1711 | 1714.96 | 4.55 | 1.76 | 0.03 | 0.88 | 99.77 | 6.09 |
| | RES-001C 1745-1748 | N | 1745 | 1748 | 3.89 | 1.48 | 0.03 | 0.82 | 98.41 | 4.25 |
| | RES-001C 1771.75-1791.4 | N | 1771.75 | 1791.4 | 0.21 | <0.01 | <0.01 | 0.09 | 92.79 | 3.83 |
| | RES-001C 1781-1784 | N | 1781 | 1784 | 0.28 | <0.01 | 0.01 | 0.11 | 98.12 | 3.37 |
| | RES-001C 1799-1802 | N | 1799 | 1802 | 0.04 | <0.01 | <0.01 | 0.1 | 90.68 | 8.7 |
| | | FD | 1799 | 1802 | 0.04 | <0.01 | <0.01 | 0.1 | 91 | 8.88 |
| | RES-001C 1814-1817 | N | 1814 | 1817 | 2.66 | 0.2 | 0.01 | 0.74 | 99.87 | 7.74 |
| | RES-001C 1837-1840 | N | 1837 | 1840 | 1.48 | 0.12 | 0.01 | 0.37 | 98.25 | 5.58 |
| | RES-001C 1855-1858 | N | 1855 | 1858 | 0.35 | 0.01 | 0.01 | 0.21 | 98.34 | 4.76 |
| | RES-001C 1873-1876 | N | 1873 | 1876 | 2.8 | <0.01 | 0.01 | 0.42 | 95.96 | 8.68 |
| | RES-001C 1892.5-1895 | N | 1892.5 | 1895 | 0.77 | <0.01 | 0.01 | 0.15 | 93.7 | 7.27 |
| | RES-001C 1934-1937 | N | 1934 | 1937 | 0.53 | <0.01 | 0.01 | 0.29 | 99.12 | 2.07 |
| | RES-001C 1987-1990 | N | 1987 | 1990 | 4.78 | <0.01 | <0.01 | 1.94 | 98.46 | 4.43 |
| | RES-001C 2007-2010 | N | 2007 | 2010 | 5.29 | <0.01 | 0.01 | 1.84 | 97.96 | 4.35 |
| | | FD | 2007 | 2010 | 5.28 | <0.01 | 0.01 | 1.84 | 97.65 | 4.27 |
| | RES-001C 2041-2044 | N | 2041 | 2044 | 4.56 | <0.01 | 0.02 | 1.59 | 97.46 | 6.13 |
| | RES-001C 2115-2118 | N | 2115 | 2118 | 1.78 | <0.01 | <0.01 | 0.81 | 89.95 | 9.29 |
| | RES-001C 2164.4-2166.3 | N | 2164.4 | 2166.3 | <0.01 | 0.05 | 0.02 | 0.03 | 97.6 | 29.5 |
| | RES-001C 2214-2215 | N | 2214 | 2215 | 0.09 | <0.01 | <0.01 | 0.02 | 95.58 | 6.66 |
| | RES-001C 2242-2244 | N | 2242 | 2244 | 3.13 | <0.01 | 0.01 | 3.7 | 97.27 | 10.05 |
| RES-002A | RES-002A 1007-1010 | N | 1007 | 1010 | 3.69 | 0.06 | 0.03 | 0.51 | 99.83 | 2.27 |
| | RES-002A 1058-1061 | N | 1058 | 1061 | 4.1 | 0.1 | 0.05 | 0.56 | 99.6 | 3.5 |
| | RES-002A 1109-1112 | N | 1109 | 1112 | 3.17 | 0.06 | 0.04 | 0.55 | 98.91 | 4.29 |
| | RES-002A 1154-1156 | N | 1154 | 1156 | 4 | 0.08 | 0.02 | 0.46 | 99.54 | 4.15 |
| | RES-002A 1201-1203 | N | 1201 | 1203 | 1.92 | 0.07 | 0.04 | 0.42 | 99.25 | 14.85 |
| | | FD | 1201 | 1203 | 1.92 | 0.07 | 0.04 | 0.39 | 99.28 | 15.1 |
| | RES-002A 1246-1249 | N | 1246 | 1249 | 0.97 | 0.05 | 0.05 | 0.46 | 99.22 | 8.59 |
| | RES-002A 1291-1292 | N | 1291 | 1292 | 1.13 | 0.07 | 0.03 | 0.37 | 99.75 | 12.2 |
| | RES-002A 1325-1328 | N | 1325 | 1328 | 1.8 | 0.05 | 0.08 | 0.4 | 99.22 | 10.05 |
| | RES-002A 1363-1366 | N | 1363 | 1366 | 1.74 | 0.06 | 0.04 | 0.45 | 99.78 | 8.6 |
| | RES-002A 1395-1397 | N | 1395 | 1397 | 0.7 | 0.05 | 0.02 | 0.22 | 99.74 | 10.7 |
| | RES-002A 1414.6-1417 | N | 1414.6 | 1417 | 3.79 | 0.08 | 0.02 | 0.41 | 99.8 | 6.79 |
| | RES-002A 1454-1457 | N | 1454 | 1457 | 3.53 | 0.12 | 0.05 | 0.53 | 97.84 | 7.56 |
| | RES-002A 1538-1541 | N | 1538 | 1541 | 4.31 | 0.14 | 0.03 | 0.31 | 98.14 | 4.31 |
| | RES-002A 1583-1586 | N | 1583 | 1586 | 4.24 | 0.16 | 0.02 | 0.31 | 97.42 | 3.94 |
| | RES-002A 1627-1630 | N | 1627 | 1630 | 3.82 | 0.11 | 0.04 | 0.34 | 98.04 | 3.83 |
| | RES-002A 1732-1735 | N | 1732 | 1735 | 5.95 | 0.18 | 0.01 | 2.15 | 98.44 | 4.09 |
| | | FD | 1732 | 1735 | 5.91 | 0.18 | 0.01 | 2.16 | 97.53 | 4.07 |
| | RES-002A 1781-1784 | N | 1781 | 1784 | 2.68 | 0.07 | 0.02 | 0.39 | 98.25 | 3.51 |

FD Field duplicate
N Normal
XRF X-Ray florescence

**APPENDIX E**
**X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS**

| | | | Depth | | Potassium Oxide | Sodium Oxide | Strontium Oxide | Titanium Dioxide | Total Metals by XRF | Loss On Ignition |
|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % |
| RES-002A | RES-002A 1814-1817 | N | 1814 | 1817 | 1.95 | 0.07 | 0.01 | 0.26 | 99.19 | 2.78 |
| | RES-002A 1876-1879 | N | 1876 | 1879 | 4.1 | 0.16 | 0.01 | 1.51 | 96.18 | 8.67 |
| | RES-002A 1927-1930 | N | 1927 | 1930 | 3.63 | 0.84 | 0.02 | 1.49 | 97.13 | 8.08 |
| | RES-002A 1981-1984 | N | 1981 | 1984 | 5.16 | 0.37 | 0.02 | 1.44 | 97.68 | 8.11 |
| | RES-002A 858-861 | N | 858 | 861 | 7.43 | 0.16 | 0.04 | 0.5 | 100 | 3 |
| | RES-002A 888-891 | N | 888 | 891 | 3.47 | 0.08 | 0.02 | 0.57 | 99.78 | 2.48 |
| | RES-002A 927-930 | N | 927 | 930 | 4.41 | 0.07 | 0.02 | 0.4 | 99.97 | 2.62 |
| | RES-002A 965-968 | N | 965 | 968 | 4.2 | 0.11 | 0.02 | 0.45 | 97.45 | 3.57 |
| | RES-002A 992-995 | N | 992 | 995 | 2.99 | 0.06 | 0.04 | 0.5 | 99.72 | 3.31 |
| | | FD | 992 | 995 | 3.06 | 0.08 | 0.04 | 0.52 | 99.8 | 3.29 |
| RES-005I | RES-005I 1011.88-1012.45 | N | 1011.88 | 1012.45 | 2.82 | 1.02 | 0.02 | 1.39 | 99.92 | 5.12 |
| | RES-005I 1322.73-1323.23 | N | 1322.73 | 1323.23 | 2.39 | 0.06 | <0.01 | 0.94 | 98.72 | 13.05 |
| | RES-005I 1353-1353.49 | N | 1353 | 1353.49 | 2.81 | 0.08 | 0.01 | 1.05 | 99.56 | 9.85 |
| | RES-005I 1360.5-1361.51 | N | 1360.5 | 1361.51 | 3.86 | 0.12 | 0.01 | 1.28 | 99.84 | 6.74 |
| | RES-005I 1370.93-1374 | N | 1370.93 | 1374 | 2.3 | 0.06 | 0.02 | 0.73 | 99.82 | 1.65 |
| | RES-005I 1380-1383 | N | 1380 | 1383 | 1.16 | 0.04 | 0.06 | 0.87 | 98.85 | 1.56 |
| | RES-005I 1389-1391.57 | N | 1389 | 1391.57 | 0.49 | 0.03 | 0.05 | 0.77 | 99.27 | 1.38 |
| | RES-005I 1396.3-1399.3 | N | 1396.3 | 1399.3 | 0.3 | 0.03 | 0.01 | 0.64 | 99.8 | 1.49 |
| | RES-005I 1405-1406.67 | N | 1405 | 1406.67 | 0.6 | 0.04 | 0.04 | 0.73 | 98.22 | 1.33 |
| | RES-005I 1410.18-1413.18 | N | 1410.18 | 1413.18 | 0.49 | 0.03 | 0.03 | 0.73 | 99.77 | 0.95 |
| | RES-005I 1419.18-1422.18 | N | 1419.18 | 1422.18 | 0.31 | 0.03 | 0.04 | 0.65 | 99.9 | 0.85 |
| | RES-005I 1425.5-1426.51 | N | 1425.5 | 1426.51 | 0.31 | 0.05 | 0.04 | 0.61 | 99.34 | 0.92 |
| | RES-005I 1428.18-1431.18 | N | 1428.18 | 1431.18 | 0.17 | 0.03 | 0.04 | 0.82 | 99.91 | 0.46 |
| | RES-005I 1437.13-1440.13 | N | 1437.13 | 1440.13 | 0.95 | 0.04 | 0.03 | 0.75 | 99.93 | 0.77 |
| | RES-005I 1446.13-1449.13 | N | 1446.13 | 1449.13 | 2.37 | 0.07 | 0.04 | 0.51 | 99.61 | 1.64 |
| | RES-005I 1455.13-1458.13 | N | 1455.13 | 1458.13 | 2.92 | 0.08 | 0.04 | 0.46 | 99.72 | 1.77 |
| | RES-005I 1464.13-1467.13 | N | 1464.13 | 1467.13 | 2.71 | 0.07 | 0.04 | 0.47 | 99.71 | 1.63 |
| | RES-005I 1473.13-1476.13 | N | 1473.13 | 1476.13 | 2.07 | 0.07 | 0.01 | 0.37 | 99.72 | 1.2 |
| | RES-005I 1481-1482.66 | N | 1481 | 1482.66 | 1.5 | 0.05 | 0.02 | 0.42 | 99.81 | 0.93 |
| | RES-005I 1485.5-1486.51 | N | 1485.5 | 1486.51 | 1.53 | 0.05 | 0.02 | 0.4 | 99.87 | 0.97 |
| | RES-005I 1487.1-1490.1 | N | 1487.1 | 1490.1 | 3.54 | 0.09 | 0.02 | 0.38 | 99.96 | 1.98 |
| | RES-005I 1490.1-1493.1 | N | 1490.1 | 1493.1 | 3.59 | 0.09 | 0.01 | 0.4 | 99.6 | 1.91 |
| | RES-005I 1499-1502 | N | 1499 | 1502 | 4.21 | 0.11 | 0.02 | 0.43 | 99.8 | 2.26 |
| | RES-005I 1506.56-1509.47 | N | 1506.56 | 1509.47 | 3.7 | 0.09 | 0.02 | 1 | 99.6 | 2.15 |
| | RES-005I 1515.47-1518.47 | N | 1515.47 | 1518.47 | 3.9 | 0.1 | 0.02 | 0.45 | 99.87 | 2.17 |
| | RES-005I 1524.47-1527.47 | N | 1524.47 | 1527.47 | 3.81 | 0.05 | 0.01 | 0.31 | 98.89 | 1.93 |
| | RES-005I 1532.98-1534.97 | N | 1532.98 | 1534.97 | 4.02 | 0.11 | 0.02 | 0.34 | 99.67 | 2.14 |
| | RES-005I 1544-1546.55 | N | 1544 | 1546.55 | 1.54 | 0.06 | 0.08 | 0.35 | 99.79 | 1.44 |
| | RES-005I 1552.55-1555.58 | N | 1552.55 | 1555.58 | 2.84 | 0.07 | 0.02 | 0.38 | 99.76 | 1.67 |
| | RES-005I 1559.46-1562.46 | N | 1559.46 | 1562.46 | 3.32 | 0.1 | 0.02 | 0.31 | 99.74 | 1.64 |
| | RES-005I 1568.46-1571.46 | N | 1568.46 | 1571.46 | 3.73 | 0.1 | 0.01 | 0.31 | 99.71 | 1.8 |
| | RES-005I 1577.46-1580.46 | N | 1577.46 | 1580.46 | 2.72 | 0.08 | 0.03 | 0.35 | 99.61 | 1.38 |
| | | FD | 1577.46 | 1580.46 | 2.68 | 0.07 | 0.03 | 0.4 | 99.54 | 1.37 |
| | RES-005I 1586.46-1589.46 | N | 1586.46 | 1589.46 | 3.45 | 0.1 | 0.02 | 0.3 | 99.34 | 1.79 |
| | RES-005I 1595.46-1598.46 | N | 1595.46 | 1598.46 | 3.6 | 0.1 | 0.02 | 0.34 | 98.46 | 1.86 |
| | RES-005I 1604.46-1607.46 | N | 1604.46 | 1607.46 | 3.83 | 0.09 | 0.03 | 0.38 | 99.74 | 1.95 |
| | RES-005I 1613.46-1616.46 | N | 1613.46 | 1616.46 | 4.01 | 0.09 | 0.03 | 0.3 | 99.84 | 1.91 |
| | RES-005I 1616.46-1619 | N | 1616.46 | 1619 | 4.19 | 0.1 | 0.04 | 0.41 | 99.8 | 2.12 |

FD Field duplicate
N Normal
XRF X-Ray florescence

**APPENDIX E**
**X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS**

| | | | Depth | | Potassium Oxide | Sodium Oxide | Strontium Oxide | Titanium Dioxide | Total Metals by XRF | Loss On Ignition |
|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % |
| RES-005I | RES-005I 1626.54-1627.16 | N | 1626.54 | 1627.16 | 1.12 | 0.04 | 0.05 | 0.16 | 99.82 | 0.8 |
| | RES-005I 1627.16-1630 | N | 1627.16 | 1630 | 3.97 | 0.09 | 0.02 | 0.29 | 99.87 | 1.77 |
| | RES-005I 1630.5-1631.5 | N | 1630.5 | 1631.5 | 3.97 | 0.08 | 0.02 | 0.29 | 99.68 | 1.86 |
| | RES-005I 1632.56-1635.56 | N | 1632.56 | 1635.56 | 4.19 | 0.11 | 0.02 | 0.29 | 99.76 | 4.81 |
| | RES-005I 1638.37-1641 | N | 1638.37 | 1641 | 4.29 | 0.06 | 0.03 | 0.66 | 98.76 | 5.5 |
| | RES-005I 1645.84-1648.08 | N | 1645.84 | 1648.08 | 3.91 | 0.08 | 0.03 | 0.36 | 99.83 | 2.55 |
| | RES-005I 1652-1654.93 | N | 1652 | 1654.93 | 3.71 | 0.08 | 0.01 | 0.33 | 99.07 | 5.14 |
| | RES-005I 1654.93-1657.3 | N | 1654.93 | 1657.3 | 2.81 | <0.01 | 0.05 | 0.31 | 98.23 | 5.52 |
| | RES-005I 1677.8-1680.8 | N | 1677.8 | 1680.8 | 4.07 | <0.01 | 0.03 | 0.33 | 98.25 | 5.02 |
| | RES-005I 1695.23-1697.23 | N | 1695.23 | 1697.23 | 4.42 | <0.01 | 0.02 | 0.49 | 97.3 | 4.12 |
| | RES-005I 1711.23-1713.23 | N | 1711.23 | 1713.23 | 3.66 | <0.01 | 0.02 | 0.23 | 96.45 | 5.03 |
| | RES-005I 1727.23-1729.23 | N | 1727.23 | 1729.23 | 4.04 | 0.01 | 0.01 | 0.29 | 98.3 | 3.71 |
| | RES-005I 1730.5-1731.5 | N | 1730.5 | 1731.5 | 3.92 | 0.04 | 0.02 | 0.28 | 98.25 | 3.69 |
| | RES-005I 1743.23-1745.23 | N | 1743.23 | 1745.23 | 3.43 | <0.01 | 0.01 | 0.24 | 96.91 | 5.16 |
| | RES-005I 1759.23-1761.23 | N | 1759.23 | 1761.23 | 3.81 | <0.01 | 0.02 | 0.26 | 98.22 | 5.58 |
| | RES-005I 1775.23-1778.23 | N | 1775.23 | 1778.23 | 3.93 | 0.03 | 0.02 | 0.29 | 99.7 | 4.61 |
| | RES-005I 1794.36-1796.3 | N | 1794.36 | 1796.3 | 3.04 | 0.09 | 0.02 | 0.28 | 99.72 | 5.11 |
| | RES-005I 1811.3-1814.3 | N | 1811.3 | 1814.3 | 3.88 | 0.03 | 0.03 | 0.35 | 98.13 | 5.09 |
| | RES-005I 1830.5-1831.5 | N | 1830.5 | 1831.5 | 3.92 | 0.02 | 0.02 | 0.36 | 98.25 | 5.14 |
| | RES-005I 1835.3-1838.3 | N | 1835.3 | 1838.3 | 3.82 | 0.07 | 0.03 | 0.32 | 98.35 | 4.91 |
| | RES-005I 1855.91-1858.91 | N | 1855.91 | 1858.91 | 3.8 | 0.07 | 0.04 | 0.38 | 99.69 | 4.83 |
| | RES-005I 1872.9-1875.38 | N | 1872.9 | 1875.38 | 3.95 | 0.06 | 0.03 | 0.34 | 98.37 | 4.55 |
| | RES-005I 1875.38-187 | N | 1875.38 | 1878.2 | 3.01 | <0.01 | 0.04 | 0.78 | 98.14 | 5.17 |
| | RES-005I 1884-1887 | N | 1884 | 1887 | 4.69 | 0.01 | 0.02 | 3.29 | 98.21 | 6.18 |
| | RES-005I 1895-1897.0 | N | 1895 | 1897.06 | 2.94 | 0.05 | 0.01 | 0.55 | 98.21 | 3.68 |
| | RES-005I 1901.49-190 | N | 1901.49 | 1902.36 | 3.35 | 0.04 | 0.01 | 0.53 | 98.23 | 5.37 |
| | RES-005I 1917.29-191 | N | 1917.29 | 1919.1 | 5.44 | 0.02 | 0.01 | 1.97 | 98.37 | 4.91 |
| | RES-005I 1923.1-1925 | N | 1923.1 | 1925.3 | 5.17 | <0.01 | 0.01 | 2.07 | 98.21 | 7.06 |
| | RES-005I 1955.06-195 | N | 1955.06 | 1958.06 | 5.12 | 0.03 | <0.01 | 1.77 | 98.1 | 6.48 |
| | RES-005I 1960.5-1961 | N | 1960.5 | 1961.5 | 5.08 | 0.03 | <0.01 | 1.76 | 98.36 | 6.52 |
| | RES-005I 1979.06-198 | N | 1979.06 | 1982.06 | 4.6 | 0.03 | 0.01 | 1.46 | 98.51 | 6.84 |
| | RES-005I 2008.11-201 | N | 2008.11 | 2011.11 | 5.14 | <0.01 | 0.01 | 2.05 | 98.18 | 6.03 |
| | RES-005I 2032.11-203 | N | 2032.11 | 2035.11 | 5.79 | 0.04 | 0.01 | 2.66 | 98.23 | 5.33 |
| | RES-005I 2049.84-205 | N | 2049.84 | 2052.84 | 7.31 | 0.16 | 0.02 | 0.4 | 98.23 | 2.21 |
| | RES-005I 2061.84-206 | N | 2061.84 | 2064.84 | 4.71 | 0.09 | 0.01 | 0.37 | 98.42 | 3.41 |
| RES-005J | RES-005J 1660.4-1668 | N | 1660.4 | 1668.47 | 3.6 | <0.01 | 0.02 | 0.29 | 98.23 | 4.55 |
| RES-006D | RES-006D 1247.48-1250.48 | N | 1247.48 | 1250.48 | 3.27 | 2.74 | 0.04 | 0.89 | 99.88 | 3.93 |
| | RES-006D 1405.47-1408.44 | N | 1405.47 | 1408.44 | 7.87 | 0.07 | 0.01 | 0.73 | 99.71 | 3.48 |
| | RES-006D 1450.44-1453.44 | N | 1450.44 | 1453.44 | 4.04 | 0.11 | 0.01 | 0.89 | 98.1 | 8.12 |
| | RES-006D 1495.44-1498.44 | N | 1495.44 | 1498.44 | 3.9 | <0.01 | 0.01 | 0.74 | 98.21 | 7.09 |
| | RES-006D 1532.81-1535.81 | N | 1532.81 | 1535.81 | 4.86 | 0.02 | 0.01 | 0.95 | 99.29 | 6.4 |
| | RES-006D 1577.43-1580.43 | N | 1577.43 | 1580.43 | 5.27 | 0.05 | 0.01 | 0.99 | 98.68 | 5.76 |
| | RES-006D 1600.5-1601.5 | N | 1600.5 | 1601.5 | 5.26 | 0.05 | 0.01 | 0.99 | 99.24 | 5.79 |
| | RES-006D 1622.43-1625.43 | N | 1622.43 | 1625.43 | 4.76 | 0.03 | 0.01 | 0.75 | 99.61 | 6.72 |
| | RES-006D 1667.43-1670.43 | N | 1667.43 | 1670.43 | 5.07 | 0.05 | <0.01 | 0.62 | 99.39 | 6.12 |
| | RES-006D 1705.4-1708.4 | N | 1705.4 | 1708.4 | 3.78 | 0.04 | <0.01 | 0.64 | 98.49 | 10.05 |
| | RES-006D 1750.4-1753.4 | N | 1750.4 | 1753.4 | 4.08 | 0.06 | 0.02 | 0.73 | 99.19 | 9.45 |
| | RES-006D 1798.4-1801.4 | N | 1798.4 | 1801.4 | 3.85 | 0.06 | 0.01 | 0.79 | 99.86 | 8.82 |

| | |
|---|---|
| FD | Field duplicate |
| N | Normal |
| XRF | X-Ray florescence |

**APPENDIX E**
**X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS**

| | | | Depth | | Potassium Oxide | Sodium Oxide | Strontium Oxide | Titanium Dioxide | Total Metals by XRF | Loss On Ignition |
|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % |
| RES-006D | RES-006D 1843.4-1846.4 | N | 1843.4 | 1846.4 | 3.79 | 0.08 | 0.01 | 0.59 | 99.92 | 9.23 |
| | RES-006D 1898.21-1901.09 | N | 1898.21 | 1901.09 | 2.64 | 0.04 | 0.03 | 0.5 | 98.78 | 6.16 |
| | RES-006D 1927.23-1930.23 | N | 1927.23 | 1930.23 | 1.4 | <0.01 | 0.08 | 0.2 | 98.54 | 6.51 |
| | | FD | 1927.23 | 1930.23 | 1.41 | <0.01 | 0.08 | 0.19 | 98.4 | 6.59 |
| | RES-006D 1952.56-1954.83 | N | 1952.56 | 1954.83 | 0.63 | 0.01 | 0.03 | 0.11 | 99.25 | 1.77 |
| | RES-006D 1954.83-197 | N | 1954.83 | 1972 | 2.22 | 0.01 | 0.04 | 0.36 | 98.53 | 4.03 |
| | RES-006D 1980.6-1983.6 | N | 1980.6 | 1983.6 | 1.94 | 0.03 | 0.02 | 0.35 | 98.6 | 9.94 |
| | RES-006D 1995.6-1998.6 | N | 1995.6 | 1998.6 | 1.47 | <0.01 | 0.02 | 0.29 | 95.55 | 8.67 |
| | RES-006D 2022.66-2025.66 | N | 2022.66 | 2025.66 | 4.5 | 0.04 | 0.02 | 1.79 | 97.46 | 8.01 |
| | RES-006D 2040.66-2043.66 | N | 2040.66 | 2043.66 | 3.45 | 0.01 | 0.03 | 1.32 | 97.28 | 5.67 |
| | RES-006D 2058.16-2061.16 | N | 2058.16 | 2061.16 | 4.97 | 0.01 | 0.01 | 2.43 | 96.18 | 7.73 |
| | RES-006D 2073.13-2076.13 | N | 2073.13 | 2076.13 | 5.17 | <0.01 | <0.01 | 2.17 | 95.75 | 7.56 |
| | | FD | 2073.13 | 2076.13 | 5.28 | <0.01 | <0.01 | 2.19 | 97 | 7.48 |
| | RES-006D 2091.13-2094.13 | N | 2091.13 | 2094.13 | 6.13 | <0.01 | 0.01 | 2.53 | 97.51 | 5.64 |
| | RES-006D 2115.47-2118.47 | N | 2115.47 | 2118.47 | 2.74 | 0.03 | 0.02 | 0.55 | 98.92 | 4.37 |
| | RES-006D 2125.45-2128.42 | N | 2125.45 | 2128.42 | 3.28 | 0.04 | 0.02 | 0.64 | 98.24 | 3.86 |
| | RES-006D 2137.08-2138.5 | N | 2137.08 | 2138.5 | 0.64 | <0.01 | 0.21 | 0.6 | 98.91 | 12 |
| RES-009 | RES-009 1012.16-1014.16 | N | 1012.16 | 1014.16 | 6.85 | 0.52 | 0.02 | 0.32 | 99.72 | 3.67 |
| | RES-009 1027.38-1030.3 | N | 1027.38 | 1030.3 | 4.85 | 2.42 | 0.06 | 0.32 | 99.43 | 3.91 |
| | RES-009 1045.3-1048.3 | N | 1045.3 | 1048.3 | 5.12 | 3.12 | 0.06 | 0.34 | 99.62 | 3.05 |
| | RES-009 105.16-105.73 | N | 105.16 | 105.73 | 3.51 | 3.8 | 0.05 | 0.54 | 99.31 | 1.39 |
| | RES-009 1063.3-1066.3 | N | 1063.3 | 1066.3 | 5.75 | 2.67 | 0.04 | 0.33 | 99.7 | 3.15 |
| | RES-009 1081.3-1084.3 | N | 1081.3 | 1084.3 | 5.51 | 2.9 | 0.04 | 0.31 | 98.85 | 2.98 |
| | RES-009 1098.34-1100.96 | N | 1098.34 | 1100.96 | 6.4 | 2.23 | 0.04 | 0.32 | 99.73 | 3.62 |
| | RES-009 199.18-199.78 | N | 199.18 | 199.78 | 3.57 | 3.89 | 0.05 | 0.51 | 99.81 | 1.39 |
| | RES-009 199.78-200.3 | N | 199.78 | 200.3 | 3.54 | 3.82 | 0.05 | 0.54 | 98.75 | 1.42 |
| | RES-009 281.14-281.64 | N | 281.14 | 281.64 | 3.49 | 3.5 | 0.07 | 0.54 | 99.69 | 2.48 |
| | RES-009 348.3-348.83 | N | 348.3 | 348.83 | 3.56 | 4.12 | 0.05 | 0.56 | 99.8 | 0.55 |
| | RES-009 447.23-447.8 | N | 447.23 | 447.8 | 2.9 | 2.21 | 0.06 | 0.97 | 99.16 | 5.65 |
| | RES-009 485.12-485.71 | N | 485.12 | 485.71 | 2.32 | 1.84 | 0.05 | 1.03 | 99.89 | 8.67 |
| | RES-009 557.06-557.56 | N | 557.06 | 557.56 | 4.62 | 0.83 | 0.02 | 0.5 | 98.6 | 8.78 |
| | RES-009 647.52-648.1 | N | 647.52 | 648.1 | 2.4 | 1.66 | 0.02 | 1.66 | 99.48 | 7.1 |
| | RES-009 7.43-7.96 | N | 7.43 | 7.96 | 3.71 | 3.63 | 0.05 | 0.53 | 99.89 | 1.6 |
| | RES-009 718-718.58 | N | 718 | 718.58 | 7.29 | 0.3 | 0.03 | 2.11 | 199.27 | 5.57 |
| | RES-009 810.42-810.98 | N | 810.42 | 810.98 | 1.88 | 1.23 | 0.03 | 1.59 | 99.73 | 8.17 |
| | RES-009 906.08-906.58 | N | 906.08 | 906.58 | 2.52 | 0.97 | 0.02 | 1.3 | 99.18 | 7.35 |
| | RES-009 987.9-988.45 | N | 987.9 | 988.45 | 2.33 | 0.14 | 0.01 | 1.49 | 99.43 | 4.21 |
| | RES-009 994.67-997.67 | N | 994.67 | 997.67 | 6.8 | 0.16 | 0.02 | 0.35 | 99.68 | 3.86 |
| RES-009D | RES-009D 1119.32-1122.42 | N | 1119.32 | 1122.42 | 4.5 | 3.57 | 0.04 | 0.38 | 99.34 | 2.79 |
| | | FD | 1119.32 | 1122.42 | 4.48 | 3.58 | 0.04 | 0.44 | 98.66 | 2.7 |
| | RES-009D 1128.62-1131.72 | N | 1128.62 | 1131.72 | 3.92 | 4.22 | 0.04 | 0.44 | 99.24 | 2.2 |
| RES-009E | RES-009E 1307.1-1310.1 | N | 1307.1 | 1310.1 | 3.61 | <0.01 | 0.02 | 0.43 | 98.23 | 9.7 |
| | RES-009E 1319.1-1322.1 | N | 1319.1 | 1322.1 | 4.53 | 0.03 | 0.02 | 0.53 | 99.28 | 4.61 |
| | RES-009E 1335.41-1338.16 | N | 1335.41 | 1338.16 | 4.08 | 0.05 | 0.02 | 0.45 | 98.5 | 5.79 |
| | RES-009E 1351.03-1354.03 | N | 1351.03 | 1354.03 | 4.47 | 0.03 | 0.02 | 0.42 | 98.83 | 5.85 |
| | RES-009E 1368.07-1370.69 | N | 1368.07 | 1370.69 | 3.81 | 0.04 | 0.02 | 0.47 | 99.66 | 8.6 |
| | RES-009E 1385.61-1388.61 | N | 1385.61 | 1388.61 | 3.67 | 0.05 | 0.01 | 0.39 | 99.71 | 6.77 |
| | RES-009E 1402.22-1404.53 | N | 1402.22 | 1404.53 | 4.07 | 0.04 | 0.02 | 0.44 | 99.62 | 5.55 |

| | |
|---|---|
| FD | Field duplicate |
| N | Normal |
| XRF | X-Ray florescence |

**APPENDIX E**
**X-RAY FLUORESCENCE WHOLE ROCK ANALYSIS**

| | | | Depth | | Potassium Oxide | Sodium Oxide | Strontium Oxide | Titanium Dioxide | Total Metals by XRF | Loss On Ignition |
|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Type | Top | Bottom | % | % | % | % | % | % |
| RES-009E | RES-009E 1410.5-1411.5 | N | 1410.5 | 1411.5 | 3.99 | 0.05 | 0.01 | 0.43 | 99.55 | 5.55 |
| | RES-009E 1418.16-1419.8 | N | 1418.16 | 1419.8 | 4.17 | 0.03 | 0.02 | 0.52 | 98.46 | 6.98 |
| | RES-009E 1431.42-1433.8 | N | 1431.42 | 1433.8 | 3.42 | <0.01 | 0.02 | 0.27 | 98.52 | 6.97 |
| | RES-009E 1446.41-1449.41 | N | 1446.41 | 1449.41 | 4.24 | 0.03 | 0.04 | 1.05 | 99.28 | 10.35 |
| | RES-009E 1464.41-1467.41 | N | 1464.41 | 1467.41 | 4.48 | 0.05 | 0.05 | 1.06 | 99.77 | 8.72 |
| | RES-009E 1478.13-1481.13 | N | 1478.13 | 1481.13 | 4.1 | 0.01 | 0.03 | 0.83 | 98.47 | 9.35 |
| | RES-009E 1496.13-1499.13 | N | 1496.13 | 1499.13 | 3.43 | 0.01 | 0.03 | 0.83 | 99.39 | 9.47 |
| | RES-009E 1510.74-1527.19 | N | 1510.74 | 1527.19 | 4.1 | 0.04 | 0.01 | 0.64 | 98.73 | 8.68 |
| | RES-009E 1514.13-1517.13 | N | 1514.13 | 1517.13 | 4.34 | 0.04 | 0.01 | 0.56 | 99.11 | 9.09 |
| | RES-009E 1532.4-1534.49 | N | 1532.4 | 1534.49 | 3.54 | 0.05 | 0.01 | 0.69 | 98.55 | 9.67 |
| | RES-009E 1540.5-1541.5 | N | 1540.5 | 1541.5 | 3.54 | 0.04 | 0.01 | 0.7 | 98.36 | 9.57 |
| | RES-009E 1547.47-1550.47 | N | 1547.47 | 1550.47 | 1.9 | <0.01 | 0.01 | 0.79 | 99.45 | 8.78 |
| | RES-009E 1565.47-1568.47 | N | 1565.47 | 1568.47 | 3.51 | 0.04 | 0.01 | 0.57 | 99.76 | 10.8 |
| | RES-009E 1597.32-1599.88 | N | 1597.32 | 1599.88 | 0.48 | 0.03 | 0.04 | 0.62 | 99.05 | 14.2 |
| | RES-009E 1602.44-1605 | N | 1602.44 | 1605 | 1.38 | 0.03 | 0.04 | 0.72 | 99.24 | 12.2 |
| | RES-009E 1617.38-1619.14 | N | 1617.38 | 1619.14 | 3.25 | 0.03 | 0.02 | 0.89 | 99.32 | 6.59 |
| | RES-009E 1634.46-1637.47 | N | 1634.46 | 1637.47 | 3.64 | 0.01 | 0.02 | 0.4 | 98.16 | 7.66 |
| | RES-009E 1650.14-1652.81 | N | 1650.14 | 1652.81 | 0.73 | <0.01 | 0.02 | 0.51 | 96.56 | 10.65 |
| | | FD | 1650.14 | 1652.81 | 0.73 | <0.01 | 0.02 | 0.5 | 97.11 | 10.7 |
| | RES-009E 1669.07-1672.07 | N | 1669.07 | 1672.07 | 4.67 | 0.02 | 0.04 | 0.9 | 98.47 | 6.4 |
| | RES-009E 1685.09-1687.47 | N | 1685.09 | 1687.47 | 4.13 | 0.01 | 0.02 | 0.31 | 98.43 | 4.15 |
| | RES-009E 1697.61-1700.61 | N | 1697.61 | 1700.61 | 3.52 | 0.02 | 0.03 | 0.65 | 99.4 | 6.27 |
| | RES-009E 1718.61-1721.61 | N | 1718.61 | 1721.61 | 2.69 | 0.02 | 0.05 | 0.55 | 99.89 | 5.07 |
| | RES-009E 1739.63-1742.63 | N | 1739.63 | 1742.63 | 0.06 | <0.01 | 0.03 | 0.2 | 98.69 | 3.49 |
| | RES-009E 1760.86-1763.86 | N | 1760.86 | 1763.86 | 1.8 | <0.01 | 0.02 | 0.41 | 98.35 | 3.58 |
| | | FD | 1760.86 | 1763.86 | 1.8 | 0.01 | 0.02 | 0.41 | 98.59 | 3.58 |
| | RES-009E 1789.83-1792.31 | N | 1789.83 | 1792.31 | 2.52 | 0.01 | 0.03 | 0.53 | 98.96 | 4.22 |
| | RES-009E 1798.16-1799.79 | N | 1798.16 | 1799.79 | 1.69 | <0.01 | 0.03 | 0.29 | 98.39 | 4.6 |
| | RES-009E 1801.42-1804.15 | N | 1801.42 | 1804.15 | 1.54 | <0.01 | 0.04 | 0.37 | 97.4 | 8.66 |
| | RES-009E 1818.62-1821.62 | N | 1818.62 | 1821.62 | 1.6 | <0.01 | <0.01 | 0.43 | 97.43 | 8.26 |
| | RES-009E 1829.95-1832.48 | N | 1829.95 | 1832.48 | 1.17 | <0.01 | 0.01 | 0.28 | 94.7 | 6.53 |
| | RES-009E 1846.66-1849.66 | N | 1846.66 | 1849.66 | 0.41 | <0.01 | 0.01 | 0.23 | 96.32 | 8.57 |
| | RES-009E 1862.15-1865.15 | N | 1862.15 | 1865.15 | 0.26 | <0.01 | <0.01 | 0.22 | 86.17 | 11.15 |
| | RES-009E 1867.87-188 | N | 1867.87 | 1884.35 | 0.28 | <0.01 | <0.01 | 0.15 | 80.01 | 3.7 |
| | RES-009E 1880.15-1882.37 | N | 1880.15 | 1882.37 | 0.22 | <0.01 | <0.01 | 0.1 | 76.19 | 5.9 |
| | RES-009E 1885.5-1886.5 | N | 1885.5 | 1886.5 | 0.21 | <0.01 | 0.01 | 0.09 | 74.44 | 5.94 |
| | RES-009E 1899-1901.88 | N | 1899 | 1901.88 | 1.23 | <0.01 | 0.01 | 0.33 | 94.75 | 7.33 |
| | RES-009E 1929.76-1932.58 | N | 1929.76 | 1932.58 | 0.17 | <0.01 | <0.01 | 0.07 | 89.35 | 4.19 |
| | RES-009E 1947.67-1950.67 | N | 1947.67 | 1950.67 | 2.61 | <0.01 | <0.01 | 0.35 | 95 | 7.54 |
| | RES-009E 1954.6-1956 | N | 1954.6 | 1956 | 2.83 | <0.01 | <0.01 | 0.24 | 96.65 | 5.12 |
| | RES-009E 1967.76-1969.72 | N | 1967.76 | 1969.72 | 6.74 | 0.05 | 0.01 | 0.44 | 98.03 | 2.24 |
| | RES-009E 1974.78-1977.89 | N | 1974.78 | 1977.89 | 0.38 | <0.01 | <0.01 | 0.11 | 87.13 | 9.62 |
| | RES-009E 1984.74-1987.74 | N | 1984.74 | 1987.74 | 0.03 | <0.01 | 0.01 | 0.1 | 97.23 | 2.96 |
| | RES-009E 2056.38-207 | N | 2056.38 | 2075 | 4.77 | <0.01 | 0.02 | 1.57 | 96.44 | 7.65 |

| | |
|---|---|
| FD | Field duplicate |
| N | Normal |
| XRF | X-Ray florescence |

**APPENDIX F**
**HUMIDITY CELL TESTING RESULTS**

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-001C | TEST 1 | 26-Aug-08 | N | 1639 | 1642 | <0.2 | 0.0028 | 0.0012L1 | 0.166 | <0.01 | 0.02 | <0.0005 | 257 | 26 | <0.05 | 0.01 | 0.02 | 3.2 | <0.05 | 0.0004 |
| | | 2-Sep-08 | N | 1639 | 1642 | 0.04F | 0.0021 | <0.001 | 0.079 | <0.01 | <0.05 | <0.0005 | 22.6 | 28 | <0.05 | <0.05 | 0.02F | 5.5 | <0.05 | 0.0003F |
| | | 9-Sep-08 | N | 1639 | 1642 | 0.12 | 0.001 | <0.001 | 0.037 | <0.02D2 | <0.1D2 | <0.0005 | 9.2 | 2 | <0.05 | <0.05 | <0.1D2 | 1.2 | 0.03 | 0.0002 |
| | | 16-Sep-08 | N | 1639 | 1642 | 0.07 | 0.0009 | <0.001 | 0.073 | <0.01 | <0.05 | <0.0005 | 17.8 | 4 | <0.05 | 0.01 | 0.02 | 3 | <0.05 | 0.0003 |
| | | 23-Sep-08 | N | 1639 | 1642 | 0.1 | <0.002 | <0.001 | 0.045 | <0.01 | <0.05 | <0.0005 | 10.7 | 2 | <0.05 | <0.05 | <0.05 | 1.3 | <0.05 | 0.0003 |
| | | 30-Sep-08 | N | 1639 | 1642 | 0.09 | <0.002 | <0.001 | 0.029 | <0.01 | <0.05 | <0.0005 | 7.6 | <5 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | 0.0002 |
| | | 7-Oct-08 | N | 1639 | 1642 | 0.05F | 0.0005F | <0.001 | 0.063 | <0.01 | <0.05 | <0.0005 | 13.8 | 2F | <0.05 | <0.05 | <0.05 | 1.3 | <0.05 | 0.0004F |
| | | 14-Oct-08 | N | 1639 | 1642 | 0.04F | 0.0007F | <0.001 | 0.09 | <0.01 | 0.02F | <0.0005 | 19.8 | 2FM1 | <0.05 | <0.05 | <0.05 | 1.5 | 0.02F | 0.0007 |
| | | 21-Oct-08 | N | 1639 | 1642 | 0.06F | <0.002 | <0.002 | 0.069 | <0.01 | <0.05 | <0.0005 | 15 | <5M1 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | 0.0005 |
| | | 28-Oct-08 | N | 1639 | 1642 | 0.05F | 0.0005F | <0.002 | 0.065 | <0.01 | <0.05 | <0.0005 | 16.9 | 2F | <0.05 | <0.05 | <0.05 | 1.2 | <0.05 | 0.0004F |
| | | 4-Nov-08 | N | 1639 | 1642 | 0.07F | <0.002 | <0.002 | 0.032 | <0.01 | <0.05 | <0.0005 | 8.4 | <5 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | 0.0001F |
| | TEST 1S | 11-Nov-08 | N | 1639 | 1642 | <0.2 | 0.0007F | <0.002 | 0.12 | <0.01 | <0.05 | <0.0005 | 37.9 | 16 | <0.05 | <0.05 | <0.05 | 1.9M1 | <0.05 | 0.0005 |
| | | 18-Nov-08 | N | 1639 | 1642 | 0.08F | <0.002 | <0.002 | 0.045 | <0.01 | <0.05 | <0.0005 | 14.9 | 2F | <0.05 | <0.05 | <0.05 | 0.6V1 | <0.05 | 0.0003F |
| | | 25-Nov-08 | N | 1639 | 1642 | 0.05F | <0.002 | <0.002 | 0.038 | <0.01 | <0.05 | <0.0005 | 14.5 | <5 | <0.05 | <0.05 | <0.05 | 0.5M1 | 0.03F | 0.0002F |
| | | 2-Dec-08 | N | 1639 | 1642 | 0.06F | <0.002 | <0.002 | 0.019F | <0.01 | <0.05 | <0.0005 | 11.7 | <5 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | 0.0004F |
| | | 9-Dec-08 | N | 1639 | 1642 | 0.09F | <0.002 | <0.002 | 0.017F | <0.01 | <0.05 | <0.0005 | 8.9 | <5M1 | <0.05 | <0.05 | <0.05 | 0.3FM2 | 0.04F | 0.0005 |
| | | 16-Dec-08 | N | 1639 | 1642 | 0.03F | <0.002 | <0.002 | 0.015F | <0.01 | <0.05 | <0.0005 | 9.7 | <5 | <0.05 | <0.05 | <0.05 | <10D3 | 0.03F | 0.0007 |
| | | 23-Dec-08 | N | 1639 | 1642 | 0.05F | -- | <0.002 | 0.006F | 0.003F | -- | <0.0005 | 6.3 | <5M1 | -- | <0.05 | <0.05 | 0.2F | 0.03F | 0.0004F |
| | | 30-Dec-08 | N | 1639 | 1642 | 0.04F | -- | <0.002 | 0.013F | <0.01 | -- | <0.0005 | 10 | 1F | -- | <0.05 | <0.05 | 0.2F | <0.05 | 0.0005 |
| | | 6-Jan-09 | N | 1639 | 1642 | 0.05F | -- | <0.002 | 0.017F | <0.01 | -- | <0.0005 | 11.5 | <5 | -- | <0.05 | <0.05 | 0.3F | <0.05 | 0.0002F |
| | | 13-Jan-09 | N | 1639 | 1642 | <0.2 | <0.002 | <0.002 | 0.006F | <0.01 | <0.05 | <0.0005 | 9 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | 0.0003F |
| | | 20-Jan-09 | N | 1639 | 1642 | 0.06F | -- | <0.002 | 0.014F | <0.01 | -- | <0.0005 | 10.2 | <5 | -- | <0.05 | <0.05 | 0.2F | 0.02F | 0.0005 |
| | | 27-Jan-09 | N | 1639 | 1642 | 0.11F | -- | <0.002 | 0.014F | 0.002F | -- | <0.0005 | 8.8 | <5 | -- | <0.05 | 0.01F | 0.2F | 0.08 | 0.0006 |
| | | 3-Feb-09 | N | 1639 | 1642 | <0.2 | -- | <0.002 | 0.018F | <0.01 | -- | <0.0005 | 8.5 | <5 | -- | <0.05 | <0.05 | 0.1F | <0.05 | 0.0002F |
| | | 10-Feb-09 | N | 1639 | 1642 | 0.03F | <0.002 | <0.002 | 0.016F | <0.01 | <0.05 | <0.0005 | 10.9 | <5H3 | <0.05 | <0.05 | <0.05 | 0.2FH3 | <0.05 | 0.0002F |
| | | 17-Feb-09 | N | 1639 | 1642 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 2 | 26-Aug-08 | N | 1745 | 1748 | 0.07 | 0.0009 | 0.0007M2 | 0.15D2 | <0.01 | 0.07D2 | 0.0002 | 708D2 | 4 | <0.05 | <0.3D2 | 0.02 | 1.7 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1745 | 1748 | <0.2 | 0.0007F | <0.001 | 0.04 | <0.01 | 0.02F | <0.0005 | 419M3 | 6 | <0.05 | <0.05 | <0.05 | 1.5 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1745 | 1748 | 0.06 | 0.0009 | <0.001 | 0.029 | <0.01 | 0.02 | <0.0005 | 425M3 | 3 | <0.05 | <0.05 | 0.01 | 1.2 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1745 | 1748 | 0.07 | <0.002 | <0.001 | 0.019 | <0.01 | <0.05 | <0.0005 | 389 | <5 | <0.05 | 0.01 | 0.02 | 1.1 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1745 | 1748 | <0.2 | 0.0004 | 0.0005 | 0.013 | <0.01 | <0.05 | <0.0005 | 332 | <5 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-001C | TEST 2 | 30-Sep-08 | N | 1745 | 1748 | 0.04 | 0.0004 | <0.001 | 0.014 | <0.01 | <0.05 | <0.0005 | 404 | <5 | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1745 | 1748 | 0.05F | <0.002 | <0.001 | 0.011F | <0.01 | <0.05 | <0.0005 | 345 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 1745 | 1748 | <0.2 | <0.002 | <0.001 | 0.007F | <0.01 | <0.05 | <0.0005 | 346 | <5 | <0.05 | <0.05 | 0.01F | 0.4F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1745 | 1748 | <0.2 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 278 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1745 | 1748 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | <0.0005 | 322 | <5 | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1745 | 1748 | <0.2 | <0.002 | <0.002 | 0.014F | <0.01 | <0.05 | <0.0005 | 451 | <5 | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 1745 | 1748 | <0.2 | <0.002 | <0.002 | 0.011F | <0.01 | <0.05 | <0.0005 | 305 | <5 | <0.05 | 0.01F | 0.02F | 0.5 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1745 | 1748 | 0.1F | <0.002 | <0.002 | 0.003F | <0.01 | <0.05 | <0.0005 | 95.1 | <5 | <0.05 | <0.05 | <0.05 | 0.1FV1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1745 | 1748 | <0.2 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 326 | <5 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1745 | 1748 | 0.05F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 195 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1745 | 1748 | 0.09FD1 | <0.002 | <0.002 | 0.006F | <0.01 | <0.1D1 | <0.0005 | 269 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1745 | 1748 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 192 | <5 | <0.05 | <0.05 | 0.04F | 0.1F | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1745 | 1748 | 0.15F | -- | <0.002 | <0.02 | 0.003F | -- | <0.0005 | 183 | <5 | -- | <0.05 | 0.01F | 0.3F | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1745 | 1748 | 0.07F | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 161 | 1F | -- | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1745 | 1748 | 0.04F | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 186 | <5 | -- | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 1745 | 1748 | 0.1F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 196 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1745 | 1748 | 0.16FD1 | -- | <0.002 | 0.004F | <0.01 | -- | <0.0005 | 190 | <5 | -- | <0.05 | 0.02FD1 | 0.4F | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1745 | 1748 | 0.06F | -- | <0.002 | 0.004F | 0.002F | -- | <0.0005 | 189 | <5 | -- | <0.05 | 0.02F | 0.3F | 0.03F | <0.0005 |
| | | 3-Feb-09 | N | 1745 | 1748 | 0.06F | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 197 | <5 | -- | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1745 | 1748 | 0.18F | -- | <0.002 | 0.007F | <0.01 | -- | <0.0005 | 246 | <5 | -- | <0.05 | 0.02F | 0.4F | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1745 | 1748 | 0.08F | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | <0.0005 | 224M3 | <3M1 | <0.05 | <0.05 | 0.01F | 0.4FM1 | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1745 | 1748 | 0.05F | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 207M2 | <3 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 14-Apr-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-001C | TEST 2 | 5-May-09 | N | 1745 | 1748 | <0.2 | <0.002 | <0.002 | 0.003F | <0.01 | <0.05 | <0.0005 | 202M2 | <3 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 12-May-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1745 | 1748 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 191M2 | <3 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 9-Jun-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1745 | 1748 | 0.05F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 197 | <3 | <0.05 | <0.05 | 0.02F | 0.4F | <0.05 | <0.0005 |
| | | 7-Jul-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1745 | 1748 | <0.2 | 0.0004F | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 295 | <3 | <0.05 | <0.05 | 0.01F | 0.5 | <0.05 | <0.0005 |
| | | 4-Aug-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1745 | 1748 | <0.2 | <0.002 | <0.002 | -- | -- | -- | <0.0005 | 265M3 | <3 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | 0.0003F |
| | TEST 3 | 26-Aug-08 | N | 1771.75 | 1791.4 | <0.2 | 0.0007 | 0.001 | 0.1D2 | <0.01 | 0.12D2 | <0.0005 | 433D2 | 45 | <0.05 | <0.3D2 | 0.02 | 0.9 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1771.75 | 1791.4 | <0.2 | 0.0011F | <0.001 | 0.034 | <0.01 | 0.05 | <0.0005 | 352 | 28 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1771.75 | 1791.4 | 0.04 | 0.0014 | 0.0013 | 0.02 | <0.01 | 0.04 | 0.0002 | 306 | 17 | <0.05 | <0.05 | 0.01 | 0.7 | <0.05 | 0.0002 |
| | | 16-Sep-08 | N | 1771.75 | 1791.4 | 0.04 | <0.002 | 0.0007 | 0.02 | <0.01 | 0.03 | <0.0005 | 353 | 10 | <0.05 | 0.01 | 0.02 | 0.9 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | 0.0006 | 0.011 | <0.01 | 0.03 | <0.0005 | 262 | 9 | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 1771.75 | 1791.4 | <0.2 | 0.0005 | <0.001 | 0.005 | <0.01 | 0.02 | <0.0005 | 298 | 5 | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | <0.001 | 0.012F | <0.01 | 0.03F | <0.0005 | 267 | 5 | <0.05 | <0.05 | 0.01F | 0.4F | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | <0.001 | 0.006F | <0.01 | 0.02F | <0.0005 | 306 | 3F | <0.05 | <0.05 | <0.05 | 0.4FM2 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | 0.0005F | 0.009F | <0.01 | 0.02F | 0.0001F | 320 | 3F | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1771.75 | 1791.4 | 0.05F | <0.002 | <0.002 | 0.012F | <0.01 | 0.01F | <0.0005 | 237 | 2F | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | <0.002 | 0.008F | <0.01 | 0.02F | <0.0005 | 251 | <5 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | 0.01F | <0.0005 | 244 | 1F | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | 0.02F | <0.0005 | 280 | 1F | <0.05 | <0.05 | <0.05 | 0.6V1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | 0.01F | <0.0005 | 208 | 1F | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | | | | | | | | | | | | | | | |
| RES-001C | TEST 3 | 2-Dec-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | 0.01F | <0.0005 | 223 | 1F | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1771.75 | 1791.4 | <0.3D1 | <0.002 | <0.002 | 0.006F | <0.01 | <0.1D1 | <0.0005 | 235 | 1F | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | 0.0006F | <0.02 | <0.01 | <0.05 | <0.0005 | 198 | <5 | <0.05 | <0.05 | 0.03F | 0.3FD3 | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1771.75 | 1791.4 | 0.16F | -- | 0.0005F | 0.004F | 0.002F | -- | <0.0005 | 264 | <5 | -- | <0.05 | 0.02F | 0.5 | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1771.75 | 1791.4 | 0.04F | -- | <0.002 | 0.004F | <0.01 | -- | <0.0005 | 174 | 1F | -- | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1771.75 | 1791.4 | <0.2 | -- | 0.0005F | 0.005F | <0.01 | -- | <0.0005 | 239 | <5 | -- | <0.05 | 0.01F | 0.5 | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 1771.75 | 1791.4 | 0.08F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 208 | <5 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1771.75 | 1791.4 | <0.2 | -- | 0.0006F | 0.003F | <0.01 | -- | 0.0001F | 203 | <5 | -- | <0.05 | 0.01F | 0.5 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1771.75 | 1791.4 | <0.2 | -- | <0.002 | 0.004F | <0.01 | -- | <0.0005 | 186 | 1F | -- | <0.05 | 0.02F | 0.4F | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1771.75 | 1791.4 | <0.2 | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 253 | <5 | -- | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1771.75 | 1791.4 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 220 | <5H3 | <0.05 | <0.05 | <0.05 | 0.4FH3 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1771.75 | 1791.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 4 | 26-Aug-08 | N | 1855 | 1858 | 0.08 | 0.0018 | 0.0054 | 0.08D2 | <0.01 | 0.2D2 | 0.0001 | 718D2 | 100 | <0.05 | <0.5D2 | 0.02 | 2.3 | <0.05 | 0.0003 |
| | | 2-Sep-08 | N | 1855 | 1858 | <0.2 | 0.001F | 0.0012 | 0.059 | <0.01 | 0.03F | <0.0005 | 334 | 17 | <0.05 | <0.05 | <0.05 | 1.5 | <0.05 | 0.0002F |
| | | 9-Sep-08 | N | 1855 | 1858 | 0.04 | 0.0006 | 0.0006 | 0.04 | <0.01 | 0.01 | <0.0005 | 282 | 6 | <0.05 | <0.05 | <0.05 | 1 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1855 | 1858 | 0.06 | <0.002 | 0.0006 | 0.035 | <0.01 | <0.05 | <0.0005 | 435 | 6 | <0.05 | <0.05 | 0.03 | 1.7 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.001 | 0.024 | <0.01 | <0.05 | <0.0005 | 82.5 | 1 | <0.05 | <0.05 | <0.05 | 0.3 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.001 | 0.042 | <0.01 | <0.05 | <0.0005 | 119 | 4 | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.001 | 0.051 | <0.01 | <0.05 | <0.0005 | 220 | 6 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | 0.0001F |
| | | 14-Oct-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.001 | 0.026 | <0.01 | <0.05 | <0.0005 | 202 | 7 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.028 | <0.01 | <0.05 | <0.0005 | 198 | 10 | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1855 | 1858 | 0.07F | 0.0004F | <0.002 | 0.041 | <0.01 | <0.05 | <0.0005 | 127 | 5 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.051 | <0.01 | <0.05 | <0.0005 | 64.2 | 1F | <0.05 | <0.05 | <0.05 | 0.1F | <0.05 | <0.0005 |
| | TEST 4S | 11-Nov-08 | N | 1855 | 1858 | <0.2 | 0.0004F | 0.0006F | 0.021 | <0.01 | <0.05 | <0.0005 | 248 | 6 | <0.05 | <0.05 | <0.05 | 1 | <0.05 | 0.0002F |
| | | 18-Nov-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.023 | <0.01 | <0.05 | <0.0005 | 67.1 | 2F | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.016F | <0.01 | <0.05 | <0.0005 | 55.1 | 2F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.013F | <0.01 | <0.05 | <0.0005 | 46.3 | 1F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 34.7 | 1F | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1855 | 1858 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1855 | 1858 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 5 | 26-Aug-08 | FD | 1855 | 1858 | 0.06 | 0.0018 | 0.0057 | 0.07D2 | <0.01 | 0.2D2 | 0.0002 | 725D2 | 97 | <0.05 | <0.5D2 | 0.03 | 2.4 | <0.05 | 0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-001C | TEST 5 | 2-Sep-08 | FD | 1855 | 1858 | <0.2 | 0.001F | 0.0015 | 0.056 | <0.01 | 0.03F | <0.0005 | 379 | 30 | <0.05 | <0.05 | 0.02F | 2 | <0.05 | 0.0001F |
| | | 9-Sep-08 | FD | 1855 | 1858 | <0.2 | 0.0005 | 0.0006 | 0.051 | <0.01 | 0.02 | <0.0005 | 240 | 12 | <0.05 | <0.05 | 0.01 | 1.2 | <0.05 | 0.0001 |
| | | 16-Sep-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.001 | 0.047 | <0.01 | <0.05 | <0.0005 | 215 | 8 | <0.05 | 0.01 | 0.02 | 1.2 | <0.05 | <0.0005 |
| | | 23-Sep-08 | FD | 1855 | 1858 | <0.2 | <0.002 | 0.0008 | 0.056 | <0.01 | <0.05 | <0.0005 | 238 | 9 | <0.05 | <0.05 | <0.05 | 1.1 | <0.05 | 0.0001 |
| | | 30-Sep-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.001 | 0.018 | <0.01 | <0.05 | <0.0005 | 212 | 2 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | <0.0005 |
| | | 7-Oct-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.001 | 0.025 | <0.01 | <0.05 | <0.0005 | 148 | 3F | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 14-Oct-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.001 | 0.04 | <0.01 | <0.05 | <0.0005 | 173 | 4F | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 21-Oct-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.026 | <0.01 | <0.05 | <0.0005 | 127 | 3F | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 28-Oct-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.033 | <0.01 | <0.05 | <0.0005 | 231 | 8 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | 0.0001F |
| | | 4-Nov-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.02 | <0.01 | <0.05 | <0.0005 | 57.2 | <5 | <0.05 | <0.05 | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 11-Nov-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.021 | <0.01 | <0.05 | <0.0005 | 58 | 2F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | 0.0001F |
| | | 18-Nov-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.036 | <0.01 | <0.05 | <0.0005 | 75.6 | 2F | <0.05 | <0.05 | <0.05 | 0.4FV1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.028 | <0.01 | <0.05 | <0.0005 | 61.2 | 3F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 2-Dec-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.019F | <0.01 | <0.05 | <0.0005 | 48.6 | 2F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 9-Dec-08 | FD | 1855 | 1858 | <0.2 | <0.002 | <0.002 | 0.025 | <0.01 | <0.05 | <0.0005 | 62.5 | 3F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 16-Dec-08 | FD | 1855 | 1858 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | FD | 1855 | 1858 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 6 | 26-Aug-08 | N | 1873 | 1876 | 0.03 | 0.0035 | 0.0068 | 0.12D2 | <0.01 | 0.01 | 0.0003 | 487D2 | 38 | <0.05 | <0.3D2 | 0.03 | 8.3 | <0.05 | 0.0005 |
| | | 2-Sep-08 | N | 1873 | 1876 | <0.2 | 0.0028 | 0.0008F | 0.039 | <0.01 | 0.03F | <0.0005 | 90.3 | 65 | <0.05 | <0.05 | 0.01F | 14.3 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1873 | 1876 | <0.2 | 0.0014 | 0.0008 | 0.027 | <0.01 | 0.02 | <0.0005 | 38 | 26 | <0.05 | <0.05 | 0.02 | 5.9 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1873 | 1876 | <0.2 | 0.0022 | 0.0008 | 0.029 | <0.01 | 0.02 | <0.0005 | 31.5 | 15 | <0.05 | 0.02 | 0.02 | 11 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1873 | 1876 | <0.2 | 0.0007 | <0.001 | 0.008 | <0.01 | <0.05 | <0.0005 | 18.1 | 7 | <0.05 | <0.05 | <0.05 | 2.2 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 1873 | 1876 | <0.2 | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 9.4 | 3 | <0.05 | <0.05 | <0.05 | 1.3 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1873 | 1876 | <0.2 | <0.002 | <0.001 | 0.005F | <0.01 | <0.05 | <0.0005 | 10.3 | 3F | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 1873 | 1876 | <0.2 | <0.002 | <0.001 | 0.012F | <0.01 | <0.05 | <0.0005 | 11.6 | 2F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1873 | 1876 | <0.2 | 0.0004F | <0.002 | 0.011F | <0.01 | <0.05 | <0.0005 | 24.6 | 5 | <0.05 | <0.05 | 0.01F | 1.1 | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | 0.014F | <0.01 | <0.05 | <0.0005 | 23 | 3F | <0.05 | <0.05 | <0.05 | 1.1 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 11.3 | 1F | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 8 | 1F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1873 | 1876 | <0.2 | <0.002V1 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 9.5 | <5 | <0.05 | <0.05 | <0.05 | 0.2FV1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1873 | 1876 | 0.03F | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 9.6 | 1F | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-001C | TEST 6 | 2-Dec-08 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 9.2 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 11.3 | 1F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | 0.003F | <0.01 | <0.05 | <0.0005 | 15.7 | 1F | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1873 | 1876 | 0.03F | -- | <0.002 | <0.02 | 0.002F | -- | <0.0005 | 11.4 | 1F | -- | 0.01F | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1873 | 1876 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 11.9 | 1F | -- | <0.05 | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1873 | 1876 | <0.2 | -- | <0.002 | 0.004F | <0.01 | -- | <0.0005 | 11.8 | 1F | -- | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 12.2 | 1F | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1873 | 1876 | <0.2 | -- | <0.002 | 0.007F | <0.01 | -- | 0.0001F | 23.9 | 1F | -- | <0.05 | 0.01F | 0.7 | <0.05 | 0.0001F |
| | | 27-Jan-09 | N | 1873 | 1876 | <0.2 | -- | <0.002 | <0.02 | 0.002F | -- | <0.0005 | 11.8 | 1F | -- | <0.05 | 0.02F | 0.3F | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1873 | 1876 | <0.2 | -- | <0.002 | 0.004F | <0.01 | -- | <0.0005 | 14 | 1F | -- | <0.05 | <0.05 | 0.3F | 0.03F | <0.0005 |
| | | 10-Feb-09 | N | 1873 | 1876 | 0.03F | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 18.2 | 3FM1 | -- | <0.05 | 0.01F | 0.4F | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 17.5 | <3 | <0.05 | 0.01F | 0.01F | 0.2F | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 20.4 | <3 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 14-Apr-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 24.2 | <3 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 12-May-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | <0.0005 | 33.4 | <3 | <0.05 | <0.05 | <0.05 | 1.1 | <0.05 | <0.0005 |
| | | 9-Jun-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 44.4 | <3 | <0.05 | 0.04F | 0.01F | 0.7 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-001C | TEST 6 | 7-Jul-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1873 | 1876 | <0.2 | 0.0006F | <0.002 | 0.016F | <0.01 | <0.05 | <0.0005 | 53.3 | <3 | <0.05 | <0.05 | 0.02F | 1.6 | <0.05 | <0.0005 |
| | | 4-Aug-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1873 | 1876 | <0.2 | <0.002 | <0.002 | 0.011F | <0.01 | 0.02F | <0.0005 | 43.5 | <3 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | 0.0003F |
| | TEST 7 | 26-Aug-08 | N | 2041 | 2044 | 0.04 | 0.0005 | 0.001 | 0.11D2 | <0.01 | 0.1D2 | 0.0006 | 573D2 | 7 | <0.05 | <0.3D2 | 0.03 | 0.8 | <0.05 | 0.0031 |
| | | 2-Sep-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.001 | 0.066 | <0.01 | <0.05 | <0.0005 | 224 | 7 | <0.05 | <0.05 | <0.05 | 1.3 | <0.05 | 0.0004F |
| | | 9-Sep-08 | N | 2041 | 2044 | 0.04 | <0.002 | <0.001 | 0.05 | <0.01 | <0.05 | <0.0005 | 139 | 4 | <0.05 | <0.05 | 0.01 | 0.6 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 2041 | 2044 | 0.04 | <0.002 | <0.001 | 0.043 | <0.01 | <0.05 | <0.0005 | 224D2 | 8 | <0.05 | 0.01 | 0.03 | 1.1 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.001 | 0.039 | <0.01 | <0.05 | 0.0001 | 188 | 9 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.001 | 0.034 | <0.01 | <0.05 | 0.0001 | 175 | 13 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.001 | 0.036 | <0.01 | <0.05 | <0.0005 | 204 | 14 | <0.05 | <0.05 | 0.01F | 0.3F | <0.05 | 0.0001F |
| | | 14-Oct-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.001 | 0.051 | <0.01 | <0.05 | <0.0005 | 113 | 8 | <0.05 | <0.05 | 0.01F | 0.2F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.035 | <0.01 | <0.05 | <0.0005 | 115 | 11 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | 0.0001F |
| | | 28-Oct-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.04 | <0.01 | <0.05 | <0.0005 | 108 | 11 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | 0.0001F |
| | | 4-Nov-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.038 | <0.01 | <0.05 | <0.0005 | 96 | 2F | <0.05 | <0.05 | 0.01F | 0.2F | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.034 | <0.01 | <0.05 | <0.0005 | 104 | 11 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 2041 | 2044 | 0.04F | <0.002V1 | <0.002 | 0.045 | <0.01 | <0.05 | 0.0002F | 240 | 12 | <0.05 | <0.05 | 0.01F | 0.4FV1 | <0.05 | 0.0001F |
| | | 25-Nov-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.04 | <0.01 | <0.05 | <0.0005 | 88.2 | 8 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.035 | <0.01 | <0.05 | <0.0005 | 83.5 | 7 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.034 | <0.01 | <0.05 | 0.0002F | 100 | 8 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.035 | <0.01 | <0.05 | <0.0005 | 76.2 | 2F | <0.05 | <0.05 | 0.01F | 0.1F | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 2041 | 2044 | 0.07F | -- | <0.002 | 0.036 | 0.002F | -- | 0.0001F | 84.3 | 8 | -- | <0.05 | 0.01F | 0.2F | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 2041 | 2044 | <0.2 | -- | <0.002 | 0.035 | <0.01 | -- | 0.0002F | 83.1 | 2F | -- | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 2041 | 2044 | <0.2 | -- | <0.002 | 0.038 | <0.01 | -- | 0.0001F | 100 | 9 | -- | 0.01F | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.033 | <0.01 | <0.05 | 0.0002F | 109 | 9 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 2041 | 2044 | <0.2 | -- | <0.002 | 0.036 | <0.01 | -- | 0.0002F | 101 | 4F | -- | <0.05 | 0.02F | 0.4F | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 2041 | 2044 | 0.12F | -- | <0.002 | 0.032 | 0.002F | -- | 0.0001F | 101 | 4F | -- | <0.05 | 0.03F | 0.3F | 0.32 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-001C | TEST 7 | 3-Feb-09 | N | 2041 | 2044 | <0.2 | -- | <0.002 | 0.038 | <0.01 | -- | 0.0002F | 108 | 3F | -- | <0.05 | 0.01F | 0.3F | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.037 | <0.01 | <0.05 | 0.0002F | 96.9 | 9H3 | <0.05 | <0.05 | 0.02F | 0.3FH3 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 2041 | 2044 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 8 | 26-Aug-08 | FD | 2041 | 2044 | 0.06 | 0.0006 | 0.0025 | 0.09D2 | <0.01 | <0.5D2 | 0.0006 | 583D2 | 11 | <0.05 | <0.3D2 | 0.05 | 0.8 | <0.05 | 0.0011 |
| | | 2-Sep-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.001 | 0.054 | <0.01 | <0.05 | 0.0002F | 414 | 33 | <0.05 | <0.05 | 0.02F | 1.6 | <0.05 | 0.0004F |
| | | 9-Sep-08 | FD | 2041 | 2044 | 0.06 | <0.002 | <0.001 | 0.046 | <0.01 | <0.05 | 0.0003 | 352 | 5 | <0.05 | <0.05 | 0.03 | 1.3 | <0.05 | 0.0003 |
| | | 16-Sep-08 | FD | 2041 | 2044 | 0.06 | <0.002 | <0.001 | 0.04 | <0.01 | <0.05 | 0.0002 | 340D2 | 8 | <0.05 | <0.05 | 0.03 | 1.5 | <0.05 | <0.0005 |
| | | 23-Sep-08 | FD | 2041 | 2044 | 0.05 | <0.002 | <0.001 | 0.035 | <0.01 | <0.05 | 0.0003 | 336 | 18 | <0.05 | <0.05 | <0.05 | 1.2 | <0.05 | <0.0005 |
| | | 30-Sep-08 | FD | 2041 | 2044 | 0.04 | <0.002 | <0.001 | 0.029 | <0.01 | <0.05 | 0.0004 | 322 | 19 | <0.05 | <0.05 | 0.02 | 1 | <0.05 | <0.0005 |
| | | 7-Oct-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.001 | 0.03 | <0.01 | <0.05 | 0.0004F | 319 | 24 | <0.05 | <0.05 | 0.02F | 0.6 | <0.05 | <0.0005 |
| | | 14-Oct-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.001 | 0.036 | <0.01 | <0.05 | 0.0004F | 290 | 23 | <0.05 | <0.05 | 0.02F | 0.5 | <0.05 | <0.0005 |
| | | 21-Oct-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.029 | <0.01 | <0.05 | 0.0004F | 270 | 19 | <0.05 | <0.05 | 0.02F | 0.8 | <0.05 | <0.0005 |
| | | 28-Oct-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.033 | <0.01 | <0.05 | 0.0005 | 271 | 24 | 0.01F | <0.05 | 0.02F | 0.7 | <0.05 | <0.0005 |
| | | 4-Nov-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.033 | <0.01 | <0.05 | 0.0004F | 274 | 3F | <0.05 | 0.01F | 0.03F | 0.7 | <0.05 | <0.0005 |
| | | 11-Nov-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.027 | <0.01 | <0.05 | 0.0006 | 286 | 19 | <0.05 | <0.05 | 0.03F | 0.9 | <0.05 | <0.0005 |
| | | 18-Nov-08 | FD | 2041 | 2044 | <0.2 | <0.002V1 | <0.002 | 0.033 | <0.01 | <0.05 | 0.0006 | 276 | 20 | <0.05 | <0.05 | 0.03F | 0.7V1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.034 | <0.01 | <0.05 | 0.0005 | 219 | 15 | <0.05 | <0.05 | 0.03F | 0.6 | <0.05 | <0.0005 |
| | | 2-Dec-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.022 | <0.01 | <0.05 | 0.0011 | 278 | 9 | <0.05 | <0.05 | 0.14 | 0.6 | <0.05 | <0.0005 |
| | | 9-Dec-08 | FD | 2041 | 2044 | <0.3D1 | <0.002 | <0.002 | 0.029 | <0.01 | <0.1D1 | 0.0005 | 253 | 20 | <0.05 | <0.05 | 0.04F | 0.8 | <0.05 | <0.0005 |
| | | 16-Dec-08 | FD | 2041 | 2044 | <0.2 | <0.002 | <0.002 | 0.03 | <0.01 | <0.05 | 0.0005 | 204 | 3F | <0.05 | <0.05 | 0.07 | <3D3 | <0.05 | <0.0005 |
| | | 23-Dec-08 | FD | 2041 | 2044 | 0.13F | -- | <0.002 | 0.032 | 0.003F | -- | 0.0006 | 196 | 15 | -- | <0.05 | 0.06 | 0.5 | <0.05 | <0.0005 |
| | | 30-Dec-08 | FD | 2041 | 2044 | 0.06F | -- | <0.002 | 0.026 | <0.01 | -- | 0.0007 | 209 | 3F | -- | <0.05 | 0.06 | 0.4F | <0.05 | <0.0005 |
| | | 6-Jan-09 | FD | 2041 | 2044 | <0.2 | -- | <0.002 | 0.027 | <0.01 | -- | 0.0006 | 233 | 13 | -- | <0.05 | 0.05 | 0.8 | <0.05 | <0.0005 |
| | | 13-Jan-09 | FD | 2041 | 2044 | 0.08F | <0.002 | <0.002 | 0.023 | <0.01 | <0.05 | 0.0005 | 224 | 16 | <0.05 | <0.05 | 0.03F | 0.6 | <0.05 | <0.0005 |
| | | 20-Jan-09 | FD | 2041 | 2044 | <0.2 | -- | <0.002 | 0.029 | <0.01 | -- | 0.0006 | 206 | 6 | -- | <0.05 | 0.04F | 0.6 | <0.05 | <0.0005 |
| | | 27-Jan-09 | FD | 2041 | 2044 | 0.29 | -- | <0.002 | 0.026 | <0.01 | -- | 0.0005 | 188 | 5 | -- | <0.05 | 0.06 | 0.5 | 0.04F | <0.0005 |
| | | 3-Feb-09 | FD | 2041 | 2044 | <0.2 | -- | <0.002 | 0.03 | <0.01 | -- | 0.0004F | 182 | 6 | -- | <0.05 | 0.03F | 0.5 | <0.05 | <0.0005 |
| | | 10-Feb-09 | FD | 2041 | 2044 | <0.2 | 0.0005F | <0.002 | 0.027 | <0.01 | <0.05 | 0.0004F | 169 | 16H3 | <0.05 | <0.05 | 0.03F | 0.4FH3 | <0.05 | <0.0005 |
| | | 17-Feb-09 | FD | 2041 | 2044 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-002A | TEST 10 | 26-Aug-08 | N | 1154 | 1156 | 2.6D2 | <0.002 | 0.0592 | 0.06D2 | <0.05D2 | 0.2D2 | 0.0055 | 184D2 | 10 | <0.3D2 | <0.5D2 | 172D2 | 2D2 | 0.1D2 | 0.0032 |
| | | 2-Sep-08 | N | 1154 | 1156 | 1.42 | <0.002 | 0.0092 | 0.14 | <0.01 | 0.01F | 0.0004F | 21.6 | 1F | <0.05 | <0.05 | 15 | 2.2 | <0.05 | 0.0003F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-002A | TEST 10 | 9-Sep-08 | N | 1154 | 1156 | 1.26 | <0.002 | 0.0022 | 0.15 | <0.01 | 0.01 | 0.0001 | 9.2 | <5 | <0.05 | <0.05 | 8.74 | 1.9 | <0.05 | 0.0003 |
| | | 16-Sep-08 | N | 1154 | 1156 | 1.53 | <0.002 | 0.0026 | 0.107 | <0.01 | <0.05 | <0.0005 | 8.8D2 | <5 | <0.05 | 0.02 | 9.13M3 | 2.3 | <0.05 | 0.0002 |
| | | 23-Sep-08 | N | 1154 | 1156 | 0.53 | <0.002 | 0.0007 | 0.126 | <0.01 | <0.05 | <0.0005 | 3.5 | <5 | <0.05 | <0.05 | 3.77 | 0.9 | <0.05 | 0.0003 |
| | | 30-Sep-08 | N | 1154 | 1156 | 0.96 | <0.002 | 0.0009 | 0.122 | <0.01 | 0.01 | <0.0005 | 5.1 | <5 | <0.05 | <0.05 | 6.99 | 1.1 | <0.05 | 0.0003 |
| | | 7-Oct-08 | N | 1154 | 1156 | 0.95 | <0.002 | <0.001 | 0.064 | <0.01 | <0.05 | <0.0005 | 5.1 | <5 | <0.05 | <0.05 | 8.19 | 1.2 | <0.05 | 0.0004F |
| | | 14-Oct-08 | N | 1154 | 1156 | 0.8 | <0.002 | <0.001 | 0.075 | <0.01 | 0.01F | <0.0005 | 3.9 | <5 | <0.05 | <0.05 | 5.86 | 0.6 | <0.05 | 0.0003F |
| | | 21-Oct-08 | N | 1154 | 1156 | 0.55 | <0.002 | <0.002 | 0.037 | <0.01 | <0.05 | <0.0005 | 2.6 | <5 | <0.05 | <0.05 | 4.58 | 0.6 | <0.05 | 0.0003F |
| | | 28-Oct-08 | N | 1154 | 1156 | 0.71 | <0.002 | 0.0005F | 0.075 | <0.01 | <0.05 | <0.0005 | 3.1 | <5 | <0.05 | <0.05 | 5.9 | 0.9 | <0.05 | 0.0002F |
| | | 4-Nov-08 | N | 1154 | 1156 | 1.15 | <0.002 | 0.0007F | 0.067 | <0.01 | <0.05 | <0.0005 | 5.4 | <5 | <0.05 | 0.01F | 10.4 | 1.4 | 0.02F | 0.0003F |
| | TEST 10S | 11-Nov-08 | N | 1154 | 1156 | 0.9 | <0.002 | 0.0015F | 0.046 | <0.01 | <0.05 | 0.0001F | 6.5 | <5 | <0.05 | <0.05 | 10.9 | 1.2 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1154 | 1156 | 0.21 | <0.002V1 | 0.0005F | 0.1 | <0.01 | <0.05 | <0.0005 | 2.2 | <5 | <0.05 | <0.05 | 4.34 | 0.3FV1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1154 | 1156 | 0.17F | <0.002 | <0.002 | 0.089 | <0.01 | <0.05 | <0.0005 | 1.7 | <5 | <0.05 | <0.05 | 4.07 | 0.2F | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1154 | 1156 | 0.19F | <0.002 | <0.002 | 0.064 | <0.01 | <0.05 | <0.0005 | 1.6 | <5 | <0.05 | <0.05 | 4.44 | 0.3F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1154 | 1156 | 0.17F | <0.002 | <0.002 | 0.07 | <0.01 | <0.05 | <0.0005 | 1.5 | <5 | <0.05 | <0.05 | 5.4 | 0.2F | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1154 | 1156 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1154 | 1156 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 11 | 26-Aug-08 | N | 1414.6 | 1417 | 13.2D2 | 0.0011 | 0.0036 | 0.06D2 | <0.05D2 | 0.2D2 | 0.0028 | 134D2 | 9 | <0.3D2 | 0.5D2 | 229D2 | 1D2 | 19.8D2 | 0.0054 |
| | | 2-Sep-08 | N | 1414.6 | 1417 | 0.57 | <0.002 | <0.001 | 0.026 | <0.01 | 0.01F | 0.0005 | 23.6 | 2F | <0.05 | 0.11 | 91.7D1 | <5D1 | 0.16 | 0.0017 |
| | | 9-Sep-08 | N | 1414.6 | 1417 | 1.11 | <0.002 | <0.001 | 0.019 | 0.002 | 0.01 | 0.0004 | 11 | 3 | <0.05 | 0.15 | 196M3 | 2D1 | 0.13 | 0.0022 |
| | | 16-Sep-08 | N | 1414.6 | 1417 | 1.7D2 | <0.002 | <0.001 | 0.04D2 | <0.05D2 | <0.3D2 | 0.0001 | 5D2 | 3 | <0.3D2 | 0.17 | 308D2 | <10D2 | 0.3D2 | 0.002 |
| | | 23-Sep-08 | N | 1414.6 | 1417 | 1.89 | <0.002 | 0.0009 | 0.009 | 0.003 | <0.05 | 0.0001 | 1D1 | 1 | <0.05 | 0.09 | 243D1M3 | <10D1 | 0.73 | 0.0026 |
| | | 30-Sep-08 | N | 1414.6 | 1417 | 2.08 | <0.002 | 0.0008 | 0.011D1 | <0.01 | <0.1D1 | 0.0001 | 0.7 | <5M1 | <0.05 | 0.07 | 169M3 | <10D1 | 1.09 | 0.002 |
| | | 7-Oct-08 | N | 1414.6 | 1417 | 2.8D1 | <0.002 | <0.001 | <0.08D1 | <0.05D1 | <0.3D1 | 0.0001F | 5<D1 | 1F | <0.3D1 | 0.06FD1 | 247D1M3 | <10D1 | 1.3D1 | 0.002 |
| | | 14-Oct-08 | N | 1414.6 | 1417 | 1.59 | <0.002 | <0.001 | 0.011F | 0.002F | 0.02FD1 | 0.0001F | 0.3F | <5 | <0.05 | 0.05 | 127D1 | <10D1 | 1.04 | 0.0009 |
| | | 21-Oct-08 | N | 1414.6 | 1417 | 1.11 | <0.002 | <0.002 | 0.006F | <0.01 | <0.05 | <0.0005 | 0.3F | <5M1 | <0.05 | 0.03F | 76.9M3 | <10D1 | 0.95 | 0.0009 |
| | | 28-Oct-08 | N | 1414.6 | 1417 | 2.53D2 | <0.002 | 0.0008F | 0.01F | <0.02D2 | <0.1D2 | <0.0005 | 0.3F | <5 | <0.05 | 0.06 | 158D2 | <10D2 | 1.87D2 | 0.0014 |
| | | 4-Nov-08 | N | 1414.6 | 1417 | 2.92 | <0.002 | 0.0006F | 0.007F | 0.002F | <0.05 | <0.0005 | 0.5F | <5 | <0.05 | 0.05 | 127D2M3 | <10D2 | 4.56M3 | 0.0012 |
| | | 11-Nov-08 | N | 1414.6 | 1417 | 1.47 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 0.4F | <5M1 | <0.05 | 0.02F | 31.1M3 | <10D1 | 19.2M3 | 0.0007 |
| | | 18-Nov-08 | N | 1414.6 | 1417 | 1.06 | <0.002V1 | <0.002 | 0.009F | <0.01 | <0.05 | <0.0005 | 0.3F | <5 | <0.05 | 0.02F | 39.9M3 | <10D2V1 | 1.94 | 0.0009 |
| | | 25-Nov-08 | N | 1414.6 | 1417 | 1.11 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05M1 | 0.02FM1 | 39.8M3 | <10D1 | 0.88 | 0.0003F |
| | | 2-Dec-08 | N | 1414.6 | 1417 | 2.66 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | 0.03F | 83.3 | 6FD1 | 1.81 | 0.0006 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-002A | TEST 11 | 9-Dec-08 | N | 1414.6 | 1417 | 2.07M2 | <0.002 | <0.002 | 0.004F | 0.003F | <0.1D1 | <0.0005 | <1 | <5M1 | <0.05 | 0.03F | 66.3M3 | <10D1 | 1.44 | 0.0003F |
| | | 16-Dec-08 | N | 1414.6 | 1417 | 1.39 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 49.2 | <10D1 | 0.86 | 0.0002F |
| | | 23-Dec-08 | N | 1414.6 | 1417 | 1.8 | -- | <0.002 | <0.02 | 0.003F | -- | <0.0005 | <1 | <5 | -- | 0.03F | 53.6 | <10D1 | 1.1 | 0.0003F |
| | | 30-Dec-08 | N | 1414.6 | 1417 | 2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | <1 | 1F | -- | 0.01F | 62.9 | <10D1 | 1.32 | 0.003 |
| | | 6-Jan-09 | N | 1414.6 | 1417 | 2.55 | -- | <0.002 | 0.004F | <0.01 | -- | <0.0005 | <1 | <5 | -- | 0.03F | 78.2 | <10D1 | 1.61 | 0.0007 |
| | | 13-Jan-09 | N | 1414.6 | 1417 | 4.1D1 | <0.002 | <0.002 | <0.03D1 | <0.02D1 | <0.05 | <0.0005 | <2D1 | <5 | <0.1D1 | 0.03FD1 | 112D1 | <10D1 | 1.86D1 | 0.0005 |
| | | 20-Jan-09 | N | 1414.6 | 1417 | 3.68 | -- | 0.0007F | <0.02 | <0.01 | -- | 0.0001F | <1 | <5 | -- | 0.04F | 104D1 | <10D1 | 2.47 | 0.0005 |
| | | 27-Jan-09 | N | 1414.6 | 1417 | 4.02 | -- | 0.0009F | <0.02 | 0.005FD1 | -- | <0.0005 | 0.3F | <5 | -- | 0.04F | 142D1 | <10D1 | 3.04 | 0.0003F |
| | | 3-Feb-09 | N | 1414.6 | 1417 | 2.75 | -- | 0.0007F | <0.02 | <0.01 | -- | <0.0005 | 0.2F | <5 | -- | 0.03F | 99.8D1 | <10D1 | 2.98 | 0.0005 |
| | | 10-Feb-09 | N | 1414.6 | 1417 | 3.22 | <0.002 | 0.0011F | <0.02 | <0.01 | <0.05 | <0.0005 | <1 | <5H3 | <0.05 | 0.03F | 99.7 | <10D2H3 | 3.18 | 0.0003F |
| | | 17-Feb-09 | N | 1414.6 | 1417 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 12 | 26-Aug-08 | N | 1454 | 1457 | 0.3FD1 | 0.0011F | 0.0026 | 0.08D1 | <0.05D1 | 0.06FD1 | 0.0054 | 109D1 | 6 | <0.3D1M1 | 0.69D1 | 170D1M3 | <3D1 | .5D1M1 | 0.0056 |
| | | 2-Sep-08 | N | 1454 | 1457 | <0.2 | 0.0013F | <0.001 | 0.044 | <0.01 | 0.01F | 0.0002F | 6.5 | 3F | 0.01F | 0.04F | 1.8M3 | 1.2 | <0.05 | 0.0001F |
| | | 9-Sep-08 | N | 1454 | 1457 | 0.03 | 0.0013 | <0.001 | 0.035 | <0.01 | <0.05 | 0.0002 | 3.4 | <5 | <0.05 | 0.04 | 1.34 | 0.9 | <0.05 | 0.0002 |
| | | 16-Sep-08 | N | 1454 | 1457 | 0.04 | <0.002 | <0.001 | 0.023 | <0.01 | <0.05 | 0.0001 | 3.5 | <5 | <0.05 | 0.04 | 1.42 | 0.9 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.001 | 0.022 | <0.01 | <0.05 | 0.0002 | 4.6 | <5 | <0.05 | 0.05 | 1.23 | 1 | <0.05 | 0.0001 |
| | | 30-Sep-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.001 | 0.02 | <0.01 | <0.05 | 0.0001 | 3.7 | <5 | <0.05 | 0.04 | 1.05 | 0.7 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.001 | 0.015F | <0.01 | <0.05 | 0.0001F | 3.3 | <5 | <0.05 | 0.03F | 1 | 0.3F | <0.05 | 0.0001F |
| | | 14-Oct-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.001 | 0.016F | <0.01 | <0.05 | <0.0005 | 2.5 | <5 | <0.05 | 0.03F | 0.92 | 0.2F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 1.6 | <5 | <0.05 | 0.02F | 0.81 | 0.2F | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.012F | <0.01 | <0.05 | <0.0005 | 1.5 | <5 | <0.05 | 0.03F | 0.94 | 0.2F | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.012F | <0.01 | <0.05 | <0.0005 | 1.7 | <5 | <0.05 | 0.03F | 1.1 | 0.1F | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.01F | <0.01 | <0.05 | <0.0005 | 1.4 | <5 | <0.05 | 0.02F | 1.27 | 0.2F | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1454 | 1457 | <0.2 | <0.002V1 | <0.002 | 0.01F | <0.01 | <0.05 | <0.0005 | 1.3 | <5 | <0.05 | 0.02F | 1.23 | 0.1FV1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.011F | <0.01 | <0.05 | <0.0005 | 1.3 | <5 | <0.05 | 0.02F | 1.52 | 0.2F | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 0.9F | <5 | <0.05 | 0.01F | 1.3 | 0.2F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 0.6F | <5 | <0.05 | 0.01F | 1.2 | 0.1F | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.006F | <0.01 | <0.05 | <0.0005 | 0.7F | <5 | <0.05 | <0.05 | 1.34 | 0.1F | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1454 | 1457 | <0.2 | -- | <0.002 | 0.007F | 0.003F | -- | <0.0005 | 0.7F | <5 | -- | 0.02F | 1.52 | 0.1F | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1454 | 1457 | <0.2 | -- | <0.002 | 0.006F | <0.01 | -- | <0.0005 | 0.8F | 1F | -- | 0.02F | 1.69B7 | <0.5 | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1454 | 1457 | <0.2 | -- | <0.002 | 0.008F | <0.01 | -- | <0.0005 | 0.7F | <5 | -- | 0.02F | 1.44 | <0.5 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-002A | TEST 12 | 13-Jan-09 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 0.7F | <5 | <0.05 | <0.05 | 1.82 | 0.1F | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1454 | 1457 | <0.2 | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 0.4F | <5 | -- | 0.01F | 1.51 | <0.5 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1454 | 1457 | <0.2 | -- | <0.002 | 0.006F | 0.002F | -- | <0.0005 | 0.4F | <5 | -- | <0.05 | 1.91 | <0.5 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1454 | 1457 | <0.2 | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 0.3F | <5 | -- | 0.01F | 1.91 | <0.5 | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1454 | 1457 | <0.2 | -- | <0.002 | 0.006F | <0.01 | -- | <0.0005 | 0.4F | <5 | -- | 0.01F | 1.96 | <0.5 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.013F | <0.01 | <0.05 | <0.0005 | 0.5F | <3 | <0.05 | 0.02F | 3.02 | <0.5 | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 0.5F | <3 | <0.05 | 0.02F | 3.93 | <0.5 | <0.05 | <0.0005 |
| | | 14-Apr-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.006F | <0.01 | <0.05 | <0.0005 | <1 | <3 | <0.05 | 0.02F | 5.76 | <0.5 | <0.05 | <0.0005 |
| | | 12-May-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | 0.01F | 0.0003F | 0.5F | <3 | <0.05 | 0.05 | 21.2 | <0.5 | <0.05 | 0.0002F |
| | | 9-Jun-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1454 | 1457 | <0.8D1 | <0.002 | <0.002 | <0.02 | <0.05D1 | <0.3D1 | 0.0008V2 | 2.2 | <3 | <0.3D1 | 0.23 | 196D1 | <0.5 | <0.05 | 0.0002F |
| | | 7-Jul-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1454 | 1457 | 0.8FD1 | <0.002 | <0.002 | <0.2D1 | 0.1<D1 | <0.5D1 | 0.0005 | 4FD1 | <3 | <0.5D1 | 0.1FD1 | 453D1 | <0.5 | <0.5D1 | 0.0003F |
| | | 4-Aug-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-002A | TEST 12 | 18-Aug-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1454 | 1457 | <0.8D1 | <0.002 | <0.002 | <0.08D1 | <0.05D1 | <0.3D1 | 0.0007 | 3FD1 | <3 | <0.5D1 | 0.24FD1 | 599D1 | <0.5 | 0.1FD1 | 0.0007 |
| | | 1-Sep-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Sep-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 1454 | 1457 | 0.5FD1 | <0.02D1 | <0.02D1 | <0.2D1 | 0.1<D1 | <0.5D1 | 0.001FD1 | 2FD1 | <50D1 | <0.5D1 | 0.1FD1 | 579D1 | <10D1 | <0.5D1 | <0.005D1 |
| | | 29-Sep-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 1454 | 1457 | <0.8D1 | <0.002 | <0.002 | <0.08D1 | <0.05D1 | <0.3D1 | 0.0003F | 1.5FD1 | <3 | <0.05 | 0.1D1 | 332D1 | <0.5M2 | <0.1D1 | 0.0002F |
| | | 27-Oct-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 1454 | 1457 | 0.07F | <0.002 | <0.002 | <0.02 | 0.01FD1 | <0.3D1M3 | 0.0004F | 1.3 | <3M1 | <0.05 | 0.09 | 384D1 | <0.5 | 0.03F | 0.0002F |
| | | 24-Nov-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 1-Dec-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Dec-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Dec-09 | N | 1454 | 1457 | 0.05F | <0.002 | <0.002 | 0.004F | <0.05D1 | 0.22 | 0.0003F | 1 | <3 | <0.05 | 0.06 | 297D1 | <0.5 | 0.02F | 0.0003F |
| | | 22-Dec-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 29-Dec-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-Jan-10 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 12-Jan-10 | N | 1454 | 1457 | 0.07F | <0.002 | <0.002 | <0.08D1 | <0.05D1 | <0.3D1 | 0.0003F | 0.9F | <3 | <0.3D1 | 0.05 | 267D1 | <0.5 | <0.05 | 0.0002F |
| | | 19-Jan-10 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-Jan-10 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 13 | 26-Aug-08 | FD | 1454 | 1457 | 0.3FD1 | 0.001F | 0.0026 | 0.07FD1 | <0.05D1 | 0.05FD1 | 0.0051 | 104D1 | 6 | <0.3D1 | 0.62D1 | 156D1 | <3D1 | 1.5D1 | 0.0022 |
| | | 2-Sep-08 | FD | 1454 | 1457 | 0.04F | 0.0005F | <0.001 | 0.033 | <0.01 | <0.05 | 0.0002F | 5.3 | 3FM1 | 0.01F | 0.03F | 2.15 | 1.1 | <0.05 | 0.0002F |
| | | 9-Sep-08 | FD | 1454 | 1457 | <0.2 | 0.0007 | <0.001 | 0.025 | <0.01 | <0.05 | 0.0001 | 3.3 | 1 | <0.05 | 0.05 | 0.74 | 0.9 | <0.05 | 0.0003 |
| | | 16-Sep-08 | FD | 1454 | 1457 | 0.04 | <0.002 | <0.001 | 0.026 | <0.01 | <0.05 | <0.0005 | 4.5 | <5 | <0.05 | 0.03 | 0.54 | 0.9 | <0.05 | <0.0005 |
| | | 23-Sep-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.001 | 0.01 | <0.01 | <0.05 | <0.0005 | 2.4 | <5 | <0.05 | 0.03 | 0.38 | 0.5 | <0.05 | 0.0002 |
| | | 30-Sep-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.001 | 0.019 | <0.01 | <0.05 | 0.0001 | 5.1 | <5 | <0.05 | 0.04 | 0.39 | 1 | <0.05 | <0.0005 |
| | | 7-Oct-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.001 | 0.014F | <0.01 | <0.05 | <0.0005 | 3.5 | <5 | <0.05 | 0.03F | 0.3 | 1.4 | <0.05 | 0.0001F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-002A | TEST 13 | 14-Oct-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.001 | 0.012F | <0.01 | <0.05 | <0.0005 | 2.2 | <5 | <0.05 | 0.02F | 0.43 | 0.3FM2 | <0.05 | <0.0005 |
| | | 21-Oct-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | <0.0005 | 2.2 | <5 | <0.05 | 0.02F | 0.22 | 0.3F | <0.05 | <0.0005 |
| | | 28-Oct-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | <0.0005 | 1.5 | <5 | <0.05 | 0.02F | 0.24 | 0.3F | <0.05 | <0.0005 |
| | | 4-Nov-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.006F | <0.01 | <0.05 | <0.0005 | 1 | <5 | <0.05 | 0.02F | 0.26 | <0.5 | <0.05 | <0.0005 |
| | | 11-Nov-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 1.4 | <5 | <0.05 | 0.02F | 0.36 | 0.2F | <0.05 | <0.0005 |
| | | 18-Nov-08 | FD | 1454 | 1457 | <0.2 | <0.002V1 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 1.3 | <5 | <0.05 | 0.02F | 0.55 | 0.2FV1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 1.3 | <5 | <0.05 | 0.02F | 0.4 | 0.2F | <0.05 | <0.0005 |
| | | 2-Dec-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.003F | <0.01 | <0.05 | <0.0005 | 1.2 | <5 | <0.05 | <0.05 | 0.46 | 0.2F | <0.05 | <0.0005 |
| | | 9-Dec-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 0.8F | <5 | <0.05 | 0.02F | 0.52 | 0.2F | <0.05 | <0.0005 |
| | | 16-Dec-08 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 0.6F | <5 | <0.05 | <0.05 | 0.79 | <0.5 | <0.05 | <0.0005 |
| | | 23-Dec-08 | FD | 1454 | 1457 | <0.2 | -- | <0.002 | 0.006F | 0.003F | -- | <0.0005 | 0.7F | <5 | -- | 0.02F | 0.91 | <0.5 | <0.05 | <0.0005 |
| | | 30-Dec-08 | FD | 1454 | 1457 | <0.2 | -- | <0.002 | 0.006F | <0.01 | -- | <0.0005 | 1.2 | 1F | -- | 0.02F | 0.87B7 | 0.1F | <0.05 | 0.0001F |
| | | 6-Jan-09 | FD | 1454 | 1457 | <0.2 | -- | <0.002 | 0.009F | <0.01 | -- | <0.0005 | 1.1 | <5 | -- | 0.02F | 0.89 | 0.1F | <0.05 | 0.0001F |
| | | 13-Jan-09 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 1 | <5 | <0.05 | <0.05 | 1.55 | 0.1F | <0.05 | 0.0001F |
| | | 20-Jan-09 | FD | 1454 | 1457 | <0.2 | -- | <0.002 | 0.008F | <0.01 | -- | <0.0005 | 1 | <5 | -- | 0.02F | 1.51 | 0.1F | <0.05 | <0.0005 |
| | | 27-Jan-09 | FD | 1454 | 1457 | <0.2 | -- | <0.002 | 0.011F | 0.002F | -- | <0.0005 | 1.4 | 1F | -- | 0.02F | 1.76 | 0.15F | <0.05 | <0.0005 |
| | | 3-Feb-09 | FD | 1454 | 1457 | <0.2 | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 0.6F | <5 | -- | 0.01F | 1.19 | <0.5 | <0.05 | <0.0005 |
| | | 10-Feb-09 | FD | 1454 | 1457 | <0.2 | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | 0.0001F | 0.6F | <5H3 | <0.05 | 0.02F | 1.44 | <0.5H3 | <0.05 | 0.0001F |
| | | 17-Feb-09 | FD | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 14 | 26-Aug-08 | N | 1927 | 1930 | 0.15F | <0.002 | 0.0019 | 0.087D1 | <0.01 | 0.06FD1 | 0.0119 | 690D1 | 7 | <0.05 | 0.13D1 | 1.43 | 1.4 | <0.05 | 0.0011 |
| | | 2-Sep-08 | N | 1927 | 1930 | 0.11F | <0.002 | <0.001 | 0.025 | <0.01 | 0.03F | 0.0017 | 554 | 8 | 0.01F | 0.01F | 0.19 | 3 | <0.05 | 0.0003F |
| | | 9-Sep-08 | N | 1927 | 1930 | 0.12 | <0.002 | <0.001 | 0.025 | <0.01 | 0.01 | 0.0015 | 542 | 2 | <0.05 | <0.05 | 0.16 | 2.4 | <0.05 | 0.0002 |
| | | 16-Sep-08 | N | 1927 | 1930 | 0.13 | <0.002 | <0.001 | 0.02 | <0.01 | 0.02 | 0.0014 | 586 | 1 | <0.05 | <0.05 | 0.22 | 2.5 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1927 | 1930 | 0.1 | <0.002 | <0.001 | 0.01 | <0.01 | <0.05 | 0.002 | 603 | <5 | <0.05 | <0.05 | 0.28 | 2.1 | <0.05 | 0.0002 |
| | | 30-Sep-08 | N | 1927 | 1930 | 0.09 | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | 0.0028 | 535 | <5 | <0.05 | <0.05 | 0.69 | 1.8 | <0.05 | 0.0002 |
| | | 7-Oct-08 | N | 1927 | 1930 | 0.07F | <0.002 | <0.001 | 0.012F | <0.01 | <0.05 | 0.003 | 543 | 1F | <0.05 | <0.05 | 1.35 | 0.3F | <0.05 | 0.0003F |
| | | 14-Oct-08 | N | 1927 | 1930 | 0.07F | <0.002 | <0.001 | 0.022 | <0.01 | <0.05 | 0.0036 | 552 | <5 | <0.05 | <0.05 | 1.99 | 1 | <0.05 | 0.0002F |
| | | 21-Oct-08 | N | 1927 | 1930 | 0.07F | <0.002 | <0.002 | 0.011F | <0.01 | <0.05 | 0.004 | 560 | <5 | <0.05 | 0.02F | 2.44 | 1.6 | <0.05 | 0.0002F |
| | | 28-Oct-08 | N | 1927 | 1930 | 0.13F | <0.002 | <0.002 | 0.018F | 0.002F | <0.05 | 0.004 | 474 | <5 | <0.05 | 0.02F | 3.32 | 1.4 | <0.05 | 0.0001F |
| | | 4-Nov-08 | N | 1927 | 1930 | 0.21 | <0.002 | <0.002 | 0.012F | <0.01 | <0.05 | 0.0045 | 543 | <5 | <0.05 | 0.03F | 4.63 | 1.7 | <0.05 | 0.0001F |
| | | 11-Nov-08 | N | 1927 | 1930 | 0.16F | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | 0.0048 | 505 | <5 | <0.05 | 0.02F | 4.66 | 1.6 | <0.05 | 0.0002F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-002A | TEST 14 | 18-Nov-08 | N | 1927 | 1930 | 0.36 | <0.002V1 | <0.002 | 0.011F | <0.01 | <0.05 | 0.0049 | 550 | <5 | <0.05 | 0.03F | 5.8 | 1.7V1 | <0.05 | 0.0002F |
| | | 25-Nov-08 | N | 1927 | 1930 | 0.45 | <0.002 | <0.002 | 0.012F | <0.01 | <0.05 | 0.0055 | 525 | <5 | <0.05 | 0.03F | 6.84 | 2 | <0.05 | 0.0002F |
| | | 2-Dec-08 | N | 1927 | 1930 | 0.49 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | 0.0054 | 449 | <5 | <0.05 | 0.02F | 7.19 | 2 | <0.05 | 0.0002F |
| | | 9-Dec-08 | N | 1927 | 1930 | 0.36 | <0.002 | <0.002 | 0.013F | 0.003F | <0.05 | 0.0051 | 497 | <5 | <0.05 | 0.03F | 8.13 | 2.1 | <0.05 | 0.0002F |
| | | 16-Dec-08 | N | 1927 | 1930 | 0.54 | <0.002 | <0.002 | 0.008F | 0.002F | <0.05 | 0.0048 | 463 | <5 | <0.05 | 0.02F | 8.54 | 2.1 | <0.05 | 0.0001F |
| | | 23-Dec-08 | N | 1927 | 1930 | 1 | -- | <0.002 | 0.011F | 0.004F | -- | 0.0047 | 479 | <5 | -- | 0.02F | 8.59 | 2.2 | <0.05 | 0.0002F |
| | | 30-Dec-08 | N | 1927 | 1930 | 0.84 | -- | <0.002 | 0.008F | <0.01 | -- | 0.0039 | 460 | 1F | -- | 0.03F | 8.4B7 | 2.1 | <0.05 | 0.0002F |
| | | 6-Jan-09 | N | 1927 | 1930 | 0.87 | -- | <0.002 | 0.013F | <0.01 | -- | 0.0036 | 468 | <5 | -- | 0.01F | 9.45 | 2.4 | <0.05 | 0.0004F |
| | | 13-Jan-09 | N | 1927 | 1930 | 0.98 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | 0.0035 | 452 | <5 | <0.05 | 0.01F | 8.89 | 2.2 | <0.05 | 0.0003F |
| | | 20-Jan-09 | N | 1927 | 1930 | 0.83 | -- | <0.002 | 0.011F | <0.01 | -- | 0.0067 | 468 | 1F | -- | 0.02F | 8.75 | 2.2 | <0.05 | 0.0002F |
| | | 27-Jan-09 | N | 1927 | 1930 | 0.89 | -- | <0.002 | 0.009F | 0.004F | -- | 0.0033 | 441 | 1F | -- | <0.05 | 10.3 | 2.5 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1927 | 1930 | 1.08 | -- | <0.002 | 0.012F | <0.01 | -- | 0.003 | 446 | <5 | -- | 0.02F | 10.3 | 2.4 | <0.05 | 0.0002F |
| | | 10-Feb-09 | N | 1927 | 1930 | 1.33 | -- | <0.002 | 0.012F | <0.01 | -- | 0.003 | 420 | <5 | -- | 0.02F | 10.9 | 2.6 | <0.05 | 0.0001F |
| | | 17-Feb-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1927 | 1930 | 1.39 | 0.0004F | <0.002 | 0.015F | <0.01 | <0.05 | 0.0028 | 404 | <3 | <0.05 | 0.02F | 13.7 | 3.3 | <0.05 | 0.0002F |
| | | 17-Mar-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1927 | 1930 | 1.59 | <0.002 | <0.002 | 0.013F | <0.01 | <0.05 | 0.0031 | 476 | <3 | <0.05 | 0.02F | 15.3 | 3.6 | <0.05 | 0.0002F |
| | | 14-Apr-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1927 | 1930 | 1.68 | <0.002 | <0.002 | 0.011F | <0.01 | <0.05 | 0.0027 | 440 | <3 | <0.05 | 0.02F | 15.2 | 3.6 | <0.05 | 0.0003F |
| | | 12-May-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1927 | 1930 | 2.03 | <0.002 | <0.002 | 0.012F | 0.002F | <0.05 | 0.0028 | 375 | <3 | <0.05 | 0.02F | 14.9 | 4.4 | <0.05 | 0.0003F |
| | | 9-Jun-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-002A | TEST 14 | 23-Jun-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1927 | 1930 | 2.59 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | 0.0025V3 | 354 | <3 | <0.05 | 0.02F | 13.9 | 4.9 | <0.05 | <0.0005 |
| | | 7-Jul-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1927 | 1930 | 4.85 | 0.0012F | <0.002 | 0.013F | 0.004F | <0.05 | 0.0034 | 383 | <3 | <0.05 | 0.02F | 24.2 | 8.9D1 | 0.04F | 0.0003F |
| | | 4-Aug-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1927 | 1930 | 5.49 | <0.002 | <0.002 | 0.013F | 0.003F | 0.02F | 0.0028 | 458 | <3 | 0.02F | 0.02F | 21.2 | 10.2D1 | 0.1 | 0.0005 |
| | TEST 9 | 26-Aug-08 | N | 888 | 891 | 0.09 | <0.002 | 0.0241 | 0.12D2 | <0.01 | <0.5D2 | <0.0005 | <10D2 | <5 | <0.05 | <0.3D2 | <0.05 | 0.2 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 888 | 891 | <0.2 | <0.002 | 0.0488 | 0.069 | <0.01 | <0.05 | <0.0005 | 5.3 | 3F | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | 0.0002F |
| | | 9-Sep-08 | N | 888 | 891 | 0.08 | <0.002 | 0.0249 | 0.036 | <0.01 | <0.05 | <0.0005 | 1.1 | 1 | <0.05 | 0.01 | 0.01 | 0.6M2 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 888 | 891 | 0.06 | <0.002 | 0.0114 | 0.01 | <0.01 | <0.05 | <0.0005 | <2D2 | <5 | <0.05 | 0.01 | 0.02 | 0.3 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 888 | 891 | 0.1 | <0.002 | 0.0457 | 0.013 | <0.01 | <0.05 | <0.0005 | 0.6 | <5 | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | 0.0001 |
| | | 30-Sep-08 | N | 888 | 891 | 0.06 | <0.002 | 0.0304 | 0.004 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.3 | <0.05 | 0.0002 |
| | | 7-Oct-08 | N | 888 | 891 | <0.2 | <0.002 | 0.0136 | 0.004F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | 0.0001F |
| | | 14-Oct-08 | N | 888 | 891 | 0.1F | <0.002 | 0.0175 | 0.016F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | 0.02F | <0.0005 |
| | | 21-Oct-08 | N | 888 | 891 | 0.05F | <0.002 | 0.0293 | 0.006F | <0.01 | <0.05 | <0.0005 | 0.3F | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 888 | 891 | 0.07F | <0.002 | 0.0523 | 0.005F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 888 | 891 | 0.04F | <0.002 | 0.102 | 0.007F | <0.01 | <0.05 | <0.0005 | 0.3F | <5 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | TEST 9S | 11-Nov-08 | N | 888 | 891 | 0.05F | 0.001F | 0.258 | 0.029 | <0.01 | <0.05 | <0.0005 | 1 | <5 | <0.05 | <0.05 | <0.05 | 1.6 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 888 | 891 | <0.2 | <0.002V1 | 0.0376 | 0.006F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.2FV1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 888 | 891 | 0.05F | <0.002 | 0.0271 | 0.006F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 888 | 891 | 0.06F | <0.002 | 0.026 | 0.004F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 888 | 891 | 0.06F | <0.002 | 0.0144 | <0.02 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 888 | 891 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 888 | 891 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-005I | TEST 15 | 26-Aug-08 | N | 1317.28 | 1320.28 | 0.2 | <0.002 | 0.0021 | 0.017F | <0.01 | 0.05 | <0.0005 | 12.1 | 26 | <0.05 | <0.05 | 0.04F | 1.9 | 0.11 | 0.0003F |
| | | 2-Sep-08 | N | 1317.28 | 1320.28 | 0.12F | <0.002 | 0.001 | 0.024 | <0.01 | 0.04F | <0.0005 | 16.3 | 16 | 0.01F | <0.05 | 0.01F | 1.3 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1317.28 | 1320.28 | 0.1 | <0.002 | 0.0008 | 0.024 | <0.01 | 0.03 | <0.0005 | 18 | 10 | <0.05 | <0.05 | 0.02 | 1 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 15 | 16-Sep-08 | N | 1317.28 | 1320.28 | 0.13 | <0.002 | 0.0007 | 0.019 | <0.01 | 0.02 | <0.0005 | 17.6 | 5 | <0.05 | <0.05 | 0.01 | 0.6 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1317.28 | 1320.28 | 0.08 | <0.002 | 0.0007 | 0.007 | <0.01 | 0.02 | <0.0005 | 15.6 | 3 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 1317.28 | 1320.28 | 0.09 | <0.002 | 0.0006 | 0.004 | <0.01 | 0.03 | <0.0005 | 13.1 | 1 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1317.28 | 1320.28 | 0.06F | <0.002 | <0.001 | 0.008F | <0.01 | 0.02F | <0.0005 | 17.7 | 1F | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 1317.28 | 1320.28 | 0.06F | <0.002 | <0.001 | 0.011F | <0.01 | 0.02F | <0.0005 | 12.2 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1317.28 | 1320.28 | 0.07F | <0.002 | <0.002 | 0.006F | <0.01 | 0.02F | <0.0005 | 11.5 | <5 | <0.05 | <0.05 | 0.05 | 0.5 | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1317.28 | 1320.28 | 0.08F | <0.002 | <0.002 | 0.012F | <0.01 | 0.02F | <0.0005 | 9.7 | <5 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1317.28 | 1320.28 | 0.05F | <0.002 | <0.002 | 0.005F | <0.01 | 0.02F | <0.0005 | 10.4 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 1317.28 | 1320.28 | 0.05F | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 9.2 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1317.28 | 1320.28 | 0.04F | <0.002V1 | <0.002 | 0.005F | <0.01 | 0.02F | <0.0005 | 9.6 | <5 | <0.05 | <0.05 | <0.05 | 0.5V1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1317.28 | 1320.28 | 0.08F | <0.002 | <0.002 | 0.005F | <0.01 | 0.01F | <0.0005 | 7.7 | <5 | <0.05 | <0.05 | 0.02F | 0.4F | <0.05 | 0.0001F |
| | | 2-Dec-08 | N | 1317.28 | 1320.28 | 0.06F | <0.002 | <0.002 | <0.02 | <0.01 | 0.01F | <0.0005 | 8.6 | <5 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1317.28 | 1320.28 | <0.2 | <0.002 | <0.002 | 0.003F | <0.01 | 0.01F | <0.0005 | 7.4 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1317.28 | 1320.28 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1317.28 | 1320.28 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 16 | 26-Aug-08 | N | 1428.18 | 1431.18 | 0.34D1 | 0.0053 | 0.0836 | 0.218D1 | <0.02D1 | 0.04FD1 | <0.0005 | 25.4D1 | 53 | <0.1D1 | <0.1D1 | 0.17D1 | 3 | 1.4D1 | 0.0049 |
| | | 2-Sep-08 | N | 1428.18 | 1431.18 | 0.05F | 0.0017F | 0.0239 | 0.071 | <0.01 | <0.05 | <0.0005 | <1 | 1F | <0.05 | <0.05 | 0.03F | 0.4F | 0.03F | 0.0006 |
| | | 9-Sep-08 | N | 1428.18 | 1431.18 | 0.03 | 0.0009 | 0.0276 | 0.155B7 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | 0.02 | 0.04 | 0.2 | 0.16 | 0.0011 |
| | | 16-Sep-08 | N | 1428.18 | 1431.18 | 0.06 | <0.002 | 0.0173 | 0.088 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.03 | 0.1 | 0.17 | 0.0016 |
| | | 23-Sep-08 | N | 1428.18 | 1431.18 | <0.2 | <0.002 | 0.0066 | 0.2 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.01 | <0.5 | 0.04 | 0.001 |
| | | 30-Sep-08 | N | 1428.18 | 1431.18 | <0.2 | <0.002 | 0.0034 | 0.085 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.02 | <0.5 | 0.02 | 0.0001 |
| | | 7-Oct-08 | N | 1428.18 | 1431.18 | <0.2 | <0.002 | 0.0026 | 0.096 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.01F | <0.5 | 0.05 | 0.0003F |
| | | 14-Oct-08 | N | 1428.18 | 1431.18 | <0.2 | <0.002 | 0.0017 | 0.138 | <0.01 | 0.01F | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.04F | <0.5 | 0.45 | 0.0005 |
| | | 21-Oct-08 | N | 1428.18 | 1431.18 | <0.2 | 0.0005F | 0.0297 | 0.18 | <0.01 | <0.05 | <0.0005 | 0.7F | <5 | <0.05 | <0.05 | 0.04F | 0.3F | 0.11 | 0.0004F |
| | | 28-Oct-08 | N | 1428.18 | 1431.18 | <0.2 | <0.002 | 0.0149 | 0.124 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.02F | 0.2F | 0.03F | 0.0003F |
| | | 4-Nov-08 | N | 1428.18 | 1431.18 | <0.2 | <0.002 | 0.0018F | 0.209 | <0.01 | <0.05 | <0.0005 | 0.3F | <5 | <0.05 | <0.05 | 0.04F | <0.5 | 0.04F | 0.0002F |
| | TEST 16S | 11-Nov-08 | N | 1428.18 | 1431.18 | <0.2 | 0.0007F | 0.0442 | 0.129 | <0.01 | <0.05 | <0.0005 | 0.8F | 1F | <0.05 | <0.05 | 0.01F | 0.2F | 0.18 | 0.0005 |
| | | 18-Nov-08 | N | 1428.18 | 1431.18 | <0.2 | <0.002V1 | 0.0148 | 0.198 | <0.01 | <0.05 | <0.0005 | 0.4F | 2F | <0.05 | <0.05 | 0.03F | <0.5V1 | 0.19 | 0.0008 |
| | | 25-Nov-08 | N | 1428.18 | 1431.18 | <0.2 | <0.002 | 0.0093 | 0.091 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.02F | <0.5 | 0.11 | 0.0003F |
| | | 2-Dec-08 | N | 1428.18 | 1431.18 | 0.04F | <0.002 | 0.0099 | 0.07 | <0.01 | <0.05 | <0.0005 | <1 | 1F | <0.05 | <0.05 | 0.02F | <0.5 | 0.22 | 0.0008 |
| | | 9-Dec-08 | N | 1428.18 | 1431.18 | 0.04F | <0.002 | 0.0084 | 0.078 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.02F | <0.5 | 0.58 | 0.0013 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 16S | 16-Dec-08 | N | 1428.18 | 1431.18 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1428.18 | 1431.18 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 17 | 26-Aug-08 | FD | 1428.18 | 1431.18 | 0.34D1 | 0.0031 | 0.0555 | 0.196D1 | <0.02D1 | 0.02FD1 | <0.0005 | 20.3D1 | 45 | <0.1D1 | <0.1D1 | 0.14D1 | 2.3 | 1.38D1 | 0.005 |
| | | 2-Sep-08 | FD | 1428.18 | 1431.18 | 0.08F | 0.0023 | 0.037 | 0.194 | <0.01 | <0.05 | <0.0005 | 1 | 3F | 0.01F | <0.05 | 0.04F | 0.7 | 0.77 | 0.0035 |
| | | 9-Sep-08 | FD | 1428.18 | 1431.18 | 0.03 | 0.0012 | 0.0413 | 0.089 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.02 | 0.3 | 0.06 | 0.0002 |
| | | 16-Sep-08 | FD | 1428.18 | 1431.18 | 0.07 | 0.0011 | 0.0453 | 0.087 | <0.01 | <0.05 | <0.0005 | <1 | 1 | <0.05 | <0.05 | 0.03 | 0.4 | 0.18 | 0.0015 |
| | | 23-Sep-08 | FD | 1428.18 | 1431.18 | 0.04 | 0.0005 | 0.0216 | 0.115 | <0.01 | <0.05 | <0.0005 | 0.3 | <5 | <0.05 | <0.05 | <0.05 | 0.1 | 0.28 | 0.0012 |
| | | 30-Sep-08 | FD | 1428.18 | 1431.18 | <0.2 | 0.0013 | 0.0534 | 0.234 | <0.01 | <0.05 | <0.0005 | 0.5 | <5 | <0.05 | <0.05 | 0.02 | 0.3 | 0.26 | 0.0012 |
| | | 7-Oct-08 | FD | 1428.18 | 1431.18 | <0.2 | 0.0012F | 0.0459 | 0.194 | <0.01 | <0.05 | <0.0005 | 0.4F | 1F | <0.05 | <0.05 | 0.01F | 1.3 | 0.36 | 0.0012 |
| | | 14-Oct-08 | FD | 1428.18 | 1431.18 | <0.2 | 0.001F | 0.0372 | 0.171 | <0.01 | 0.01F | <0.0005 | 0.5F | <5 | <0.05 | <0.05 | <0.05 | <0.5 | 0.25 | 0.0007 |
| | | 21-Oct-08 | FD | 1428.18 | 1431.18 | <0.2 | 0.0006F | 0.018 | 0.224 | <0.01 | <0.05 | <0.0005 | 0.6F | <5 | <0.05 | <0.05 | <0.05 | <0.5 | 0.23 | 0.0007 |
| | | 28-Oct-08 | FD | 1428.18 | 1431.18 | <0.3D2 | 0.0004F | 0.0153 | 0.31 | <0.01 | <0.1D2 | <0.0005 | 0.6F | <5 | <0.05 | <0.05 | <0.1D2 | <0.5 | <0.1D2 | 0.0004F |
| | | 4-Nov-08 | FD | 1428.18 | 1431.18 | <0.2 | <0.002 | 0.0112 | 0.351 | <0.01 | <0.05 | <0.0005 | 0.8F | 1F | <0.05 | <0.05 | 0.03F | <0.5 | 0.29 | 0.0016 |
| | TEST 17S | 11-Nov-08 | FD | 1428.18 | 1431.18 | <0.2 | <0.02D2 | 0.028D2 | 0.296 | <0.01 | <0.05 | <0.005D2 | 1.6 | <5 | <0.05 | <0.05 | 0.02F | <0.5 | 0.45 | 0.001FD2 |
| | | 18-Nov-08 | FD | 1428.18 | 1431.18 | 0.05F | <0.002V1 | 0.0155 | 0.228 | <0.01 | <0.05 | <0.0005 | 0.7F | <5 | <0.05 | <0.05 | 0.01F | <0.5V1 | 0.66 | 0.0015 |
| | | 25-Nov-08 | FD | 1428.18 | 1431.18 | 0.06F | <0.002 | 0.0095 | 0.117 | <0.01 | 0.01F | <0.0005 | 0.6F | <5 | <0.05 | <0.05 | 0.03F | <0.5 | 0.39 | 0.0012 |
| | | 2-Dec-08 | FD | 1428.18 | 1431.18 | 0.04F | <0.002 | 0.0124 | 0.244 | <0.01 | <0.05 | <0.0005 | 0.7F | 1F | <0.05 | <0.05 | 0.02F | <0.5 | 0.49 | 0.0013 |
| | | 9-Dec-08 | FD | 1428.18 | 1431.18 | 0.04F | <0.002 | 0.0109 | 0.187 | <0.01 | <0.05 | <0.0005 | 0.3F | <5 | <0.05 | 0.01F | 0.01F | <0.5 | 0.35 | 0.0011 |
| | | 16-Dec-08 | FD | 1428.18 | 1431.18 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | FD | 1428.18 | 1431.18 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 18 | 26-Aug-08 | N | 1499 | 1502 | <0.2 | <0.002 | 0.0058 | <0.02 | <0.01 | 0.01F | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1499 | 1502 | 0.14F | <0.002 | 0.0083 | 0.031 | <0.01 | <0.05 | <0.0005 | 10.2 | 17 | 0.01F | <0.05 | 0.02F | 1.8 | 0.06 | 0.0021 |
| | | 9-Sep-08 | N | 1499 | 1502 | 0.12 | 0.0006 | 0.008 | <0.02 | <0.01 | <0.05 | <0.0005 | <1V1 | 1 | <0.05 | 0.01 | 0.01 | 1.5 | 0.03 | 0.0005 |
| | | 16-Sep-08 | N | 1499 | 1502 | 0.09 | <0.002 | 0.0072 | 0.012 | <0.01 | <0.05 | <0.0005 | 0.4 | 1 | <0.05 | <0.05 | 0.01 | 1.8 | 0.02 | 0.0006 |
| | | 23-Sep-08 | N | 1499 | 1502 | 0.04 | <0.002 | 0.0052 | 0.003 | <0.01 | <0.05 | <0.0005 | 0.2 | <5 | <0.05 | <0.05 | <0.05 | 1.1 | 0.03 | 0.0004 |
| | | 30-Sep-08 | N | 1499 | 1502 | 0.04 | 0.0005 | 0.0143 | <0.02 | <0.01 | <0.05 | <0.0005 | 0.4 | <5 | <0.05 | <0.05 | 0.01 | 2.3 | <0.05 | 0.0004 |
| | | 7-Oct-08 | N | 1499 | 1502 | <0.2 | 0.0004F | 0.0125 | <0.02 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | 0.0003F |
| | | 14-Oct-08 | N | 1499 | 1502 | 0.09F | <0.002 | 0.0111 | 0.011F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 1.1 | 0.04F | 0.0004F |
| | | 21-Oct-08 | N | 1499 | 1502 | 0.2 | 0.0004F | 0.0143 | 0.008F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 1.1 | 0.04F | 0.0011 |
| | | 28-Oct-08 | N | 1499 | 1502 | 0.17F | <0.002 | 0.011 | 0.007F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 1.1 | 0.02F | 0.0008 |
| | | 4-Nov-08 | N | 1499 | 1502 | 0.04F | <0.002 | 0.0082 | <0.02 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | 0.01F | <0.05 | 0.8 | <0.05 | 0.0003F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 18S | 11-Nov-08 | N | 1499 | 1502 | 0.36 | <0.01D2 | 0.018D2 | 0.011F | <0.01 | <0.05 | <0.003D2 | <1 | <5 | <0.05 | <0.05 | <0.05 | 1.8 | 0.23 | 0.0019FD2 |
| | | 18-Nov-08 | N | 1499 | 1502 | 0.04F | <0.002V1 | 0.0051 | <0.02 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.5V1 | 0.02F | 0.0002F |
| | | 25-Nov-08 | N | 1499 | 1502 | 0.07F | <0.002 | 0.0046 | 0.005F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.01F | 0.6 | 0.04F | 0.0003F |
| | | 2-Dec-08 | N | 1499 | 1502 | 0.28 | <0.002 | 0.0057 | 0.004F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.8 | 0.14 | 0.0015 |
| | | 9-Dec-08 | N | 1499 | 1502 | 0.15F | <0.002 | 0.0029 | 0.005F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | 0.09 | 0.0008 |
| | | 16-Dec-08 | N | 1499 | 1502 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1499 | 1502 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 19 | 26-Aug-08 | N | 1586.46 | 1589.46 | 0.03F | <0.002 | 0.0078 | 0.257 | <0.01 | <0.05 | <0.0005 | 17.8 | 24 | <0.05 | <0.05 | 0.01F | 1.1 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1586.46 | 1589.46 | 0.16F | 0.0004F | 0.0073 | 0.063 | <0.01 | <0.05 | <0.0005 | 2.3 | 4F | 0.01F | <0.05 | 0.03F | 3.4M2 | 0.06 | 0.0001F |
| | | 9-Sep-08 | N | 1586.46 | 1589.46 | 0.15 | 0.0005 | 0.0078 | 0.047 | <0.01 | <0.05 | <0.0005 | 0.3 | <5 | <0.05 | <0.05V1 | 0.01 | 2.7 | 0.06 | 0.0002 |
| | | 16-Sep-08 | N | 1586.46 | 1589.46 | 0.06 | <0.002 | 0.0053 | 0.019 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.01 | 1.5 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1586.46 | 1589.46 | 0.08 | <0.002 | 0.0056 | 0.012 | <0.01 | <0.05 | <0.0005 | 0.2 | <5 | <0.05 | <0.05 | <0.05 | 1.3 | 0.04 | <0.0005 |
| | | 30-Sep-08 | N | 1586.46 | 1589.46 | 0.17 | 0.0007 | 0.025 | 0.024 | <0.01 | 0.01 | <0.0005 | 0.4 | <5 | <0.05 | <0.05 | 0.02 | 3.1 | 0.06 | 0.0002 |
| | | 7-Oct-08 | N | 1586.46 | 1589.46 | 0.12F | <0.002 | 0.0083 | 0.017F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.1F | 0.08 | 0.0002F |
| | | 14-Oct-08 | N | 1586.46 | 1589.46 | <0.2 | <0.002 | 0.0043 | 0.009F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1586.46 | 1589.46 | 0.12F | <0.002 | 0.0069 | 0.006F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | 0.04F | 0.0001F |
| | | 28-Oct-08 | N | 1586.46 | 1589.46 | <0.2 | <0.002 | 0.0033 | 0.004F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1586.46 | 1589.46 | <0.2 | <0.002 | 0.0048 | 0.006F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | TEST 19S | 11-Nov-08 | N | 1586.46 | 1589.46 | 0.14F | <0.002 | 0.0135 | 0.014F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 1.1 | 0.11 | 0.0002F |
| | | 18-Nov-08 | N | 1586.46 | 1589.46 | 0.08F | <0.002V1 | 0.0046 | 0.005F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.2FV1 | 0.08 | <0.0005 |
| | | 25-Nov-08 | N | 1586.46 | 1589.46 | 0.08F | <0.002 | 0.0056 | 0.008F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | 0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1586.46 | 1589.46 | 0.11F | <0.002 | 0.0022 | <0.02 | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | 0.07 | <0.0005 |
| | | 9-Dec-08 | N | 1586.46 | 1589.46 | 0.06F | <0.002 | 0.0015F | 0.005F | <0.01 | <0.05 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 0.01F | 0.1F | 0.04F | <0.0005 |
| | | 16-Dec-08 | N | 1586.46 | 1589.46 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1586.46 | 1589.46 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 20 | 26-Aug-08 | N | 1632.56 | 1635.56 | <0.3D1 | 0.0008F | 0.0035 | 0.147 | <0.02D1 | 0.05 | 0.0144 | 91.3 | 37 | <0.1D1 | 0.27 | 5.1D1 | 0.6 | <0.1D1 | 0.0003F |
| | | 2-Sep-08 | N | 1632.56 | 1635.56 | 0.04F | 0.0004F | <0.001 | 0.164 | <0.01 | 0.02F | 0.0002F | 2.1 | 1F | <0.05 | <0.05 | 0.13 | 0.7 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1632.56 | 1635.56 | 0.04 | <0.002 | <0.001 | 0.161 | <0.01 | <0.05 | 0.0003 | 2.1 | 5 | <0.05 | 0.02 | 0.43 | 0.8 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1632.56 | 1635.56 | 0.09 | <0.002 | <0.001 | 0.136 | <0.01 | 0.01 | 0.0005 | 3.3 | 5 | <0.05 | 0.02 | 1.02 | 1 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1632.56 | 1635.56 | 0.06 | <0.002 | <0.001 | 0.071 | <0.01 | <0.05 | 0.0003 | 1.1 | <5 | <0.05 | <0.05 | 0.68 | 0.3 | <0.05 | 0.0001 |
| | | 30-Sep-08 | N | 1632.56 | 1635.56 | 0.11 | <0.002 | <0.001 | 0.101 | <0.01 | <0.05 | 0.0006 | 2 | 1 | 0.01 | 0.02 | 1.7 | 0.4 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 20 | 7-Oct-08 | N | 1632.56 | 1635.56 | 0.1F | <0.002 | <0.001 | 0.086 | <0.01 | <0.05 | 0.0004F | 1.2 | <5 | <0.05 | <0.05 | 1.67 | 0.1F | <0.05 | 0.0001F |
| | | 14-Oct-08 | N | 1632.56 | 1635.56 | 0.16F | <0.002 | <0.001 | 0.067 | <0.01 | <0.05 | 0.001 | 2.7 | 3F | <0.05 | 0.02F | 3.58 | 0.1F | <0.05 | 0.0002F |
| | | 21-Oct-08 | N | 1632.56 | 1635.56 | 0.2 | <0.002 | <0.002 | 0.042 | <0.01 | <0.05 | 0.0013 | 3.4 | 2F | <0.05 | 0.03F | 4.5 | 0.2F | <0.05 | 0.0002F |
| | | 28-Oct-08 | N | 1632.56 | 1635.56 | 0.18F | <0.002 | <0.002 | 0.056 | <0.01 | <0.05 | 0.0014 | 3 | <5 | <0.05 | 0.02F | 4.86 | 0.2F | <0.05 | 0.0001F |
| | | 4-Nov-08 | N | 1632.56 | 1635.56 | 0.18F | <0.002 | <0.002 | 0.032 | <0.01 | <0.05 | 0.0013 | 3 | <5 | <0.05 | 0.03F | 4.86 | 0.4F | <0.05 | 0.0004F |
| | TEST 20S | 11-Nov-08 | N | 1632.56 | 1635.56 | 0.21 | <0.002 | <0.002 | 0.041 | <0.01 | <0.05 | 0.0044 | 8.2 | 6 | <0.05 | 0.07 | 9.72 | 0.7 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1632.56 | 1635.56 | 0.08F | <0.002V1 | <0.002 | 0.108 | <0.01 | <0.05 | 0.0012 | 1.9 | 1F | <0.05 | 0.02F | 4.55 | 0.1FV1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1632.56 | 1635.56 | 0.13F | <0.002 | <0.002 | 0.074 | <0.01 | <0.05 | 0.0013 | 1.9 | <5 | <0.05 | 0.03F | 5.97 | 0.2F | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1632.56 | 1635.56 | 0.13F | <0.002 | <0.002 | 0.057 | <0.01 | <0.05 | 0.001 | 1.5 | <5 | <0.05 | 0.02F | 5.92 | 0.2F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1632.56 | 1635.56 | 0.12F | <0.002 | <0.002 | 0.067 | <0.01 | <0.05 | 0.001 | 0.9F | <5 | <0.05 | 0.02F | 6.78 | 0.2F | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1632.56 | 1635.56 | 0.1F | <0.002 | <0.002 | 0.053 | <0.01 | <0.05 | 0.0009 | 1.1 | <5 | <0.05 | 0.01F | 7.35M3 | 0.2F | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1632.56 | 1635.56 | 0.16F | -- | <0.002 | 0.039 | 0.003F | -- | 0.0009 | 1.2 | <5 | -- | 0.02F | 8.11M3 | 0.1FD1 | 0.03F | <0.0005 |
| | | 30-Dec-08 | N | 1632.56 | 1635.56 | 0.19F | -- | <0.002 | 0.049 | <0.01 | -- | 0.0012 | 1.6 | <5 | -- | 0.03F | 12.1B7M3 | 0.2F | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1632.56 | 1635.56 | 0.19F | -- | <0.002 | 0.05 | <0.01 | -- | 0.0012 | 1.5 | <5M1 | -- | 0.02F | 13.5M3 | 0.2F | 0.04F | <0.0005 |
| | | 13-Jan-09 | N | 1632.56 | 1635.56 | 0.18FM1 | <0.002 | <0.002 | 0.047 | <0.01 | <0.05 | 0.0012 | 1.5M1 | <5 | <0.05 | 0.02F | 14.1M3 | 0.2F | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1632.56 | 1635.56 | 0.28 | -- | <0.002 | 0.048 | <0.01 | -- | 0.0011 | 1.5 | <5 | -- | 0.03F | 16.2M3 | <3D1 | 0.06 | <0.0005 |
| | | 27-Jan-09 | N | 1632.56 | 1635.56 | 0.27 | -- | <0.002 | 0.053 | 0.002F | -- | 0.001 | 1.3 | 1F | -- | 0.02F | 17 | <3D1 | 0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1632.56 | 1635.56 | 0.32 | -- | <0.002 | 0.051 | <0.01 | -- | 0.001 | 1.8 | <5 | -- | 0.03F | 20.3M3 | <3D1 | 0.08 | <0.0005 |
| | | 10-Feb-09 | N | 1632.56 | 1635.56 | 0.28 | <0.002 | <0.002 | 0.048 | <0.01 | <0.05 | 0.0012 | 1.1 | <5H3 | <0.05 | 0.03F | 20.2 | <3D2H3 | 0.07 | <0.0005 |
| | | 17-Feb-09 | N | 1632.56 | 1635.56 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 21 | 26-Aug-08 | N | 1652 | 1654.93 | 0.84 | 0.0009F | 0.0048 | 0.091 | <0.01 | 0.04F | 0.073 | 49.5 | 14 | <0.05 | 0.29 | 11.7 | 2.4 | <0.05 | 0.0021 |
| | | 2-Sep-08 | N | 1652 | 1654.93 | 0.71 | 0.0011F | 0.0006F | 0.035 | <0.01 | 0.01F | 0.0013 | 2 | <5 | 0.01F | 0.01F | 0.47 | 3.3 | <0.05 | 0.001 |
| | | 9-Sep-08 | N | 1652 | 1654.93 | 0.47 | 0.0007 | <0.001 | 0.051 | <0.01 | <0.05 | 0.0013 | 1.8 | 1 | <0.05 | 0.02 | 0.97 | 1.4 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1652 | 1654.93 | 1.85 | <0.002 | 0.0018 | 0.096 | 0.003 | <0.05 | 0.01 | 14 | 7 | <0.05 | 0.12 | 9.41M3 | 2.7 | 0.03 | 0.0002 |
| | | 23-Sep-08 | N | 1652 | 1654.93 | 2.25 | <0.002 | 0.0012 | 0.066 | <0.01 | 0.01 | 0.0091 | 10.8 | 2 | <0.05 | 0.12 | 11.8M3 | 2.3D2 | 0.03M3 | 0.0003 |
| | | 30-Sep-08 | N | 1652 | 1654.93 | 7.61M3 | <0.002 | 0.0041 | 0.059 | 0.003 | <0.05 | 0.0254 | 25.9 | <5 | <0.05 | 0.36 | 47.3M3 | 9.2D1 | 0.11 | 0.0008 |
| | | 7-Oct-08 | N | 1652 | 1654.93 | 6.61M3 | <0.002 | 0.0051 | 0.095 | <0.01 | <0.05 | 0.0131 | 13.8 | <5 | <0.05 | 0.27 | 59.8M3 | 6.9D1 | 0.22 | 0.0006 |
| | | 14-Oct-08 | N | 1652 | 1654.93 | 4.01M3 | <0.002 | 0.0007F | 0.05 | 0.007F | <0.3D1 | 0.0032 | 6.1 | <5 | <0.05 | 0.1 | 235D1M3 | 2.2FD1 | 1.82 | 0.0003F |
| | | 21-Oct-08 | N | 1652 | 1654.93 | 2.32 | <0.002 | 0.002 | 0.033 | <0.01 | <0.05 | 0.001 | 2 | 1F | <0.05 | 0.06 | 26.7M3 | 2.4FD1 | 0.16 | 0.0003F |
| | | 28-Oct-08 | N | 1652 | 1654.93 | 4.37M3 | <0.002 | 0.0061 | 0.037 | <0.01 | <0.05 | 0.0017 | 3.6 | 1F | <0.05 | 0.16 | 75.9M3 | 3.9D2 | 0.45 | 0.0006 |
| | | 4-Nov-08 | N | 1652 | 1654.93 | 6.12M3 | <0.002 | 0.0131 | 0.032 | <0.01 | <0.05 | 0.0018 | 3.3 | 1F | <0.05 | 0.22 | 114D2M3 | 4.5D1 | 1.12 | 0.0012 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 21 | 11-Nov-08 | N | 1652 | 1654.93 | 3.42 | <0.002 | 0.0113 | 0.038 | <0.01 | <0.05 | 0.0009 | 1.3 | 1F | <0.05 | 0.12 | 71.4M3 | 2.3FD2 | 0.77 | 0.0005 |
| | | 18-Nov-08 | N | 1652 | 1654.93 | 3.91M3 | <0.002 | 0.0128 | 0.032 | <0.01 | <0.05 | 0.0009 | 1.2 | 1F | <0.05 | 0.13 | 90.8M3 | 2.4FD2 | 1.3 | 0.0006 |
| | | 25-Nov-08 | N | 1652 | 1654.93 | 0.56 | <0.002 | 0.0034 | 0.036 | <0.01 | <0.05 | 0.0002F | 0.3F | <5 | <0.05 | 0.02F | 13.8M3 | <3D1 | 0.4 | 0.0007 |
| | | 2-Dec-08 | N | 1652 | 1654.93 | 1.48 | <0.002 | 0.0038 | 0.034 | 0.003F | <0.05 | 0.0005 | 0.6F | <5 | <0.05 | 0.04F | 25.1M3 | 1.4FD1 | 1.55 | 0.0007 |
| | | 9-Dec-08 | N | 1652 | 1654.93 | 0.82 | <0.002 | 0.0035 | 0.027 | <0.01 | <0.05 | 0.0003F | 0.3F | <5M1 | <0.05 | 0.02F | 12.1M3 | 0.5FD1 | 1.3 | 0.0004F |
| | | 16-Dec-08 | N | 1652 | 1654.93 | 3.51 | <0.002 | 0.0093 | 0.047 | 0.002F | <0.05 | 0.0009 | 1 | <5 | <0.05 | 0.09 | 68.8 | 1.9FD1 | 1.61 | 0.0006 |
| | | 23-Dec-08 | N | 1652 | 1654.93 | 2.35 | -- | 0.0111 | 0.035 | 0.004F | -- | 0.0005 | 0.4F | <5 | -- | 0.07 | 51.9 | 1FD1 | 1.14 | 0.0004F |
| | | 30-Dec-08 | N | 1652 | 1654.93 | 2.47 | -- | 0.0103 | 0.024 | <0.01 | -- | 0.0004F | 0.5F | <5 | -- | 0.07 | 52.5B7 | 1FD1 | 1.98 | 0.0004F |
| | | 6-Jan-09 | N | 1652 | 1654.93 | 3.65 | -- | 0.0173 | 0.03 | <0.01 | -- | 0.0005 | 0.5F | <5 | -- | 0.09 | 72.2 | 1FD1 | 2.6 | 0.0006 |
| | | 13-Jan-09 | N | 1652 | 1654.93 | 4 | <0.002 | 0.0161 | 0.034 | <0.01 | <0.05 | 0.0004F | 0.3F | <5 | <0.05 | 0.07 | 59.1 | 1FD1 | 2.74 | 0.0005 |
| | | 20-Jan-09 | N | 1652 | 1654.93 | 4.16 | -- | 0.018D1 | 0.031 | <0.01 | -- | 0.0004F | 0.4F | <5 | -- | 0.08 | 58.3 | 1FD1 | 2.86 | 0.0007 |
| | | 27-Jan-09 | N | 1652 | 1654.93 | 4.98 | -- | 0.0206 | 0.031 | 0.005F | -- | 0.0004F | 0.3F | <5 | -- | 0.08 | 61.9M3 | <5D1 | 3.32 | 0.0003F |
| | | 3-Feb-09 | N | 1652 | 1654.93 | 3.5 | -- | 0.0155 | 0.035 | <0.01 | -- | 0.0003F | 0.3F | <5 | -- | 0.06 | 46.4 | <5D1 | 2.87 | 0.0004F |
| | | 10-Feb-09 | N | 1652 | 1654.93 | 4.89 | -- | 0.015 | 0.04 | <0.01 | -- | 0.0003F | 0.7F | <5 | -- | 0.08 | 52.1 | <5D1 | 3.58 | 0.0002F |
| | | 17-Feb-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1652 | 1654.93 | 5.9 | <0.002 | 0.0181 | 0.034 | <0.01 | <0.05 | 0.0003F | 0.3F | <3 | <0.05 | 0.06 | 42.9 | 0.3F | 5.84 | 0.0004F |
| | | 17-Mar-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1652 | 1654.93 | 7.12 | <0.002 | 0.016 | 0.024 | <0.01 | <0.05 | 0.0002F | 0.2F | <3 | 0.01F | 0.06 | 32.6 | 0.1F | 6.67 | 0.0005 |
| | | 14-Apr-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1652 | 1654.93 | 9.46 | <0.002 | 0.0138 | 0.028 | <0.01 | <0.05 | 0.0002F | <1 | <3 | <0.05 | 0.05 | 26.4 | 0.2F | 10.8 | 0.0001F |
| | | 12-May-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1652 | 1654.93 | 9.78 | <0.01D1 | 0.022 | 0.033 | <0.01 | <0.05 | 0.0003F | <1 | <3 | <0.05 | 0.05 | 30.3 | 0.3F | 13.2 | 0.0003F |
| | | 9-Jun-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 21 | 16-Jun-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1652 | 1654.93 | 10.2 | <0.002 | 0.0168 | 0.034 | <0.01 | <0.05 | 0.0002FV3 | <1 | <3 | 0.01F | 0.05 | 21.2 | 0.2F | 17.7 | 0.001 |
| | | 7-Jul-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1652 | 1654.93 | 15.2 | <0.002 | 0.0297 | 0.035 | <0.01 | 0.01F | 0.0002F | <1 | <3 | <0.05 | 0.05 | 27.1 | 0.2F | 22.3 | 0.0003F |
| | | 4-Aug-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1652 | 1654.93 | 4.17 | <0.002 | 0.0102 | 0.031 | <0.01 | 0.02F | 0.0002F | 0.2F | <3 | <0.05 | 0.03F | 13 | 0.2F | 20.7 | 0.0005 |
| | TEST 22 | 26-Aug-08 | N | 1654.93 | 1659.8 | <0.2 | 0.0025 | 0.0049 | 0.125 | <0.01 | 0.08 | 0.107 | 56.8 | 21 | <0.05 | 0.27 | 1.62 | 3.6 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1654.93 | 1659.8 | 0.06F | 0.001F | 0.0013 | 0.105 | <0.01 | 0.02F | 0.0061 | 5.3 | <5 | 0.01F | 0.02F | 0.59 | 3.8 | <0.05 | 0.0003F |
| | | 9-Sep-08 | N | 1654.93 | 1659.8 | 0.05 | 0.0008 | <0.001 | 0.168 | <0.01 | <0.05 | 0.0042 | 3 | <5 | <0.05 | 0.03 | 0.63 | 2.3 | <0.05 | 0.0001 |
| | | 16-Sep-08 | N | 1654.93 | 1659.8 | 0.05 | 0.0004 | <0.001 | 0.106 | 0.003 | <0.05 | 0.0039 | 2.6 | 1 | <0.05 | 0.02 | 0.67 | 2 | <0.05 | 0.0001 |
| | | 23-Sep-08 | N | 1654.93 | 1659.8 | 0.06 | <0.002 | <0.001 | 0.109 | <0.01 | 0.01 | 0.0035 | 2.5 | <5 | <0.05 | 0.02 | 0.8 | 0.9D2 | <0.05 | 0.0001 |
| | | 30-Sep-08 | N | 1654.93 | 1659.8 | 0.09 | <0.002 | 0.0009 | 0.07 | <0.01 | <0.05 | 0.0132 | 8.8 | 1 | <0.05 | 0.07 | 1.28 | 2.7 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1654.93 | 1659.8 | 0.09F | <0.002 | <0.001 | 0.073 | <0.01 | 0.01F | 0.0136 | 8.5 | 2F | <0.05 | 0.08 | 1.64 | 1.5 | <0.05 | 0.0001F |
| | | 14-Oct-08 | N | 1654.93 | 1659.8 | 0.08F | <0.002 | <0.001 | 0.082 | <0.01 | <0.05 | 0.0104 | 7 | <5 | <0.05 | 0.07 | 1.88M3 | 1.6 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1654.93 | 1659.8 | 0.08F | <0.002 | 0.0005F | 0.153 | <0.01 | <0.05 | 0.0078 | 4.9 | <5 | <0.05 | 0.05 | 2.56 | 1.6M1 | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1654.93 | 1659.8 | 0.13F | <0.002 | <0.002 | 0.138 | <0.01 | <0.05 | 0.0127 | 6.3 | <5 | <0.05 | 0.07 | 2.56 | 1.6 | <0.05 | 0.0003F |
| | | 4-Nov-08 | N | 1654.93 | 1659.8 | 0.09F | <0.002 | <0.002 | 0.062 | <0.01 | <0.05 | 0.0185 | 7.9 | <5 | <0.05 | 0.1 | 4.21M3 | 1.8 | <0.05 | 0.0001F |
| | TEST 22S | 11-Nov-08 | N | 1654.93 | 1659.8 | 0.04F | <0.002 | 0.0005F | 0.094 | <0.01 | <0.05 | 0.014 | 7.3 | <5 | <0.05 | 0.08 | 3.31 | 3.5 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1654.93 | 1659.8 | <0.2 | <0.002 | <0.002 | 0.121 | <0.01 | <0.05 | 0.0046 | 2.8 | <5 | <0.05 | 0.03F | 2.26M3 | 1.5 | <0.05 | 0.0001F |
| | | 25-Nov-08 | N | 1654.93 | 1659.8 | <0.2 | <0.002 | <0.002 | 0.13 | <0.01 | <0.05 | 0.0037 | 2.1 | <5 | <0.05 | 0.03F | 2.21 | 1.1 | <0.05 | 0.0002F |
| | | 2-Dec-08 | N | 1654.93 | 1659.8 | 0.03F | <0.002 | <0.002 | 0.063 | 0.002F | <0.05 | 0.0041 | 2 | <5 | <0.05 | 0.03F | 2.74 | 0.8 | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1654.93 | 1659.8 | <0.2 | <0.002 | <0.002 | 0.091 | <0.01 | <0.05 | 0.0049 | 2 | <5 | <0.05 | 0.03F | 3.34 | 0.8 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1654.93 | 1659.8 | <0.2 | <0.002 | <0.002 | 0.061 | <0.01 | <0.05 | 0.004 | 1.5 | <5 | <0.05 | 0.03F | 3.71 | 0.6 | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1654.93 | 1659.8 | 0.06F | -- | <0.002 | 0.063 | 0.003F | -- | 0.0039 | 1.6 | <5 | -- | 0.03F | 3.52 | 0.6 | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1654.93 | 1659.8 | 0.1F | -- | <0.002 | 0.043 | <0.01 | -- | 0.005 | 2.2 | 1F | -- | 0.05 | 5.69B7 | 0.7 | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1654.93 | 1659.8 | 0.1F | -- | <0.002 | 0.044 | <0.01 | -- | 0.0041 | 1.6 | <5 | -- | 0.03F | 5.68 | 0.6 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 22S | 13-Jan-09 | N | 1654.93 | 1659.8 | 0.12F | <0.002 | <0.002 | 0.021 | <0.01 | <0.05 | 0.0042 | 1.7 | <5 | <0.05 | 0.04F | 6.1 | 0.5 | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1654.93 | 1659.8 | 0.17F | -- | <0.002 | 0.028 | <0.01 | -- | 0.0049 | 2 | <5 | -- | 0.04F | 7.67 | 0.7 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1654.93 | 1659.8 | 0.31 | -- | <0.002 | 0.04 | 0.002F | -- | 0.0052 | 2 | <5 | -- | 0.04F | 9.07 | 0.8 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1654.93 | 1659.8 | 0.37 | -- | <0.002 | 0.022 | <0.01 | -- | 0.0047 | 2 | <5 | -- | 0.04F | 10.3 | 0.8 | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1654.93 | 1659.8 | 0.56 | <0.002 | <0.002 | 0.021 | <0.01 | <0.05 | 0.0069 | 2.8 | <5H3 | <0.05 | 0.06 | 17.2 | 1.3H3 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1654.93 | 1659.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 23 | 26-Aug-08 | N | 1759.23 | 1761.23 | 2.97 | <0.002 | 0.0025 | 0.099 | 0.003F | 0.05 | 0.0323 | 66 | 30 | <0.05 | 0.28 | 53 | 1.2FD1 | 2.69 | 0.0043 |
| | | 2-Sep-08 | N | 1759.23 | 1761.23 | 0.42 | 0.0009F | <0.001 | 0.063 | <0.01 | 0.01F | 0.0009 | 3.8 | <5 | <0.05 | 0.02F | 6.91 | 0.4F | 0.07 | <0.0005 |
| | | 9-Sep-08 | N | 1759.23 | 1761.23 | 0.61 | 0.0008 | <0.001 | 0.073 | <0.01 | <0.05 | 0.0011 | 3.6 | <5 | <0.05 | 0.03 | 13.7 | 0.5 | 0.09 | 0.0004 |
| | | 16-Sep-08 | N | 1759.23 | 1761.23 | 5.16 | <0.002 | 0.0005 | 0.031 | 0.01 | <0.1D1 | 0.0119 | 22.3 | 1 | <0.05 | 0.2 | 111D1 | 4D1 | 2.13 | 0.0005 |
| | | 23-Sep-08 | N | 1759.23 | 1761.23 | 10.2D2 | <0.002 | 0.0006 | 0.11D2 | 0.02D2 | 0.08D2 | 0.0141 | 13D2 | <5 | <0.3D2 | 0.37D2 | 409D2 | 5D2 | 3.6D2 | 0.0003 |
| | | 30-Sep-08 | N | 1759.23 | 1761.23 | 5.36 | 0.0011 | 0.001 | 0.019 | 0.011 | <0.3D1 | 0.0045 | 9.1 | <5 | <0.05 | 0.13 | 224D1 | 5D1 | 3.27 | 0.0004 |
| | | 7-Oct-08 | N | 1759.23 | 1761.23 | 4.16 | <0.002 | 0.001 | 0.022 | 0.006FD1 | 0.01F | 0.0028 | 10 | 1F | <0.05 | 0.09 | 194D1 | <10D1 | 2.34 | 0.0003F |
| | | 14-Oct-08 | N | 1759.23 | 1761.23 | 11.2 | <0.002 | 0.0044 | 0.043 | 0.004F | <0.1D1 | 0.0108 | 17.2 | <5 | <0.05 | 0.39 | 130D1 | 14D1 | 0.33 | 0.0006 |
| | | 21-Oct-08 | N | 1759.23 | 1761.23 | 2.78D1 | 0.0004F | 0.001F | 0.025 | <0.02D1 | <0.05 | 0.0026 | 4.1 | <5 | <0.05 | 0.06 | 159D1 | 3FD1 | 2.39 | 0.0006 |
| | | 28-Oct-08 | N | 1759.23 | 1761.23 | 1.25 | <0.002 | 0.0008F | 0.031 | <0.01 | <0.05 | 0.0015 | 3 | <5 | <0.05 | 0.04F | 76.9 | <10D2 | 1.08 | 0.0005 |
| | | 4-Nov-08 | N | 1759.23 | 1761.23 | 4.87 | <0.002 | 0.0017F | 0.022 | 0.007F | <0.05 | 0.0059 | 5 | <5 | <0.05 | 0.1 | 277D2 | 4FD1 | 4.97 | 0.0005 |
| | | 11-Nov-08 | N | 1759.23 | 1761.23 | 1.46 | <0.002 | 0.0012F | 0.026 | 0.002F | <0.05 | 0.0024 | 3.2 | 2F | <0.05 | 0.03F | 104D2 | <10D2 | 1.21 | 0.0005 |
| | | 18-Nov-08 | N | 1759.23 | 1761.23 | 3.66 | <0.002 | 0.0013F | 0.027 | 0.005F | <0.05 | 0.0043 | 2.6 | 2F | <0.05 | 0.07 | 190D2 | <10D2 | 2.67 | 0.0002F |
| | | 25-Nov-08 | N | 1759.23 | 1761.23 | 2.56 | <0.002 | 0.0016F | 0.021 | 0.004F | <0.05 | 0.0048 | 2.3 | 1F | <0.05 | 0.06 | 200D1 | <10D1 | 1.88 | 0.0003F |
| | | 2-Dec-08 | N | 1759.23 | 1761.23 | 1.39D1 | <0.002 | 0.001F | 0.022 | 0.005F | <0.1D1 | 0.003 | 2.2 | 1F | <0.05 | 0.05 | 135D1 | <10D1 | 1.04 | 0.0003F |
| | | 9-Dec-08 | N | 1759.23 | 1761.23 | 2.14 | <0.002 | 0.0013F | 0.013F | 0.002F | <0.05 | 0.0051 | 2.3 | 2F | <0.05 | 0.07 | 189D1 | <10D1 | 1.77 | 0.0003F |
| | | 16-Dec-08 | N | 1759.23 | 1761.23 | 2.08 | <0.002 | 0.0017F | 0.017F | 0.004F | <0.05 | 0.0047 | 1.8 | <5 | <0.1D1 | 0.02FD1 | 153D1 | <10D1 | 1.68 | 0.0003F |
| | | 23-Dec-08 | N | 1759.23 | 1761.23 | 1.05 | -- | 0.0015F | 0.007F | 0.006F | -- | 0.0049 | 1.6 | 2F | -- | 0.06 | 168D1 | <10D1 | 2.1 | 0.0003F |
| | | 30-Dec-08 | N | 1759.23 | 1761.23 | 2.75 | -- | 0.0011F | 0.014F | <0.01 | -- | 0.0044 | 2FD1 | 1F | -- | 0.07FD1 | 174D1 | <10D1 | 3.14 | 0.0003F |
| | | 6-Jan-09 | N | 1759.23 | 1761.23 | 3.2D1 | -- | 0.0018F | <0.08D1 | <0.05D1 | -- | 0.0052 | 2.2 | 1F | -- | 0.06 | 201D1 | <10D1 | 3D1 | 0.0001F |
| | | 13-Jan-09 | N | 1759.23 | 1761.23 | 2.3D1 | <0.002 | 0.0013F | 0.01FD1 | <0.02D1 | <0.05 | 0.0033 | 1.9FD1 | 1F | <0.1D1 | 0.04FD1 | 133D1 | <10D1 | 3.48D1 | 0.0005 |
| | | 20-Jan-09 | N | 1759.23 | 1761.23 | 2.68 | -- | 0.0018F | 0.019F | 0.004F | -- | 0.0039 | 2.3 | <5 | -- | 0.04F | 133D1 | <10D1 | 3.84 | 0.0002F |
| | | 27-Jan-09 | N | 1759.23 | 1761.23 | 3.27 | -- | 0.0015F | 0.019F | 0.008FD1 | -- | 0.0036 | 2.4 | 1F | -- | 0.04F | 155D1 | <10D1 | 4.33 | <0.0005 |
| | | 3-Feb-09 | N | 1759.23 | 1761.23 | 2.57 | -- | 0.0015F | 0.02 | 0.002F | -- | 0.0032 | 2.4 | <5 | -- | 0.03F | 133D1 | <10D1 | 3.48 | 0.0001F |
| | | 10-Feb-09 | N | 1759.23 | 1761.23 | 2.31 | -- | 0.0008F | 0.027 | 0.002F | -- | 0.0021 | 1.6 | <5 | -- | 0.03F | 93.8 | <10D1 | 4.95 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 23 | 17-Feb-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1759.23 | 1761.23 | 2.32 | <0.002V1 | 0.001F | 0.024 | <0.01 | <0.05 | 0.0033 | 1.5 | <3 | <0.05 | 0.03F | 111D2 | 0.3F | 3.97 | <0.0005 |
| | | 17-Mar-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1759.23 | 1761.23 | 3.35 | <0.002 | 0.0014F | 0.019F | 0.003F | <0.05 | 0.0034 | 1.3 | <3 | <0.05 | 0.03F | 108D1 | 0.2F | 6.25 | 0.0002F |
| | | 14-Apr-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1759.23 | 1761.23 | 3.17 | <0.002 | 0.0008F | 0.022 | 0.003F | <0.05 | 0.0024 | 1.4 | <3 | <0.05 | 0.03F | 87.9 | 0.3F | 8.63 | 0.0002F |
| | | 12-May-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1759.23 | 1761.23 | 4.31 | <0.002 | 0.0024 | 0.021 | <0.02D1 | <0.05 | 0.0041 | 2.5 | <3 | <0.05 | 0.03F | 133D1 | 0.3F | 9.86 | 0.0003F |
| | | 9-Jun-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1759.23 | 1761.23 | 7.55D1 | <0.002 | 0.002 | 0.012F | <0.02D1 | <0.1D1 | 0.0059 | 2.8 | <3 | <0.1D1 | 0.05 | 172D1 | 0.4F | 13.9 | 0.0006 |
| | | 7-Jul-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1759.23 | 1761.23 | 10.8 | <0.002 | 0.0028 | 0.022 | <0.01 | <0.05 | 0.0027 | 2.5 | <3 | <0.05 | 0.03F | 143D1 | 0.4F | 27.3 | 0.0003F |
| | | 4-Aug-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1759.23 | 1761.23 | 8.31 | <0.002 | 0.0019F | 0.02 | <0.01 | 0.02F | 0.0038 | 3.2 | <3 | <0.1D1 | 0.04F | 162D1 | 0.3F | 29.7 | 0.0005 |
| | TEST 24 | 26-Aug-08 | N | 1892.81 | 1895 | 25.8 | 0.0013F | 0.0027 | 0.102 | 0.026 | 0.15 | 0.0667 | 90.4 | 36 | <0.05 | 6.41 | 2.59 | 8.8D1 | 31.5 | 0.0134 |
| | | 2-Sep-08 | N | 1892.81 | 1895 | 0.18F | <0.002 | <0.001 | 0.036 | <0.01 | <0.05 | 0.0006 | 1 | <5 | 0.01F | 0.04F | 0.11 | 0.2F | 0.31 | 0.0001F |
| | | 9-Sep-08 | N | 1892.81 | 1895 | 3.06 | 0.0006 | <0.001 | 0.063 | 0.002 | 0.01 | 0.0048 | 6.3 | <5 | <0.05 | 0.12 | 2.16 | 1.8 | 19.7 | 0.0012 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 24 | 16-Sep-08 | N | 1892.81 | 1895 | 4.6 | <0.002 | <0.001 | 0.072 | 0.007 | <0.05 | 0.0215 | 6.6 | 2 | <0.05 | 0.36 | 6.72 | 3.8M2 | 0.72 | 0.0009 |
| | | 23-Sep-08 | N | 1892.81 | 1895 | 9.87 | <0.002 | 0.0005 | 0.057 | 0.011 | 0.02 | 0.0856 | 15.1 | 3 | <0.05 | 1.4 | 25.8 | 7D2 | 1.33 | 0.0011 |
| | | 30-Sep-08 | N | 1892.81 | 1895 | 7.45 | <0.002 | 0.0012 | 0.044 | 0.013 | <0.05 | 0.0783 | 8.8 | 2 | <0.05 | 1.04 | 33.6 | 5.2D1 | 2.06 | 0.0017 |
| | | 7-Oct-08 | N | 1892.81 | 1895 | 4.72 | <0.002 | <0.001 | 0.037 | 0.008F | <0.05 | 0.0401 | 4.7 | 2F | <0.05 | 0.47 | 29 | 2.1FD1 | 1.86 | 0.0009 |
| | | 14-Oct-08 | N | 1892.81 | 1895 | 6.21 | <0.002 | 0.0005F | 0.035 | 0.011 | <0.05 | 0.0468 | 4.6 | 1F | <0.05 | 0.52 | 47.5 | 2.8FD1 | 3.19 | 0.0008 |
| | | 21-Oct-08 | N | 1892.81 | 1895 | 4.5 | 0.0009F | 0.0006F | 0.031 | 0.008F | <0.05 | 0.0365 | 2.4 | 1F | <0.05 | 0.31 | 35.2 | 1.1 | 2.59 | 0.0015 |
| | | 28-Oct-08 | N | 1892.81 | 1895 | 6.59 | <0.002 | 0.0011F | 0.022 | 0.007F | <0.05 | 0.087 | 2.4 | 1F | <0.05 | 0.52 | 61.3 | 1.7FD2 | 3.42 | 0.0005 |
| | | 4-Nov-08 | N | 1892.81 | 1895 | 3.54 | <0.002 | 0.0009F | 0.034 | 0.006F | <0.05 | 0.0543 | 1.9 | 1F | <0.05 | 0.29 | 34.4 | 1.2FD1 | 3.34 | 0.0011 |
| | | 11-Nov-08 | N | 1892.81 | 1895 | 4.77 | <0.002 | 0.0014F | 0.018F | 0.005F | <0.05 | 0.0757 | 1.8 | <5 | <0.05 | 0.36 | 44.6 | 0.6FD2 | 3.18 | 0.0003F |
| | | 18-Nov-08 | N | 1892.81 | 1895 | 2.68 | <0.002 | 0.0006F | 0.016F | 0.004F | <0.05 | 0.0443 | 1.3 | <5 | <0.05 | 0.19 | 27 | <3D2 | 3.27 | 0.0007 |
| | | 25-Nov-08 | N | 1892.81 | 1895 | 4.85 | <0.002 | <0.004D1M1 | 0.019F | 0.005F | <0.05 | 0.0983 | 2.6 | <5 | <0.05 | 0.4 | 45 | 0.7FD1 | 3.09 | 0.001 |
| | | 2-Dec-08 | N | 1892.81 | 1895 | 2.76 | <0.002 | 0.0007F | 0.034 | 0.006F | <0.05 | 0.0553 | 1.4 | 1F | <0.05 | 0.27 | 33.4 | <3D1 | 3.13 | 0.0008 |
| | | 9-Dec-08 | N | 1892.81 | 1895 | 1.43 | 0.0004F | <0.002 | 0.029 | <0.01 | <0.05 | 0.0335 | 1.4 | <5 | <0.05 | 0.14 | 16.9 | <3D1 | 3.56 | 0.0005 |
| | | 16-Dec-08 | N | 1892.81 | 1895 | 1.31 | <0.002 | <0.002 | 0.03 | 0.003F | <0.05 | 0.031 | 2.3 | <5 | <0.05 | 0.14 | 20.4 | <3D1 | 2.78 | 0.0002F |
| | | 23-Dec-08 | N | 1892.81 | 1895 | 1.38 | -- | 0.0006F | 0.027 | 0.005F | -- | 0.0395 | 2.2 | <5 | -- | 0.17 | 20.9 | <3D1 | 2.64 | 0.0004F |
| | | 30-Dec-08 | N | 1892.81 | 1895 | 3.05 | -- | 0.001F | 0.016F | <0.01 | -- | 0.0815 | 2.1 | 1F | -- | 0.36 | 48.7B7 | 0.6FD1 | 4.15 | 0.0005 |
| | | 6-Jan-09 | N | 1892.81 | 1895 | 2.05 | -- | 0.0009F | 0.024 | 0.002F | -- | 0.0521 | 1 | <5 | -- | 0.28 | 37.3 | <3D1 | 2.58 | 0.0006 |
| | | 13-Jan-09 | N | 1892.81 | 1895 | 3.84 | <0.002 | 0.0011F | 0.014F | <0.01 | <0.05 | 0.112 | 1.2 | 1F | <0.05 | 0.46 | 62.9 | <5D1 | 3.3 | 0.0002F |
| | | 20-Jan-09 | N | 1892.81 | 1895 | 3.15 | -- | 0.0011F | 0.019F | <0.01 | -- | 0.0925 | 0.8F | 1F | -- | 0.39 | 52.1 | <5D1 | 3.31 | 0.0001F |
| | | 27-Jan-09 | N | 1892.81 | 1895 | 3.18 | -- | 0.0008F | 0.018F | 0.005F | -- | 0.0812 | 0.8F | 1F | -- | 0.4 | 54.5 | <5D1 | 2.73 | <0.0005 |
| | | 3-Feb-09 | N | 1892.81 | 1895 | 3.7 | -- | 0.0011F | 0.018F | 0.002F | -- | 0.111 | 1.4 | <5 | -- | 0.53 | 78.6 | <5D1 | 3.08 | 0.0002F |
| | | 10-Feb-09 | N | 1892.81 | 1895 | 2.84 | <0.002 | 0.0021 | 0.017F | 0.003F | <0.05 | 0.107 | 1.3 | 1FH3 | <0.05 | 0.46 | 75D2 | <5D2H3 | 3.21D2 | 0.0003F |
| | | 17-Feb-09 | N | 1892.81 | 1895 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 25 | 26-Aug-08 | N | 1917.29 | 1920.9 | 0.37 | <0.002 | 0.0019 | 0.1 | <0.01 | 0.05 | 0.0011 | 134 | 8 | <0.05 | 0.22 | 0.76 | 1.2 | <0.05 | 0.002 |
| | | 2-Sep-08 | N | 1917.29 | 1920.9 | 0.13F | <0.002 | <0.001 | 0.033 | <0.01 | 0.01F | <0.0005 | 4.6 | <5 | <0.05 | 0.01F | 0.06 | 0.7 | <0.05 | 0.0001F |
| | | 9-Sep-08 | N | 1917.29 | 1920.9 | 0.25 | <0.002 | <0.001 | 0.02 | <0.01 | <0.05 | <0.0005 | 2.2 | <5 | <0.05 | 0.02 | 0.08 | 2.4 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1917.29 | 1920.9 | 0.25 | <0.002 | <0.001 | 0.037 | 0.003 | <0.05 | 0.0001 | 13.8 | 2 | <0.05 | 0.02 | 0.66 | 0.5 | <0.05 | 0.0003 |
| | | 23-Sep-08 | N | 1917.29 | 1920.9 | 0.43 | <0.002 | <0.001 | 0.02 | <0.01 | <0.05 | 0.0002 | 18.3 | <5 | <0.05 | 0.04 | 1.68 | 0.4 | <0.05 | 0.0001 |
| | | 30-Sep-08 | N | 1917.29 | 1920.9 | 1.4 | <0.002 | 0.0005 | 0.044 | 0.005 | <0.05 | 0.0005 | 33.2 | 2 | <0.05 | 0.08 | 5.45 | 1.4 | 0.05 | 0.0005 |
| | | 7-Oct-08 | N | 1917.29 | 1920.9 | 0.91 | <0.002 | <0.001 | 0.033 | <0.01 | <0.05 | 0.0003F | 13.9 | 2F | <0.05 | 0.04F | 3.21 | 0.6 | 0.03F | 0.0002F |
| | | 14-Oct-08 | N | 1917.29 | 1920.9 | 0.57 | <0.002 | <0.001 | 0.015F | 0.002F | <0.05 | 0.0002F | 9.2 | <5 | <0.05 | 0.03F | 2.6 | 0.5 | 0.03F | 0.0014 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | TEST 25 | 21-Oct-08 | N | 1917.29 | 1920.9 | 1.24 | <0.002 | 0.0006F | 0.017F | <0.01 | <0.05 | 0.0004F | 16 | 1F | <0.05 | 0.05 | 5.3 | 0.9 | 0.06 | 0.0005 |
| | | 28-Oct-08 | N | 1917.29 | 1920.9 | 0.89 | <0.002 | <0.002 | 0.013F | <0.01 | <0.05 | 0.0004F | 12 | <5 | <0.05 | 0.04F | 4.91 | 0.9 | 0.04F | 0.0007 |
| | | 4-Nov-08 | N | 1917.29 | 1920.9 | 1.35 | <0.002 | <0.002 | 0.037 | 0.004F | <0.05 | 0.0005 | 14.8 | 1F | <0.05 | 0.06 | 6.65 | 1.2M2 | 0.09 | 0.0004F |
| | | 18-Nov-08 | N | 1917.29 | 1920.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 25S | 11-Nov-08 | N | 1917.29 | 1920.9 | 0.34 | <0.002 | <0.002 | 0.04 | <0.01 | <0.05 | 0.0002F | 3.7 | <5 | <0.05 | 0.02F | 2 | 0.4F | 0.04F | <0.0005 |
| | | 18-Nov-08 | N | 1917.29 | 1920.9 | 0.15F | <0.002 | <0.002 | 0.023 | <0.01 | <0.05 | 0.0002F | 2.5 | <5 | <0.05 | 0.01F | 1.3 | 0.2F | 0.03F | 0.0001F |
| | | 25-Nov-08 | N | 1917.29 | 1920.9 | 0.11F | <0.002 | <0.002 | 0.01F | <0.01 | <0.05 | 0.0002F | 2.3 | <5 | <0.05 | 0.01F | 1.34 | 0.1F | 0.03F | 0.0002F |
| | | 2-Dec-08 | N | 1917.29 | 1920.9 | 0.14F | <0.002 | <0.002 | 0.008F | 0.002F | <0.05 | 0.0001F | 2.5 | <5 | <0.05 | 0.01F | 1.55 | 0.2F | 0.04F | <0.0005 |
| | | 9-Dec-08 | N | 1917.29 | 1920.9 | 0.17F | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | 0.0002F | 2.8 | <5 | <0.05 | 0.01F | 2 | 0.2F | 0.06 | <0.0005 |
| | | 16-Dec-08 | N | 1917.29 | 1920.9 | 0.17F | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | 0.0002F | 2.7 | <5 | <0.05 | <0.05 | 2.47 | 0.2F | 0.06 | <0.0005 |
| | | 23-Dec-08 | N | 1917.29 | 1920.9 | 0.18F | -- | <0.002 | 0.004F | 0.003F | -- | 0.0002F | 2.8 | <5 | -- | 0.02F | 2.17 | 0.2F | 0.08 | <0.0005 |
| | | 30-Dec-08 | N | 1917.29 | 1920.9 | 0.21 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0003F | 3.4 | 1F | -- | 0.02F | 3.29B7 | 0.2F | 0.07 | <0.0005 |
| | | 6-Jan-09 | N | 1917.29 | 1920.9 | 0.22 | -- | 0.0009F | 0.006F | <0.01 | -- | 0.0003F | 4.1 | <5 | -- | 0.03F | 3.67 | 0.2F | 0.08 | <0.0005 |
| | | 13-Jan-09 | N | 1917.29 | 1920.9 | 0.39 | <0.002 | 0.0009F | <0.02 | <0.01 | <0.05 | 0.0005 | 4.8 | <5 | <0.05 | 0.02F | 6.19 | 0.4F | 0.1 | <0.0005 |
| | | 20-Jan-09 | N | 1917.29 | 1920.9 | 0.26 | -- | 0.001F | 0.006F | <0.01 | -- | 0.0004F | 3.7 | <5 | -- | 0.02F | 3.61 | 0.2F | 0.11 | <0.0005 |
| | | 27-Jan-09 | N | 1917.29 | 1920.9 | 0.24 | -- | <0.002 | 0.004F | 0.003F | -- | 0.0003F | 3.6 | 1F | -- | 0.02F | 3.49 | 0.2F | 0.09 | <0.0005 |
| | | 3-Feb-09 | N | 1917.29 | 1920.9 | 0.21 | -- | <0.002 | 0.009F | <0.01 | -- | 0.0003F | 3.4 | <5 | -- | 0.02F | 3.68 | 0.2F | 0.11 | <0.0005 |
| | | 10-Feb-09 | N | 1917.29 | 1920.9 | 0.23 | <0.002 | 0.0006F | 0.008F | <0.01 | <0.05 | 0.0004F | 2.7 | <5H3 | <0.05 | 0.02F | 4.46 | 0.2FH3 | 0.13 | <0.0005 |
| | | 17-Feb-09 | N | 1917.29 | 1920.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-005J | TEST 26 | 26-Aug-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0093 | 0.0049 | 0.054 | <0.01 | 0.05 | 0.0003F | 17.4 | 9 | <0.05 | 0.05 | 0.36 | 0.9 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1660.4 | 1686.47 | 0.04F | 0.0043 | 0.004 | 0.03D1 | <0.02D1 | 0.03FD1 | 0.0002F | 13.8 | 4F | 0.01F | <0.05 | 0.05 | 1.4 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1660.4 | 1686.47 | 0.06 | 0.0031 | 0.0032 | 0.026 | <0.01 | 0.02 | <0.0005 | 11.9 | 2 | <0.05 | 0.02 | 0.03 | 1.1 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0026 | 0.0045 | 0.022 | 0.002 | 0.01 | <0.0005 | 7.6 | <5 | <0.05 | <0.05 | 0.02 | 0.3 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1660.4 | 1686.47 | 0.04 | 0.0024 | 0.0051 | 0.031 | <0.01 | 0.02 | 0.0001 | 9.8 | <5 | <0.05 | 0.01 | 0.03 | 0.7 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 1660.4 | 1686.47 | 0.04 | 0.0015 | 0.0044 | 0.012 | <0.01 | 0.01 | 0.0001 | 7.2 | <5 | <0.05 | <0.05 | 0.01 | 0.5 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0013F | 0.0037 | 0.021 | <0.01 | 0.02F | <0.0005 | 6 | <5 | <0.05 | 0.01F | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0011F | 0.0032 | 0.027 | <0.01 | <0.05 | 0.0001F | 6 | <5 | <0.05 | <0.05 | 0.04F | 0.2F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0012F | 0.0034 | 0.023 | <0.01 | 0.02F | 0.0001F | 5 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1660.4 | 1686.47 | 0.08F | 0.0009F | 0.0023 | 0.026 | <0.01 | <0.05 | 0.0003F | 4.2 | <5 | <0.05 | 0.02F | 0.03F | 0.2F | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0008F | 0.0026 | 0.03 | <0.01 | <0.05 | 0.0004F | 4.3 | <5 | <0.05 | 0.02F | 0.05 | 0.2F | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0007F | 0.0031 | 0.04 | <0.01 | <0.05 | 0.0007 | 5.6 | <5 | <0.05 | 0.03F | 0.09 | 0.1F | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005J | TEST 26 | 18-Nov-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0007F | 0.0033 | 0.034 | <0.01 | <0.05 | 0.0005 | 3.5 | <5 | <0.05 | 0.02F | 0.15 | <0.5 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0007FV2 | 0.0013F | 0.035 | <0.01 | <0.05 | 0.0008 | 3.6 | <5 | <0.05 | 0.02F | 0.25 | <0.5 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0005F | 0.002 | 0.043 | <0.01 | <0.05 | 0.0008 | 4 | <5 | <0.05 | 0.03F | 0.21 | <0.5 | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0005F | 0.0017F | 0.044 | <0.01 | <0.05 | 0.0011 | 3.7 | <5 | <0.05 | 0.03F | 0.26 | <0.5 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1660.4 | 1686.47 | <0.2 | 0.0004F | 0.0014F | 0.045 | <0.01 | <0.05 | 0.0011 | 3.6 | <5 | <0.05 | 0.03F | 0.43 | <0.5 | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1660.4 | 1686.47 | <0.2 | -- | 0.0014F | 0.039 | 0.003F | -- | 0.0009 | 2.5 | <5 | -- | 0.03F | 0.34 | <0.5 | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1660.4 | 1686.47 | <0.2 | -- | 0.0012F | 0.041 | <0.01 | -- | 0.001 | 2.5 | <5 | -- | 0.03F | 0.44B7 | <0.5 | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1660.4 | 1686.47 | <0.2 | -- | 0.0011F | 0.055 | <0.01 | -- | 0.0012 | 2.4 | <5 | -- | 0.03F | 0.63 | <0.5 | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 1660.4 | 1686.47 | <0.2 | <0.002 | 0.002 | 0.053 | <0.01 | <0.05 | 0.0011 | 2.2 | <5 | <0.05 | 0.02F | 0.61 | <0.5 | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1660.4 | 1686.47 | <0.2 | -- | 0.0017F | 0.055 | <0.01 | -- | 0.0011 | 2.2 | <5 | -- | 0.03F | 0.6 | <0.5 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1660.4 | 1686.47 | <0.2 | -- | 0.0011F | 0.062 | 0.002F | -- | 0.0012 | 2.3 | <5 | -- | 0.03F | 0.76 | <0.5 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1660.4 | 1686.47 | <0.2 | -- | 0.0011F | 0.063 | <0.01 | -- | 0.0011 | 2 | <5 | -- | 0.03F | 0.8 | <0.5 | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1660.4 | 1686.47 | <0.2 | -- | <0.002 | 0.072 | <0.01 | -- | <0.0005 | 2 | <5 | -- | 0.03F | 0.9 | <0.5 | <0.05 | 0.0223 |
| | | 17-Feb-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1660.4 | 1686.47 | <0.2 | <0.002V1 | 0.0018F | 0.1 | <0.01 | <0.05 | 0.0018 | 2 | <3 | <0.05 | 0.04F | 1.4 | <0.5 | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1660.4 | 1686.47 | <0.2 | <0.002 | 0.0012F | 0.104 | <0.01 | <0.05 | 0.0021 | 1.7 | <3 | <0.05 | 0.05 | 2.05 | <0.5 | <0.05 | <0.0005 |
| | | 14-Apr-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1660.4 | 1686.47 | <0.2 | <0.002 | 0.0009F | 0.121 | <0.01 | <0.05 | 0.0024 | 1.4 | <3 | <0.05 | 0.05 | 2.3 | <0.5 | <0.05 | <0.0005 |
| | | 12-May-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1660.4 | 1686.47 | <0.2 | <0.002 | 0.0012F | 0.121 | <0.01 | <0.05 | 0.0029 | 1.1 | <3 | <0.05 | 0.05 | 3.06 | <0.5 | <0.05 | <0.0005 |
| | | 9-Jun-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005J | TEST 26 | 23-Jun-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1660.4 | 1686.47 | <0.2 | <0.002 | 0.0012F | 0.091 | <0.01 | <0.05 | 0.0043 | 1 | <3 | <0.05 | 0.06 | 3.79 | <0.5 | <0.05 | 0.0003F |
| | | 7-Jul-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1660.4 | 1686.47 | 0.03F | <0.002 | 0.0035 | 0.104 | <0.01 | <0.05 | 0.0058 | 1.1 | <3 | <0.05 | 0.1 | 6.94 | <0.5 | <0.05 | <0.0005 |
| | | 4-Aug-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1660.4 | 1686.47 | <0.2 | <0.002 | 0.0016F | 0.071 | <0.01 | 0.02F | 0.0072 | 0.9F | <3 | <0.05 | 0.14 | 10.2 | <0.5 | <0.05 | 0.0003F |
| | | 1-Sep-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Sep-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 1660.4 | 1686.47 | 0.05F | <0.002 | 0.0016F | 0.048 | <0.01 | 0.02F | 0.0085 | 0.7F | <30D1 | <0.05 | 0.15 | 15.6 | <5D1 | <0.05 | <0.0005 |
| | | 29-Sep-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 1660.4 | 1686.47 | <0.2 | <0.002 | 0.0019F | 0.036 | <0.01 | <0.05 | 0.0086 | 0.7F | <3 | <0.05 | 0.16 | 17 | <0.5 | <0.05 | <0.0005 |
| | | 27-Oct-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 1660.4 | 1686.47 | <0.2 | <0.002 | 0.0024 | 0.036 | 0.002F | <0.05 | 0.0078 | 0.4F | <3 | <0.05 | 0.12 | 18.8 | <0.5 | <0.05 | <0.0005 |
| | | 24-Nov-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 1-Dec-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Dec-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Dec-09 | N | 1660.4 | 1686.47 | 0.05F | <0.002 | 0.0041 | 0.031 | <0.01 | <0.05 | 0.011 | 0.4F | <3 | <0.05 | 0.16 | 29 | <0.5 | <0.05 | <0.0005 |
| | | 22-Dec-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 29-Dec-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-Jan-10 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 12-Jan-10 | N | 1660.4 | 1686.47 | 0.03F | <0.002 | 0.0039 | 0.022 | <0.01 | <0.05 | 0.0098 | 0.3F | <3 | <0.05 | 0.11 | 30.5M3 | <0.5 | <0.05 | <0.0005 |
| | | 19-Jan-10 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005J | TEST 26 | 26-Jan-10 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-006D | TEST 27 | 26-Aug-08 | N | 1750.4 | 1753.4 | 320 | 0.002 | 0.006 | 0.103 | 0.144 | 0.04F | 0.0045 | 395 | 9 | 0.21 | 3.14 | 1.14 | 158D1M2 | 218 | 0.0121 |
| | | 2-Sep-08 | N | 1750.4 | 1753.4 | 28.9 | <0.002 | <0.001 | 0.012F | 0.009F | <0.05 | 0.0004F | 45.2 | <5 | 0.01F | 0.13 | 1.23 | 28.7 | 4.33 | <0.0005 |
| | | 9-Sep-08 | N | 1750.4 | 1753.4 | 12.7 | <0.002 | <0.001 | 0.011 | 0.02 | <0.05 | 0.0002 | 17.7 | <5 | <0.05 | 0.07 | 0.99 | 11 | 2.98 | 0.0001 |
| | | 16-Sep-08 | N | 1750.4 | 1753.4 | 12.2 | <0.002 | <0.001 | 0.008 | 0.007 | <0.05 | 0.0002 | 19.4 | <5 | <0.05 | 0.06 | 1.62 | <0.5 | 4.4 | 0.0001 |
| | | 23-Sep-08 | N | 1750.4 | 1753.4 | 14.6 | <0.002 | <0.001 | 0.018 | 0.006 | <0.05 | 0.0003 | 22.9 | <5 | <0.05 | 0.07 | 2.12 | 12 | 8.15 | 0.0002 |
| | | 30-Sep-08 | N | 1750.4 | 1753.4 | 13 | <0.002 | 0.0006 | <0.02 | 0.007 | <0.05 | 0.0004 | 15.6 | <5 | <0.05 | 0.05 | 2.44 | 10.7 | 9.54 | 0.0003 |
| | | 7-Oct-08 | N | 1750.4 | 1753.4 | 23.5 | <0.002 | 0.0007F | <0.02 | 0.014 | <0.05 | 0.0005 | 28.3 | <5 | <0.05 | 0.1 | 5.47 | 15.3 | 13 | 0.0004F |
| | | 14-Oct-08 | N | 1750.4 | 1753.4 | 20.6 | <0.002 | <0.001 | 0.004F | 0.009F | <0.05 | 0.0005 | 21.5 | <5 | <0.05 | 0.11 | 3.71 | 13.8 | 15.7 | 0.0001F |
| | | 21-Oct-08 | N | 1750.4 | 1753.4 | 15.5 | <0.002 | <0.002 | <0.02 | 0.005F | <0.05 | 0.0003F | 17 | <5 | <0.05 | 0.06 | 1.94 | 10.5 | 15.3 | 0.0001F |
| | | 28-Oct-08 | N | 1750.4 | 1753.4 | 11.7 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0004F | 15.7 | <5 | <0.05 | 0.06 | 1.78 | 9.1 | 15.4 | <0.0005 |
| | | 4-Nov-08 | N | 1750.4 | 1753.4 | 11.8 | <0.002 | <0.002 | <0.02 | 0.004F | <0.05 | 0.0004F | 12.8 | <5 | <0.05 | 0.06 | 1.67 | 9.5D3 | 18 | <0.0005 |
| | | 11-Nov-08 | N | 1750.4 | 1753.4 | 47.2 | <0.002 | 0.0015F | <0.02 | 0.014 | <0.05 | 0.0012 | 56.2 | <5 | <0.05 | 0.24 | 10.2 | 30.9 | 25.1 | 0.0001F |
| | | 18-Nov-08 | N | 1750.4 | 1753.4 | 96.4 | <0.002 | 0.0038 | <0.02 | 0.037 | <0.05 | 0.0029 | 115 | <5 | 0.01F | 0.52 | 30.9 | 39.4 | 48.1 | <0.0005 |
| | | 25-Nov-08 | N | 1750.4 | 1753.4 | 14.4 | <0.002V1 | <0.002 | <0.02 | 0.006F | <0.05 | 0.0005 | 46.1 | <5 | <0.05 | 0.07 | 2.95 | 11.3 | 13.7 | <0.0005 |
| | | 2-Dec-08 | N | 1750.4 | 1753.4 | 5.33 | <0.002 | <0.002 | <0.02 | 0.005F | <0.05 | 0.0002F | 18.1 | <5 | <0.05 | 0.03F | 1.35 | 4.5 | 19.5 | 0.0003F |
| | | 9-Dec-08 | N | 1750.4 | 1753.4 | 3.86 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 10 | <5 | <0.05 | 0.02F | 1.08 | 3.1 | 16.6 | 0.0001F |
| | | 16-Dec-08 | N | 1750.4 | 1753.4 | 4.47 | <0.002 | <0.002 | <0.02 | 0.003F | <0.05 | 0.0002F | 8.9 | <5 | <0.05 | 0.01F | 1.44 | 3.3 | 20.4 | <0.0005 |
| | | 23-Dec-08 | N | 1750.4 | 1753.4 | 3.84 | -- | <0.002 | <0.02 | 0.004F | -- | 0.0002F | 6.4 | <5 | -- | 0.02F | 1.02 | 2.8 | 16.4 | <0.0005 |
| | | 30-Dec-08 | N | 1750.4 | 1753.4 | 4.75 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0002F | 7.9 | <5 | -- | 0.02F | 1.12B7 | 3.3 | 25.4 | <0.0005 |
| | | 6-Jan-09 | N | 1750.4 | 1753.4 | 5 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0002F | 6.5 | <5 | -- | 0.02F | 1.3 | 3.3 | 21.5 | 0.0001F |
| | | 13-Jan-09 | N | 1750.4 | 1753.4 | 4.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 5.2 | <5 | <0.05 | <0.05 | 1.11 | 2.6 | 20 | 0.0001F |
| | | 20-Jan-09 | N | 1750.4 | 1753.4 | 17.6 | -- | 0.0008F | <0.02 | 0.006F | -- | 0.0006 | 21.4 | <5 | -- | 0.06 | 5.22 | 6.1 | 47.4 | 0.0001F |
| | | 27-Jan-09 | N | 1750.4 | 1753.4 | 10.6 | -- | <0.002 | <0.02 | 0.007F | -- | 0.0002F | 14.7 | 1F | -- | 0.03F | 2.65 | 8 | 28.2 | <0.0005 |
| | | 3-Feb-09 | N | 1750.4 | 1753.4 | 40.1 | -- | 0.0015F | <0.02 | 0.02 | -- | 0.0014 | 55.1 | <5 | -- | 0.13 | 31.6 | 27.1D1 | 50.6 | <0.0005 |
| | | 10-Feb-09 | N | 1750.4 | 1753.4 | 4.58M3 | <0.002 | <0.002 | <0.02 | 0.002F | <0.05 | 0.0002F | 7.7 | <5H3 | <0.05 | 0.02F | 2.78M3 | 3.3D2H3 | 14.3M3 | <0.0005 |
| | | 17-Feb-09 | N | 1750.4 | 1753.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 28 | 26-Aug-08 | N | 1898.21 | 1901.09 | 251 | 0.0005F | 0.0019 | 0.13 | 0.141 | 0.05 | 0.0255 | 446 | 20 | 0.03F | 2.58 | 157D1 | 254D1 | 69.3 | 0.0217 |
| | | 2-Sep-08 | N | 1898.21 | 1901.09 | 41 | <0.002 | <0.001 | 0.043 | 0.021 | 0.02F | 0.0005 | 110 | 1F | <0.05 | 0.09 | 11.7 | 44.5 | 16.8 | 0.0012 |
| | | 9-Sep-08 | N | 1898.21 | 1901.09 | 4.13 | <0.002 | <0.001 | 0.014 | <0.01 | <0.05 | <0.0005 | 8.4 | <5 | <0.05 | 0.03 | 2.49 | 6.4 | 0.07 | <0.0005 |
| | | 16-Sep-08 | N | 1898.21 | 1901.09 | 5.6 | <0.002 | <0.001 | 0.023 | 0.005 | <0.05 | <0.0005 | 12.5 | <5 | <0.05 | 0.02 | 3.73 | 6.9 | 0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-006D | TEST 28 | 23-Sep-08 | N | 1898.21 | 1901.09 | 4.85 | <0.002 | <0.001 | 0.008 | <0.01 | 0.01 | <0.0005 | 9.4 | <5 | <0.05 | 0.02 | 3.7 | 6.1 | 0.09 | 0.0002 |
| | | 30-Sep-08 | N | 1898.21 | 1901.09 | 10.5 | <0.002 | <0.001 | <0.02 | 0.005 | <0.05 | 0.0003 | 18.4 | <5 | <0.05 | 0.03 | 10.2 | 14.4 | 0.31 | 0.0003 |
| | | 7-Oct-08 | N | 1898.21 | 1901.09 | 31.9 | <0.002 | <0.001 | 0.018F | 0.014 | <0.05 | 0.0009 | 53 | <5 | <0.05 | 0.13 | 40.5 | 41.3D1 | 1.31 | 0.0007 |
| | | 14-Oct-08 | N | 1898.21 | 1901.09 | 14.7 | <0.002 | <0.001 | 0.01F | 0.006F | <0.05 | 0.0004F | 26 | <5 | <0.05 | 0.07 | 19.1 | 22.4D1 | 0.59 | 0.0004F |
| | | 21-Oct-08 | N | 1898.21 | 1901.09 | 15.8 | <0.002 | <0.002 | 0.007F | 0.005F | <0.05 | 0.0005 | 24.5 | <5 | <0.05 | 0.07 | 18.7 | 16.9D1 | 0.79 | 0.0003F |
| | | 28-Oct-08 | N | 1898.21 | 1901.09 | 18.1 | <0.002 | <0.002 | <0.02 | 0.003F | <0.05 | 0.0007 | 28.7 | <5 | <0.05 | 0.09 | 23.4 | 24.1D2 | 0.99 | 0.0004F |
| | | 4-Nov-08 | N | 1898.21 | 1901.09 | 20 | <0.002 | <0.002 | 0.011F | 0.007F | <0.05 | 0.0009 | 33.7 | <5 | <0.05 | 0.1 | 25.2 | 28D1 | 1.64 | 0.0005 |
| | | 11-Nov-08 | N | 1898.21 | 1901.09 | 23.6 | <0.002 | <0.002 | 0.009F | 0.007F | <0.05 | 0.001 | 35.8 | <5 | <0.05 | 0.12 | 28.7 | 32.8D2 | 1.83 | 0.0004F |
| | | 18-Nov-08 | N | 1898.21 | 1901.09 | 29.8 | <0.002 | <0.002 | 0.009F | 0.009F | <0.05 | 0.0012 | 44.6 | <5 | <0.05 | 0.15 | 39.1 | 40.6D2M2 | 2.52 | 0.0004F |
| | | 25-Nov-08 | N | 1898.21 | 1901.09 | 23.6 | <0.002V1 | <0.002 | 0.008F | 0.007F | <0.05 | 0.001 | 35.1 | <5 | <0.05 | 0.11 | 32.1 | 34.5D1 | 2.04 | 0.0005 |
| | | 2-Dec-08 | N | 1898.21 | 1901.09 | 18.7 | <0.002 | <0.002 | 0.008F | 0.008F | <0.05 | 0.0007 | 32.6 | <5 | <0.05 | 0.09 | 23.2 | 27.9D1 | 2.19 | 0.0005 |
| | | 9-Dec-08 | N | 1898.21 | 1901.09 | 15.9 | <0.002 | <0.002 | 0.005F | 0.004F | <0.05 | 0.0007 | 29.8 | <5 | <0.05 | 0.08 | 21.7 | 24D1 | 2.34 | 0.0004F |
| | | 16-Dec-08 | N | 1898.21 | 1901.09 | 16.3 | <0.002 | <0.002 | 0.007F | 0.006F | <0.05 | 0.0016 | 28.2 | <5 | <0.05 | 0.07 | 24.2 | 25.1D1 | 2.1 | 0.154 |
| | | 23-Dec-08 | N | 1898.21 | 1901.09 | 20.4 | -- | 0.0006F | 0.005F | 0.008F | -- | 0.0008 | 32.2 | <5 | -- | 0.1 | 26.7 | 22.3D1 | 2.87 | 0.0004F |
| | | 30-Dec-08 | N | 1898.21 | 1901.09 | 12.6 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0005 | 20.7 | <5 | -- | 0.06 | 17.7B7 | 18.3D1 | 2.36 | 0.0003F |
| | | 6-Jan-09 | N | 1898.21 | 1901.09 | 14.2 | -- | <0.002 | 0.007F | 0.003F | -- | 0.0005 | 21 | <5 | -- | 0.06 | 20.6 | 20.5D1 | 2.91 | 0.0004F |
| | | 13-Jan-09 | N | 1898.21 | 1901.09 | 23.7 | <0.002 | <0.002 | <0.02 | 0.002F | <0.05 | 0.0009 | 34 | <5 | <0.05 | 0.1 | 28.2 | 32.8D1 | 3.29 | 0.0005 |
| | | 20-Jan-09 | N | 1898.21 | 1901.09 | 26.3 | -- | <0.002 | 0.006F | 0.007F | -- | 0.001 | 37.4 | <5 | -- | 0.13 | 31.8 | 36.5D1 | 4.23 | 0.0005 |
| | | 27-Jan-09 | N | 1898.21 | 1901.09 | 23.5 | -- | <0.002 | 0.007F | 0.009F | -- | 0.0008 | 33.7 | <5 | -- | 0.1 | 34.5 | 32.7D1M2 | 4.18 | 0.0006 |
| | | 3-Feb-09 | N | 1898.21 | 1901.09 | 54.2 | -- | 0.0005F | 0.01F | 0.015 | -- | 0.0016 | 82.4 | <5 | -- | 0.23 | 65.1 | 69.1D1 | 6.18 | 0.0006 |
| | | 10-Feb-09 | N | 1898.21 | 1901.09 | 63.1 | -- | <0.002 | 0.011F | 0.022 | -- | 0.0001F | 103 | <5 | -- | 0.32 | 92.1 | 83D1 | 7.34 | <0.0005 |
| | | 17-Feb-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1898.21 | 1901.09 | 67.3 | <0.002V1 | 0.0011F | 0.015F | 0.024 | <0.05 | 0.0016 | 136 | <3 | <0.05 | 0.35 | 159D2 | 86D2 | 9.33 | 0.0004F |
| | | 17-Mar-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1898.21 | 1901.09 | 23.3 | <0.002 | <0.002 | 0.01F | 0.009F | <0.05 | 0.0004F | 41.4 | <3 | <0.05 | 0.08 | 32.3 | 38D1 | 5.81 | 0.0002F |
| | | 14-Apr-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-006D | TEST 28 | 28-Apr-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1898.21 | 1901.09 | 4.84 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 12.2 | <3 | <0.05 | 0.03F | 10.4 | 9.1D1 | 3.2 | <0.0005 |
| | | 12-May-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1898.21 | 1901.09 | 61.4 | <0.002 | 0.0029 | 0.005F | 0.018FD1 | <0.05 | 0.0031 | 117 | <3 | <0.05 | 0.31 | 161D1 | 91D1 | 47.1 | 0.0003F |
| | | 9-Jun-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1898.21 | 1901.09 | 57.6D1 | <0.002 | 0.0022 | <0.02 | <0.05D1 | <0.3D1 | 0.0039 | 118 | <3 | 0.06FD1 | 0.33 | 188D1 | 76D1 | 61.5 | 0.0011 |
| | | 7-Jul-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1898.21 | 1901.09 | 45.1 | <0.002 | 0.0024 | 0.006F | <0.01 | 0.01F | 0.0024 | 94.5 | <3 | <0.05 | 0.24 | 168D1 | 74D1 | 83.9 | 0.0007 |
| | | 4-Aug-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1898.21 | 1901.09 | 23 | <0.002 | <0.002 | 0.003F | <0.01 | 0.02F | 0.0006 | 32.3 | <3 | <0.05 | 0.08 | 34.1 | 36D1 | 33.3 | 0.0003F |
| | TEST 29 | 26-Aug-08 | N | 1952.56 | 1954.83 | 10.8 | <0.002 | 0.0008F | 0.056 | <0.01 | 0.04F | 0.0018 | 34.9 | 24 | <0.05 | 0.15 | 7.99 | 12.9 | 3.96 | 0.0079 |
| | | 2-Sep-08 | N | 1952.56 | 1954.83 | 10.7 | <0.002 | <0.001 | 0.028 | <0.01 | 0.01F | 0.0002F | 20.3 | 2F | 0.01F | 0.04F | 5.2 | 19.1 | 0.19 | 0.0036 |
| | | 9-Sep-08 | N | 1952.56 | 1954.83 | 3.38 | <0.002 | <0.001 | 0.01 | <0.01 | <0.05 | <0.0005 | 7.4 | 1 | <0.05 | 0.02 | 1.33 | 6.1M2 | 0.03 | 0.0018 |
| | | 16-Sep-08 | N | 1952.56 | 1954.83 | 10.9 | <0.002 | <0.001 | 0.03 | 0.003 | <0.05 | 0.0002 | 26.7 | 4 | <0.05 | 0.06 | 8.32 | 13.6 | 0.1 | 0.0086 |
| | | 23-Sep-08 | N | 1952.56 | 1954.83 | 15.6 | <0.002 | <0.001 | 0.017 | <0.01 | 0.01 | 0.0003 | 31.4 | 1 | <0.05 | 0.1 | 19.2 | 19.7D2 | 0.41 | 0.0156 |
| | | 30-Sep-08 | N | 1952.56 | 1954.83 | 17.9 | <0.002 | 0.0008 | 0.032 | 0.003 | <0.05 | 0.0004 | 28.7 | 1 | <0.05 | 0.08 | 28.5 | 23.4D1 | 0.91 | 0.0396 |
| | | 7-Oct-08 | N | 1952.56 | 1954.83 | 8.12 | <0.002 | 0.0009F | 0.031 | <0.01 | <0.05 | 0.0002F | 12.1 | 1F | <0.05 | 0.03F | 20.4 | 12.4D1M2 | 0.89 | 0.045B7 |
| | | 14-Oct-08 | N | 1952.56 | 1954.83 | 5.64 | <0.002 | 0.0006F | 0.037 | <0.01 | <0.05 | 0.0001F | 7.2 | <5 | <0.05 | 0.04F | 27.8 | 7.1D1 | 1.98 | 0.0509 |
| | | 21-Oct-08 | N | 1952.56 | 1954.83 | 4.23 | <0.002 | 0.001F | 0.016F | <0.01 | <0.05 | <0.0005 | 3.4 | <5 | <0.05 | 0.03F | 23.8 | 2.9FD1 | 1.81 | 0.043 |
| | | 28-Oct-08 | N | 1952.56 | 1954.83 | 4.01 | <0.002 | 0.0006F | 0.024 | <0.01 | <0.05 | <0.0005 | 2.9 | <5 | <0.05 | 0.03F | 25.1 | 3.3D2 | 2.73 | 0.0419 |
| | | 4-Nov-08 | N | 1952.56 | 1954.83 | 3.42 | <0.002 | 0.0014F | 0.043 | <0.01 | <0.05 | 0.0001F | 2.1 | <5 | <0.05 | 0.04F | 26.1 | 2.7FD1 | 5.52 | 0.0897 |
| | TEST 29S | 11-Nov-08 | N | 1952.56 | 1954.83 | 0.76 | <0.002 | <0.002 | 0.017F | <0.01 | <0.05 | <0.0005 | 0.4F | <5 | <0.05 | 0.01F | 7.48 | 0.5FD2 | 1.3 | 0.0611 |
| | | 18-Nov-08 | N | 1952.56 | 1954.83 | 0.44 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 0.3F | <5 | <0.05 | <0.05 | 3.75 | 1FD2 | 0.7 | 0.0319 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-006D | TEST 29S | 25-Nov-08 | N | 1952.56 | 1954.83 | 0.3 | <0.002V1 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 0.2F | <5 | <0.05 | <0.05 | 2.45 | <3D1 | 0.42 | 0.016B3 |
| | | 2-Dec-08 | N | 1952.56 | 1954.83 | 0.68 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 0.5F | <5 | <0.05 | <0.05 | 5.46 | 0.8FD1 | 0.81 | 0.0296 |
| | | 9-Dec-08 | N | 1952.56 | 1954.83 | 0.91 | <0.002 | <0.002 | 0.003F | <0.01 | <0.05 | <0.0005 | 0.4F | <5 | <0.05 | 0.01F | 6.2 | <3D1 | 0.8 | 0.026 |
| | | 16-Dec-08 | N | 1952.56 | 1954.83 | 0.62 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 0.3F | <5 | <0.05 | 0.01F | 4.26M3 | <3D1 | 0.51 | 0.0187 |
| | | 23-Dec-08 | N | 1952.56 | 1954.83 | 0.64 | -- | <0.002 | <0.02 | 0.003F | -- | <0.0005 | <1 | <5 | -- | <0.05 | 4.33 | <3D1 | 0.55 | 0.0263 |
| | | 30-Dec-08 | N | 1952.56 | 1954.83 | 0.62 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 0.3F | <5 | -- | 0.01F | 4.59B7 | <3D1 | 0.54 | 0.0239 |
| | | 6-Jan-09 | N | 1952.56 | 1954.83 | 0.6 | -- | <0.002 | 0.003F | <0.01 | -- | <0.0005 | 0.3F | <5 | -- | <0.05 | 4.2 | <3D1 | 0.54 | 0.0179 |
| | | 13-Jan-09 | N | 1952.56 | 1954.83 | 0.64 | <0.002 | <0.002 | <0.02 | <0.01 | <0.1D1 | <0.0005 | <1 | <5 | <0.05 | <0.05 | 4.36 | <3D1 | 0.52 | 0.02 |
| | | 20-Jan-09 | N | 1952.56 | 1954.83 | 0.73 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 0.5F | <5 | -- | <0.05 | 4.32 | <3D1 | 0.61 | 0.0206 |
| | | 27-Jan-09 | N | 1952.56 | 1954.83 | 0.65 | -- | <0.002 | <0.02 | 0.002F | -- | <0.0005 | 0.5F | <5 | -- | <0.05 | 4.78 | <3D1 | 0.6 | 0.0214 |
| | | 3-Feb-09 | N | 1952.56 | 1954.83 | 0.95 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 0.5F | <5 | -- | <0.05 | 6.63 | <3D1 | 0.69 | 0.0202 |
| | | 10-Feb-09 | N | 1952.56 | 1954.83 | 1.01 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 0.3F | <5H3 | <0.05 | <0.05 | 7.17 | <3D2H3 | 0.84 | 0.0215 |
| | | 17-Feb-09 | N | 1952.56 | 1954.83 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 30 | 26-Aug-08 | N | 1954.83 | 1972 | 0.13F | <0.002 | 0.0024 | 0.059 | <0.01 | 0.05 | 0.0003F | 20.7 | 8 | <0.05 | 0.06 | 0.56 | 1.7 | <0.05 | 0.0002F |
| | | 2-Sep-08 | N | 1954.83 | 1972 | 0.09F | <0.002 | 0.0009F | 0.029 | <0.01 | 0.03F | 0.0003F | 19.5 | 7 | <0.05 | 0.07 | 0.53 | 2.6 | <0.05 | 0.0005 |
| | | 9-Sep-08 | N | 1954.83 | 1972 | 0.26 | <0.002 | <0.001 | 0.028 | <0.01 | 0.03 | 0.0006 | 21 | 6 | <0.05 | 0.13 | 1.79 | 2 | 0.1 | 0.0005 |
| | | 16-Sep-08 | N | 1954.83 | 1972 | 0.53 | <0.002 | <0.001 | 0.024 | 0.004 | 0.01 | 0.0008 | 20.3 | 4 | <0.05 | 0.16 | 6.69 | 2.4 | <0.05 | 0.001 |
| | | 23-Sep-08 | N | 1954.83 | 1972 | 1.58 | <0.002 | <0.001 | 0.025 | 0.004 | 0.02 | 0.0014 | 25.8 | 3 | <0.05 | 0.25 | 23.1 | 4D2 | <0.05 | 0.0091 |
| | | 30-Sep-08 | N | 1954.83 | 1972 | 2.22 | <0.002 | <0.001 | 0.01 | 0.007 | <0.05 | 0.0016 | 23.6 | 2 | <0.05 | 0.25 | 38.6 | 5.2D1 | <0.05 | 0.0193 |
| | | 7-Oct-08 | N | 1954.83 | 1972 | 2.97 | <0.002 | <0.001 | 0.017F | 0.007F | 0.01F | 0.0018 | 25.5 | 2F | <0.05 | 0.28 | 57.7 | 5.8D1 | <0.05 | 0.0413 |
| | | 14-Oct-08 | N | 1954.83 | 1972 | 2.42 | <0.002 | <0.001 | 0.013F | 0.006F | <0.05 | 0.0013 | 19.7 | 2F | <0.05 | 0.21 | 53.7 | 5.4D1 | <0.05 | 0.0386 |
| | | 21-Oct-08 | N | 1954.83 | 1972 | 2.87 | <0.002 | <0.002 | 0.009F | 0.005F | 0.01F | 0.0014 | 21 | 2F | <0.05 | 0.2 | 63.7 | 3.7D1 | <0.05 | 0.0685 |
| | | 28-Oct-08 | N | 1954.83 | 1972 | 2.72 | <0.002 | <0.002 | 0.011F | <0.01 | <0.05 | 0.0014 | 18.7 | 1F | <0.05 | 0.17 | 63.3 | 4.9D2 | <0.05 | 0.0622 |
| | | 4-Nov-08 | N | 1954.83 | 1972 | 3.09 | <0.002 | <0.002 | 0.012F | 0.004F | <0.05 | 0.0018 | 21.5 | 1F | <0.05 | 0.18 | 80 | 6.1D1 | <0.05 | 0.111 |
| | | 11-Nov-08 | N | 1954.83 | 1972 | 2.79 | <0.002 | <0.002 | 0.011F | 0.003F | <0.05 | 0.0016 | 18.9 | 1F | <0.05 | 0.14 | 70.7 | 5.3D2 | <0.05 | 0.104 |
| | | 18-Nov-08 | N | 1954.83 | 1972 | 2.62 | <0.002 | <0.002 | 0.008F | 0.003F | <0.05 | 0.0015 | 17.7 | <5 | <0.05 | 0.12 | 71.9 | 5.4D2 | <0.05 | 0.121 |
| | | 25-Nov-08 | N | 1954.83 | 1972 | 3.06 | <0.002V1 | <0.002 | 0.009F | 0.002F | <0.05 | 0.0019 | 19.5 | 1F | <0.05 | 0.13 | 75.2 | 6D1 | <0.05 | 0.159B3 |
| | | 2-Dec-08 | N | 1954.83 | 1972 | 2.48 | <0.002 | <0.002 | 0.009F | 0.004F | <0.05 | 0.0014 | 16.3 | <5 | <0.05 | 0.11 | 64.4 | 5.2D1 | <0.05 | 0.115 |
| | | 9-Dec-08 | N | 1954.83 | 1972 | 2.65 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | 0.0016 | 16.5 | 1F | <0.05 | 0.11 | 68.3 | 5.3D1 | <0.05 | 0.148 |
| | | 16-Dec-08 | N | 1954.83 | 1972 | 2.77 | <0.002 | <0.002 | 0.007F | 0.003F | <0.05 | 0.0006 | 16 | 1F | <0.05 | 0.09 | 75.1 | 5.7D1 | <0.05 | 0.0003F |
| | | 23-Dec-08 | N | 1954.83 | 1972 | 2.92M2 | -- | <0.002 | 0.009F | 0.004F | -- | 0.0017 | 16.4 | <5 | -- | 0.11 | 74M3 | 5D1 | 0.02F | 0.175 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-006D | TEST 30 | 30-Dec-08 | N | 1954.83 | 1972 | 2.56 | -- | <0.002 | 0.009F | <0.01 | -- | 0.0016 | 13.8 | 1FM1 | -- | 0.08 | 69.6M3 | 3.1D1 | <0.05 | 0.16 |
| | | 6-Jan-09 | N | 1954.83 | 1972 | 2.82 | -- | <0.002 | 0.008F | <0.01 | -- | 0.0017 | 14.2 | 1FM1 | -- | 0.08 | 75.3M3 | 5D1 | 0.03F | 0.179 |
| | | 13-Jan-09 | N | 1954.83 | 1972 | 2.73 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | 0.0017 | 12.9 | <5M1 | <0.05 | 0.08 | 70.2M3 | 8D1 | <0.05 | 0.162 |
| | | 20-Jan-09 | N | 1954.83 | 1972 | 2.86 | -- | <0.002 | 0.008F | <0.01 | -- | 0.0016 | 12.6 | 1F | -- | 0.08 | 71.7M3 | 5D1 | <0.05 | 0.169 |
| | | 27-Jan-09 | N | 1954.83 | 1972 | 2.75 | -- | <0.002 | 0.009F | <0.01 | -- | 0.0016 | 12.1 | 1F | -- | 0.07 | 66.9M3 | 5D1 | <0.05 | 0.169B7 |
| | | 3-Feb-09 | N | 1954.83 | 1972 | 2.87 | -- | <0.002 | 0.008F | <0.01 | -- | 0.0017 | 12.6 | <5 | -- | 0.07 | 72.5M3 | 5D1 | <0.05 | 0.191 |
| | | 10-Feb-09 | N | 1954.83 | 1972 | 2.95 | -- | <0.002 | 0.009F | <0.01 | -- | 0.0018 | 12.5 | <5M1 | -- | 0.08 | 70.9M3 | 6D1 | <0.05 | 0.202 |
| | | 17-Feb-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1954.83 | 1972 | 2.99 | <0.002V1 | <0.002 | 0.012F | <0.01 | <0.05 | 0.0018 | 10.9 | <3 | <0.05 | 0.07 | 66.3 | 6.6D2 | <0.05 | 0.198 |
| | | 17-Mar-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1954.83 | 1972 | 2.51 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | 0.0016 | 9.2 | <3 | <0.05 | 0.06 | 61.9 | 3.7D1 | <0.05 | 0.191 |
| | | 14-Apr-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1954.83 | 1972 | 3.41 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | 0.0021 | 12.1 | <3 | <0.05 | 0.07 | 79.7 | 6.8D1 | <0.05 | 0.263 |
| | | 12-May-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1954.83 | 1972 | 4 | <0.002 | 0.0008F | 0.011F | <0.02D1 | <0.05 | 0.0025 | 11.4 | <3 | <0.05 | 0.07 | 94.5D1 | 7.2D1 | 0.04F | 0.313 |
| | | 9-Jun-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1954.83 | 1972 | 4.14D1 | <0.002 | <0.002 | 0.0029F | <0.02D1 | <0.1D1 | 0.0029 | 11.3 | <3 | 0.02FD1 | 0.08 | 102D1 | 6.8D1 | 0.08 | 0.335 |
| | | 7-Jul-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1954.83 | 1972 | 5.14 | <0.002 | 0.0006F | 0.008F | <0.01 | <0.05 | 0.0029 | 13 | <3 | <0.05 | 0.08 | 126D1 | 8.6D1 | 0.16 | 0.257 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-006D | TEST 30 | 4-Aug-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1954.83 | 1972 | 4.79 | <0.002 | <0.002 | 0.008F | <0.01 | 0.02F | 0.0027 | 11.3 | <3 | <0.1D1 | 0.09 | 125D1 | 8.9D1 | 0.25 | 0.185 |
| | TEST 31 | 26-Aug-08 | N | 1980.6 | 1983.6 | 301 | 0.0021 | 0.0055 | 0.063 | 0.12 | 0.06 | 0.235D1 | 308 | 8 | 0.62 | 4.48 | 51.7 | 119D1 | 398 | 0.0084 |
| | | 2-Sep-08 | N | 1980.6 | 1983.6 | 13.4 | <0.002 | <0.001 | 0.025 | 0.007F | <0.05 | 0.0273 | 22.1 | <5 | <0.05 | 0.08 | 3.97 | 17.8 | 19.5 | 0.0002F |
| | | 9-Sep-08 | N | 1980.6 | 1983.6 | 18.9M3 | <0.002 | <0.001 | 0.008 | 0.009 | <0.05 | 0.0801 | 35 | <5 | <0.05 | 0.16 | 8.44M3 | 21.6 | 45.3M3 | 0.0003 |
| | | 16-Sep-08 | N | 1980.6 | 1983.6 | 12.9M3 | <0.002 | 0.0006 | 0.006 | 0.01 | <0.05 | 0.0752 | 21.5 | <5 | <0.05 | 0.11 | 12.3M3 | 14.8 | 16.5M3 | <0.0005 |
| | | 23-Sep-08 | N | 1980.6 | 1983.6 | 16M3 | <0.002 | 0.0008 | 0.004 | 0.007 | 0.01 | 0.194 | 27.8 | <5 | <0.05 | 0.25 | 39.2M3 | 21.1D2 | 15.3 | 0.0002 |
| | | 30-Sep-08 | N | 1980.6 | 1983.6 | 27.7M3 | <0.002 | 0.002 | <0.02 | 0.013 | 0.01 | 0.348D1 | 55.5 | <5M1 | 0.01 | 0.44 | 47M3 | 36.7D1 | 31.9M3 | 0.0001 |
| | | 7-Oct-08 | N | 1980.6 | 1983.6 | 23.1M3 | <0.002 | 0.0027 | <0.02 | 0.008F | <0.05 | 0.395D1 | 52.9 | <5M1 | <0.05 | 0.5 | 63M3 | 31.3D1 | 29.4M3 | 0.0002F |
| | | 14-Oct-08 | N | 1980.6 | 1983.6 | 8.84M3 | <0.002 | 0.0007F | <0.02 | 0.004F | <0.05 | 0.104 | 20.2 | <5 | <0.05 | 0.14 | 15.2M3 | 14.1D1 | 22.5M3 | 0.0002F |
| | | 21-Oct-08 | N | 1980.6 | 1983.6 | 11M3 | <0.002 | 0.001F | <0.02 | 0.004F | <0.05 | 0.15 | 26.6 | <5 | <0.05 | 0.18 | 27.7 | 16.1D1 | 26.1M3 | <0.0005 |
| | | 28-Oct-08 | N | 1980.6 | 1983.6 | 11.9M3 | <0.002 | 0.0008F | <0.02 | <0.01 | <0.05M1 | 0.186 | 27.1 | <5 | 0.01F | 0.21 | 40.5M3 | 15.4D2 | 29.9M3 | <0.0005 |
| | | 4-Nov-08 | N | 1980.6 | 1983.6 | 3.05 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0585 | 5.6 | <5 | <0.05 | 0.06 | 10.3 | 4.4D1 | 8.88M3 | 0.0001F |
| | TEST 31S | 11-Nov-08 | N | 1980.6 | 1983.6 | 10.8 | <0.002 | 0.0015F | <0.02 | 0.003F | <0.05 | 0.257D2 | 26.9 | <5 | <0.05 | 0.24 | 59.8 | 17.5D2 | 25.5 | <0.0005 |
| | | 18-Nov-08 | N | 1980.6 | 1983.6 | 2.65 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0742 | 7.4 | <5 | <0.05 | 0.06 | 11.4M3 | 4.3D2 | 9.83M3 | <0.0005 |
| | | 25-Nov-08 | N | 1980.6 | 1983.6 | 1.91 | <0.002V1 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0463 | 4.8 | <5M1 | <0.05 | 0.04F | 6.81M3 | 3.3D1 | 7.37M3 | <0.0005 |
| | | 2-Dec-08 | N | 1980.6 | 1983.6 | 2.69 | <0.002 | <0.002 | <0.02 | 0.003F | <0.05 | 0.0575 | 6.5 | <5 | <0.05 | 0.06 | 8M3 | 4.9D1 | 10.4M3 | <0.0005 |
| | | 9-Dec-08 | N | 1980.6 | 1983.6 | 2.17 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0475 | 4.9 | <5 | <0.05 | 0.05 | 5.28M3 | 3.5D1 | 8.84M3 | <0.0005 |
| | | 16-Dec-08 | N | 1980.6 | 1983.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1980.6 | 1983.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 32 | 26-Aug-08 | N | 2091.13 | 2094.13 | 0.12F | 0.0006F | 0.0063 | 0.115 | <0.01 | 0.05 | 0.0007 | 361M3 | 11 | <0.05 | 0.05 | 0.2 | 2 | 0.04F | 0.0003F |
| | | 2-Sep-08 | N | 2091.13 | 2094.13 | <0.2 | 0.0007F | <0.001 | 0.041 | <0.01 | 0.01F | <0.0005 | 16.4 | 3F | <0.05 | <0.05 | <0.05 | 1.1 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 2091.13 | 2094.13 | 0.04 | <0.002 | <0.001 | 0.024 | <0.01 | <0.05 | <0.0005 | 7.5 | 2 | <0.05 | 0.02 | <0.05 | 1.1 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 2091.13 | 2094.13 | 0.08 | <0.002 | <0.001 | 0.013 | 0.002 | <0.05 | <0.0005 | 3.7 | 1 | <0.05 | <0.05 | 0.02 | 1.1 | 0.02 | <0.0005 |
| | | 23-Sep-08 | N | 2091.13 | 2094.13 | 0.06 | <0.002 | <0.001 | 0.082 | <0.01 | <0.05 | 0.0002 | 30.8 | 10 | <0.05 | <0.05 | 0.03 | 1.5D2 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 2091.13 | 2094.13 | <0.2 | <0.002 | 0.0009 | 0.013 | <0.01 | <0.05 | <0.0005 | 21.9 | 8 | <0.05 | <0.05 | 0.03 | 0.7 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 2091.13 | 2094.13 | 0.04F | 0.0007F | 0.0011 | 0.063 | <0.01 | <0.05 | <0.0005 | 31.3 | 8 | <0.05 | <0.05 | 0.03F | 0.6 | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 2091.13 | 2094.13 | 0.05F | <0.002 | 0.0008F | 0.036 | <0.01 | <0.05 | <0.0005 | 31.7 | 6 | <0.05 | <0.05 | 0.04F | 1 | 0.02F | <0.0005 |
| | | 21-Oct-08 | N | 2091.13 | 2094.13 | 0.04F | <0.002 | 0.0008F | 0.024 | <0.01 | <0.05 | <0.0005 | 19 | 4F | <0.05 | <0.05 | 0.01F | 1.8 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-006D | TEST 32 | 28-Oct-08 | N | 2091.13 | 2094.13 | 0.05F | <0.002 | 0.0006F | 0.039 | <0.01 | <0.05 | <0.0005 | 18.8 | 5 | <0.05 | <0.05 | 0.05 | 1.5 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 2091.13 | 2094.13 | <0.2 | <0.002 | 0.0013F | 0.052 | <0.01 | <0.05 | <0.0005 | 29.2 | 4F | <0.05 | <0.05 | 0.02F | 1.5 | <0.05 | <0.0005 |
| | TEST 32S | 11-Nov-08 | N | 2091.13 | 2094.13 | <0.2 | <0.002 | 0.002 | 0.029 | <0.01 | <0.05 | 0.0002F | 54 | 9 | <0.05 | <0.05 | 0.13 | 3 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 2091.13 | 2094.13 | <0.2 | <0.002 | <0.002 | 0.013F | <0.01 | <0.05 | <0.0005 | 10.7 | <5 | <0.05 | <0.05 | 0.09 | 0.5 | <0.05 | 0.0001F |
| | | 25-Nov-08 | N | 2091.13 | 2094.13 | <0.2 | <0.002V1 | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 8.9 | <5 | <0.05 | <0.05 | 0.13 | 0.3F | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 2091.13 | 2094.13 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | <0.0005 | 9 | <5 | <0.05 | <0.05 | 0.15 | 0.3F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 2091.13 | 2094.13 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 10.6 | 1F | <0.05 | <0.05 | 0.14 | 0.2F | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 2091.13 | 2094.13 | <0.3D1 | <0.002 | <0.002 | 0.012F | <0.01 | <0.05 | <0.0005 | 13.3 | <5 | <0.1D1 | 0.02F | 0.17D1 | 0.3F | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 2091.13 | 2094.13 | <0.2 | -- | <0.002 | 0.006F | 0.002F | -- | <0.0005 | 12.5 | <5M1 | -- | 0.01F | 0.31 | 0.3F | <0.05 | 0.0002F |
| | | 30-Dec-08 | N | 2091.13 | 2094.13 | <0.2 | -- | <0.002 | 0.006F | <0.01 | -- | <0.0005 | 12.2 | <5 | -- | <0.05 | 0.38 | 0.2F | <0.05 | 0.0001F |
| | | 6-Jan-09 | N | 2091.13 | 2094.13 | <0.2 | -- | <0.002 | 0.006F | <0.01 | -- | <0.0005 | 16.8 | <5 | -- | <0.05 | 0.37 | 0.2F | <0.05 | 0.0002F |
| | | 13-Jan-09 | N | 2091.13 | 2094.13 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 15.7 | <5 | <0.05 | <0.05 | 0.41 | 0.3F | <0.05 | 0.0002F |
| | | 20-Jan-09 | N | 2091.13 | 2094.13 | <0.2 | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 18.7 | 1F | -- | <0.05 | 0.56 | 0.1F | <0.05 | 0.0001F |
| | | 27-Jan-09 | N | 2091.13 | 2094.13 | <0.2 | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 17.4 | <5 | -- | <0.05 | 0.54 | 0.3F | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 2091.13 | 2094.13 | <0.2 | -- | <0.002 | 0.005F | <0.01 | -- | <0.0005 | 18.1 | <5 | -- | <0.05 | 0.65 | 0.3F | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 2091.13 | 2094.13 | <0.2 | <0.002 | 0.0005F | 0.006F | <0.01 | <0.05 | 0.0001F | 18.1 | <5H3 | <0.05 | 0.01F | 0.65 | <10D3H3 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 2091.13 | 2094.13 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-008A | TEST 33 | 26-Aug-08 | N | 1597 | 1600 | 0.04F | 0.001F | 0.0028 | 0.022 | <0.01 | 0.06 | <0.0005 | 13.4 | 18 | <0.05 | <0.05 | 0.03F | 0.4F | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1597 | 1600 | <0.2 | 0.0007F | 0.0015 | 0.011F | <0.01 | 0.05 | <0.0005 | 9.9 | 10 | <0.05 | 0.01F | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1597 | 1600 | 0.09 | 0.0009 | 0.0013 | 0.007 | <0.01 | 0.04 | <0.0005 | 7 | 2 | <0.05 | 0.01 | <0.05 | 0.4 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1597 | 1600 | 0.07 | 0.0009 | 0.0016 | 0.005 | 0.002 | 0.03 | <0.0005 | 7.1 | <5 | <0.05 | <0.05 | <0.05 | 0.4 | 0.02 | <0.0005 |
| | | 23-Sep-08 | N | 1597 | 1600 | 0.09 | 0.0005 | 0.0009 | 0.004 | <0.01 | 0.04 | <0.0005 | 6.5 | <5 | <0.05 | 0.01 | 0.01 | 0.3 | 0.03 | <0.0005 |
| | | 30-Sep-08 | N | 1597 | 1600 | 0.07 | 0.0006 | 0.0014 | <0.02 | <0.01 | 0.03 | <0.0005 | 7 | <5 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1597 | 1600 | 0.1F | 0.0006F | 0.0008F | 0.005F | <0.01 | 0.02F | <0.0005 | 7.3 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | 0.03F | <0.0005 |
| | | 14-Oct-08 | N | 1597 | 1600 | 0.12F | 0.0005F | 0.0009F | 0.007F | <0.01 | 0.01F | <0.0005 | 8.5 | <5 | <0.05 | <0.05 | <0.05 | 3FD1 | 0.04F | <0.0005 |
| | | 21-Oct-08 | N | 1597 | 1600 | 0.06F | 0.0006F | 0.0012F | <0.02 | <0.01 | 0.02F | <0.0005 | 8.2 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | 0.04F | <0.0005 |
| | | 28-Oct-08 | N | 1597 | 1600 | 0.07F | 0.0005F | 0.0009F | <0.02 | <0.01 | 0.02F | <0.0005 | 9.3 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | 0.03F | <0.0005 |
| | | 4-Nov-08 | N | 1597 | 1600 | 0.06F | 0.0004F | 0.0007F | 0.004F | <0.01 | 0.01F | <0.0005 | 9 | <5 | <0.05 | <0.05 | <0.05 | <3D3 | 0.04F | <0.0005 |
| | | 11-Nov-08 | N | 1597 | 1600 | 0.08F | <0.002 | 0.0007F | 0.005F | <0.01 | 0.01F | <0.0005 | 8.5 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1597 | 1600 | 0.06F | 0.0004F | 0.0006F | 0.004F | <0.01 | 0.02F | <0.0005 | 9.3 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | 0.02F | <0.0005 |
| | | 25-Nov-08 | N | 1597 | 1600 | 0.04F | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 8.6 | <5 | <0.05 | <0.05 | 0.01F | 0.2F | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-008A | TEST 33 | 2-Dec-08 | N | 1597 | 1600 | 0.07F | <0.002 | 0.0007F | 0.006F | <0.01 | <0.05 | <0.0005 | 10.1 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | 0.02F | <0.0005 |
| | | 9-Dec-08 | N | 1597 | 1600 | 0.05F | <0.002 | <0.002 | <0.02 | <0.01 | 0.01F | <0.0005 | 9.8 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | 0.02F | <0.0005 |
| | | 16-Dec-08 | N | 1597 | 1600 | 0.04F | <0.002 | 0.0006F | <0.02 | <0.01 | <0.05 | <0.0005 | 9.4 | <5 | <0.05 | 0.01F | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1597 | 1600 | 0.04F | -- | 0.0006F | 0.005F | <0.01 | -- | <0.0005 | 9.2 | <5 | -- | 0.02F | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1597 | 1600 | 0.05F | -- | 0.0006F | 0.004F | <0.01 | -- | <0.0005 | 9.8 | <5 | -- | <0.05 | 0.05 | <0.5 | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1597 | 1600 | 0.06F | -- | <0.002 | 0.003F | <0.01 | -- | <0.0005 | 9.7 | <5 | -- | <0.05 | <0.05 | <0.5 | <0.05 | 0.0001F |
| | | 13-Jan-09 | N | 1597 | 1600 | 0.05F | <0.002 | 0.0006F | 0.004F | <0.01 | <0.05 | <0.0005 | 10.2 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | 0.02F | 0.0001F |
| | | 20-Jan-09 | N | 1597 | 1600 | 0.05F | -- | 0.0007F | 0.004F | <0.01 | -- | <0.0005 | 10.3 | 1F | -- | <0.05 | <0.05 | <0.5 | 0.04F | 0.0001F |
| | | 27-Jan-09 | N | 1597 | 1600 | 0.03F | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 8.7 | 1F | -- | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1597 | 1600 | <0.2 | -- | 0.0005F | 0.004F | <0.01 | -- | <0.0005 | 10.4 | <5 | -- | <0.05 | 0.03F | 0.1F | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1597 | 1600 | 0.04F | <0.002 | 0.0006F | 0.003F | <0.01 | <0.05 | <0.0005 | 9.5 | <5H3 | <0.05 | <0.05 | <0.05 | 0.1FH3 | 0.02F | <0.0005 |
| | | 17-Feb-09 | N | 1597 | 1600 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 34 | 26-Aug-08 | N | 1717 | 1720 | <0.2 | <0.002 | <0.001 | 0.078 | <0.01 | 0.01F | <0.0005 | 102 | 2 | <0.05 | <0.05 | 0.02F | 0.3F | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1717 | 1720 | 0.04F | <0.002 | <0.001 | 0.027 | <0.01 | <0.05 | <0.0005 | 76.6 | 5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1717 | 1720 | 0.1 | <0.002 | <0.001 | 0.014 | <0.01 | <0.05 | <0.0005 | 61.5 | <5 | <0.05 | 0.01 | <0.05 | 0.3 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1717 | 1720 | 0.08 | <0.002 | <0.001 | 0.013 | 0.002 | <0.05 | <0.0005 | 73.4 | <5 | <0.05 | <0.05 | <0.05 | 0.3 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1717 | 1720 | 0.11 | <0.002 | <0.001 | 0.008 | <0.01 | 0.01 | <0.0005 | 46.8 | <5 | <0.05 | <0.05 | 0.01 | 0.2 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 1717 | 1720 | 0.07 | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 41.9 | <5 | <0.05 | <0.05 | <0.05 | 0.2 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1717 | 1720 | 0.09F | <0.002 | <0.001 | 0.005F | <0.01 | 0.01F | <0.0005 | 41.4 | <5 | <0.05 | <0.05 | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 1717 | 1720 | 0.06F | <0.002 | <0.001 | 0.006F | <0.01 | <0.05 | <0.0005 | 35.8 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1717 | 1720 | 0.09F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 29 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1717 | 1720 | 0.08F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 23.9 | <5 | <0.05 | <0.05 | 0.02F | 0.1F | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1717 | 1720 | 0.07F | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 27.9 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 1717 | 1720 | 0.06F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 20 | <5 | <0.05 | <0.05 | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1717 | 1720 | 0.05F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 20 | <5 | <0.05 | <0.05 | <0.05 | 0.1FV1M2 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1717 | 1720 | <0.2 | <0.002V1 | <0.002M1 | <0.02 | <0.01 | <0.05 | <0.0005 | 17 | <5 | <0.05 | <0.05 | 0.01F | <0.5 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1717 | 1720 | 0.05F | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 21.9 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1717 | 1720 | 0.04F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 17.9 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1717 | 1720 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 19.4 | <5 | <0.05 | <0.05 | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1717 | 1720 | <0.2 | -- | <0.002 | 0.003F | <0.01 | -- | <0.0005 | 16.5 | <5 | -- | <0.05 | 0.02F | 0.1F | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1717 | 1720 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 15.2 | <5 | -- | <0.05 | 0.04F | <0.5 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-008A | TEST 34 | 6-Jan-09 | N | 1717 | 1720 | 0.07F | -- | <0.002 | 0.004F | <0.01 | -- | <0.0005 | 16 | <5 | -- | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 1717 | 1720 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 15.1 | <5 | <0.05 | <0.05 | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1717 | 1720 | 0.04F | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 16.7 | 1F | -- | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1717 | 1720 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 14.9 | 1F | -- | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1717 | 1720 | 0.05F | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 14.8 | <5 | -- | <0.05 | 0.02F | <0.5 | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1717 | 1720 | 0.08F | -- | <0.002 | 0.003F | <0.01 | -- | <0.0005 | 18.7 | <5 | -- | <0.05 | 0.04F | 0.1F | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1717 | 1720 | 0.05F | <0.002V1 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 15.1 | <3 | <0.05 | <0.05 | 0.07 | <0.5 | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1717 | 1720 | 0.04F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 11.8 | <3 | <0.05 | 0.01F | 0.11 | <0.5 | <0.05 | <0.0005 |
| | | 14-Apr-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1717 | 1720 | 0.04F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 14.9 | <3 | <0.05 | <0.05 | 0.02F | <0.5 | <0.05 | <0.0005 |
| | | 12-May-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1717 | 1720 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 18 | <3 | <0.05 | <0.05 | 0.02F | <0.5 | <0.05 | <0.0005 |
| | | 9-Jun-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1717 | 1720 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 23.3 | <3 | <0.05 | 0.02F | 0.01F | <0.5 | <0.05 | 0.0005 |
| | | 7-Jul-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1717 | 1720 | <0.2 | <0.002 | <0.002 | 0.003F | <0.01 | <0.05 | <0.0005 | 29.4 | <3 | <0.05 | <0.05 | 0.02F | <0.5 | <0.05 | <0.0005 |
| | | 4-Aug-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-008A | TEST 34 | 11-Aug-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1717 | 1720 | <0.2 | <0.002 | <0.002 | 0.004F | <0.01 | 0.02F | <0.0005 | 29.2 | <3 | <0.05 | <0.05 | 0.03F | <0.5 | <0.05 | 0.0003F |
| | | 1-Sep-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Sep-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 1717 | 1720 | 0.07F | <0.002 | <0.002 | <0.02 | <0.01 | 0.02F | <0.0005 | 21.9 | <30D1 | <0.05 | <0.05 | 0.01F | <5D1 | <0.05 | <0.0005 |
| | | 29-Sep-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 1717 | 1720 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 16.3 | <3 | <0.05 | <0.05 | 0.03F | <0.5 | <0.05 | <0.0005 |
| | | 27-Oct-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 1717 | 1720 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 13.8 | <3 | <0.05 | <0.05 | 0.01F | <0.5 | <0.05 | <0.0005 |
| | | 24-Nov-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 35 | 26-Aug-08 | N | 1844.1 | 1846.6 | 0.05F | 0.0005F | 0.0011 | 0.136 | <0.01 | 0.02F | 0.0005 | 277 | 9 | <0.05 | 0.08 | 0.04F | 1.5 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.001 | 0.027 | <0.01 | 0.02F | <0.0005 | 147 | 37 | <0.05 | <0.05 | 0.01F | 1.8 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1844.1 | 1846.6 | 0.05 | 0.0004 | <0.001 | 0.019 | <0.01 | 0.01 | 0.0001 | 126 | 29 | <0.05 | 0.02 | 0.01 | 1.6 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1844.1 | 1846.6 | 0.03 | <0.002 | <0.001 | 0.015 | 0.002 | <0.05 | <0.0005 | 116 | 10 | <0.05 | <0.05 | <0.05 | 1.6 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1844.1 | 1846.6 | 0.07 | <0.002 | <0.001 | 0.008 | <0.01 | <0.05 | <0.0005 | 97.7 | 4 | <0.05 | <0.05 | 0.02 | 1.1 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.001 | <0.02 | <0.01 | <0.05 | <0.0005 | 97.2 | 3 | <0.05 | <0.05 | <0.05 | 1.3 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1844.1 | 1846.6 | 0.05F | <0.002 | <0.001 | 0.003F | <0.01 | <0.05 | <0.0005 | 81.8 | 3F | <0.05 | <0.05 | 0.01F | 0.9 | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 1844.1 | 1846.6 | 0.05F | <0.002 | <0.001 | 0.007F | <0.01 | <0.05 | <0.0005 | 86.2 | 3F | <0.05 | <0.05 | 0.01F | 0.8 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1844.1 | 1846.6 | 0.04F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 71.6 | 2F | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1844.1 | 1846.6 | 0.06F | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | <0.0005 | 72.3 | 2F | <0.05 | <0.05 | <0.05 | 1 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 60.8 | 2F | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 1844.1 | 1846.6 | 0.04F | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 70.5 | 2F | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 52.9 | 2F | <0.05 | <0.05 | <0.05 | 1.1V1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1844.1 | 1846.6 | <0.2 | <0.002V1 | <0.002 | 0.003F | <0.01 | <0.05 | 0.0002F | 49.7 | 2F | <0.05 | <0.05 | 0.02F | 0.9 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1844.1 | 1846.6 | 0.03F | <0.002 | <0.002 | 0.003F | <0.01 | <0.05 | <0.0005 | 51.9 | 1F | <0.05 | <0.05 | <0.05 | 1 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-008A | TEST 35 | 9-Dec-08 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 46.3 | 1F | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | 0.0002F |
| | | 16-Dec-08 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 43.2 | 1F | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1844.1 | 1846.6 | <0.2 | -- | <0.002 | 0.003F | 0.002F | -- | 0.0001F | 40 | <5 | -- | 0.01F | 0.01F | 0.8 | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1844.1 | 1846.6 | <0.2 | -- | <0.002 | 0.003F | <0.01 | -- | 0.0001F | 51.9 | 2F | -- | <0.05 | 0.04F | 0.8 | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1844.1 | 1846.6 | 0.04F | -- | <0.002 | <0.02 | <0.01 | -- | 0.0001F | 41.1 | 2F | -- | <0.05 | <0.05 | 1 | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 32.6 | 2F | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1844.1 | 1846.6 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 34.9 | 1F | -- | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1844.1 | 1846.6 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 33.1 | 1F | -- | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1844.1 | 1846.6 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 37.5 | 2F | -- | <0.05 | 0.01F | 0.8 | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1844.1 | 1846.6 | 0.06F | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 31.5 | 2F | -- | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1844.1 | 1846.6 | 0.05F | <0.002V1 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 33.7 | <3M1 | <0.05 | <0.05 | 0.02F | 0.9 | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 27 | <3 | <0.05 | <0.05 | 0.03F | 0.7 | <0.05 | <0.0005 |
| | | 14-Apr-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 26.8 | <3 | <0.05 | <0.05 | 0.01F | 0.7 | <0.05 | <0.0005 |
| | | 12-May-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 30.4 | <3 | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 9-Jun-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1844.1 | 1846.6 | 0.03F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 38.4 | <3 | 0.01F | <0.05 | <0.05 | 0.7 | <0.05 | 0.0003F |
| | | 7-Jul-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-008A | TEST 35 | 14-Jul-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | 0.0002F | 53.3 | <3 | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 4-Aug-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1844.1 | 1846.6 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | 0.02F | 0.0002F | 55.3 | <3 | <0.05 | <0.05 | <0.05 | 1.1 | <0.05 | 0.0002F |
| | TEST 36 | 26-Aug-08 | N | 1979.95 | 1982.94 | 0.34 | <0.002 | 0.0013 | 0.097 | <0.01 | 0.02F | 0.006 | 231 | 5 | <0.05 | <0.05 | 0.35 | 4 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | 0.0017 | 0.028 | <0.01 | 0.01F | 0.0004F | 179 | 54 | <0.05 | <0.05 | 0.02F | 3.5 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1979.95 | 1982.94 | 0.04 | <0.002 | 0.0007 | 0.019 | <0.01 | 0.01 | 0.0004 | 161 | 73 | <0.05 | 0.01 | 0.01 | 2.7 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 1979.95 | 1982.94 | 0.06 | <0.002 | 0.0009 | 0.017 | 0.002 | <0.05 | 0.0005 | 155 | 81 | <0.05 | <0.05 | 0.02 | 2.6 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1979.95 | 1982.94 | 0.11 | <0.002 | <0.001 | 0.01 | <0.01 | 0.01 | 0.0004 | 135 | 45 | <0.05 | <0.05 | 0.05 | 1.9 | <0.05 | 0.0002 |
| | | 30-Sep-08 | N | 1979.95 | 1982.94 | 0.08 | <0.002 | 0.0006 | <0.02 | <0.01 | <0.05 | 0.0005 | 150 | 40 | <0.05 | <0.05 | 0.06 | 2.2 | <0.05 | 0.0003 |
| | | 7-Oct-08 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.001 | 0.008F | <0.01 | 0.01F | 0.0004F | 152 | 26 | <0.05 | <0.05 | 0.02F | 2.4 | <0.05 | 0.0003F |
| | | 14-Oct-08 | N | 1979.95 | 1982.94 | 0.03F | <0.002 | <0.001 | 0.011F | <0.01 | <0.05 | 0.0003F | 139 | 10 | <0.05 | <0.05 | 0.02F | 2.1 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 136 | 11 | <0.05 | <0.05 | <0.05 | 2.5 | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | 0.014F | <0.01 | <0.05 | 0.0003F | 119 | 5 | <0.05 | <0.05 | 0.06 | 2.3 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1979.95 | 1982.94 | <0.2 | <0.004D2 | 0.0006F | 0.005F | <0.01 | <0.05 | 0.0003F | 141 | 3F | <0.05 | <0.05 | <0.05 | 2 | <0.05 | 0.123 |
| | | 11-Nov-08 | N | 1979.95 | 1982.94 | 0.04F | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | 0.0004F | 109 | 1F | <0.05 | <0.05 | <0.05 | 2.2 | <0.05 | 0.0001F |
| | | 18-Nov-08 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | 0.0003F | 117 | 2F | <0.05 | <0.05 | <0.05 | 2.6V1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1979.95 | 1982.94 | <0.2 | <0.002V1 | <0.002 | 0.004F | <0.01 | <0.05 | 0.0003F | 129 | 4F | <0.05 | <0.05 | 0.02F | 2 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | 0.0003F | 117 | 2F | <0.05 | <0.05 | <0.05 | 2.4 | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 104 | 4F | <0.05 | <0.05 | 0.02F | 0.7 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0003F | 92 | <5 | <0.05 | <0.05 | <0.05 | 1.7 | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1979.95 | 1982.94 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0003F | 92.3 | 1F | -- | <0.05 | 0.02F | 1.8 | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1979.95 | 1982.94 | <0.2 | -- | <0.002 | 0.004F | <0.01 | -- | 0.0003F | 101 | 1F | -- | <0.05 | 0.04F | 1.9 | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1979.95 | 1982.94 | <0.2 | -- | <0.002 | 0.003F | <0.01 | -- | 0.0002F | 94.4 | 4F | -- | <0.05 | <0.05 | 1.8 | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 79.8 | 2F | 0.01F | <0.05 | <0.05 | 2.1 | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1979.95 | 1982.94 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0002F | 83.6 | 1F | -- | <0.05 | <0.05 | 2.1 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1979.95 | 1982.94 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0002F | 86.8 | <5 | -- | <0.05 | <0.05 | 1.6 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1979.95 | 1982.94 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0002F | 83.6 | <5 | -- | <0.05 | 0.02F | 2.1 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-008A | TEST 36 | 10-Feb-09 | N | 1979.95 | 1982.94 | 0.04F | -- | <0.002 | <0.02 | <0.01 | -- | 0.0002F | 88.4 | 4F | -- | <0.05 | <0.05 | 2.4 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1979.95 | 1982.94 | <0.2 | <0.002V1 | <0.002 | 0.006F | <0.01 | <0.05 | 0.0002F | 88.7 | <3 | <0.05 | <0.05 | 0.01F | 2.2 | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 73.6 | <3 | <0.05 | 0.01F | 0.02F | 1.8 | <0.05 | <0.0005 |
| | | 14-Apr-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 85 | <3 | <0.05 | <0.05 | 0.02F | 2 | <0.05 | <0.0005 |
| | | 12-May-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 101 | <3 | <0.05 | <0.05 | <0.05 | 2.7 | <0.05 | 0.0002F |
| | | 9-Jun-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 97.6 | <3 | <0.05 | <0.05 | 0.01F | 3.2 | <0.05 | 0.0003F |
| | | 7-Jul-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1979.95 | 1982.94 | <0.2 | 0.0013F | <0.002 | 0.004F | <0.01 | <0.05 | 0.0003F | 118 | <3 | <0.05 | <0.05 | 0.02F | 2.7 | <0.05 | <0.0005 |
| | | 4-Aug-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1979.95 | 1982.94 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | 0.02F | 0.0005 | 131 | <3 | <0.05 | 0.01F | 0.04F | 3 | <0.05 | 0.0003F |
| | TEST 37 | 26-Aug-08 | N | 2053.81 | 2056.81 | 0.04F | <0.002 | <0.001 | 0.068 | <0.01 | <0.05 | 0.0004F | 260 | 10 | <0.05 | 0.04F | 0.02F | 0.2FM2 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.001 | 0.012F | <0.01 | <0.05 | <0.0005 | 193 | 70D1M2 | <0.05 | <0.05 | <0.05 | 1.2 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-008A | TEST 37 | 9-Sep-08 | N | 2053.81 | 2056.81 | 0.05 | <0.002 | <0.001 | 0.011 | <0.01 | <0.05 | <0.0005 | 210 | 30 | <0.05 | 0.02 | <0.05 | 1.1 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.001 | 0.011 | 0.002 | <0.05 | <0.0005 | 131 | 5 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.001 | 0.005 | <0.01 | 0.01 | <0.0005 | 203 | 6 | <0.05 | 0.01 | 0.02 | 1.3 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.001 | <0.03D1 | <0.01 | <0.1D1 | <0.0005 | 145 | 4 | <0.05 | <0.05 | <0.05 | 1 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 2053.81 | 2056.81 | 0.03F | <0.002 | <0.001 | <0.02 | <0.01 | 0.01F | <0.0005 | 111 | 4F | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 2053.81 | 2056.81 | 0.04F | <0.002 | <0.001 | 0.009F | <0.01 | <0.05 | <0.0005 | 91.3 | 3F | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 99.9 | 3F | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 2053.81 | 2056.81 | 0.06F | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 80.5 | 2F | <0.05 | <0.05 | 0.18 | 0.6 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 2053.81 | 2056.81 | <0.2 | 0.0009F | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 80.1 | 2F | <0.05 | <0.05 | <0.05 | 0.1F | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 78.7 | 1F | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 90.4 | 1F | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002V1 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 67.1 | 1F | <0.05 | <0.05 | 0.01F | 0.5 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | 0.002F | <0.05 | <0.0005 | 70.1 | 2F | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 86 | 2F | <0.05 | <0.05 | 0.01F | 1.8 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 62.9 | 1F | <0.05 | <0.05 | <0.05 | 0.6M2 | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 2053.81 | 2056.81 | <0.2 | -- | <0.002 | <0.02 | 0.002F | -- | <0.0005 | 75.4 | <5 | -- | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 2053.81 | 2056.81 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 62.5 | <5 | -- | <0.05 | 0.02F | 0.4F | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 2053.81 | 2056.81 | 0.03F | -- | <0.002 | 0.004F | <0.01 | -- | <0.0005 | 67 | 2F | -- | <0.05 | <0.05 | 0.5 | <0.05 | 0.0001F |
| | | 13-Jan-09 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 45.4 | <5 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 2053.81 | 2056.81 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 62.4 | 1F | -- | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 2053.81 | 2056.81 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 44.3 | <5 | -- | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 2053.81 | 2056.81 | 0.03F | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 46.6 | <5 | -- | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 2053.81 | 2056.81 | 0.03F | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 45.7 | <5 | -- | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 2053.81 | 2056.81 | <0.2 | <0.002V1 | <0.002 | 0.004F | <0.01 | <0.05 | <0.0005 | 46.4 | <3 | <0.05 | <0.05 | 0.01F | 0.4F | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 40.5 | <3 | <0.05 | 0.01F | <0.05 | 0.4F | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-008A | TEST 37 | 14-Apr-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 37.6 | <3 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 12-May-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 57.9 | <3 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 9-Jun-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 2053.81 | 2056.81 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 36.6 | <3 | <0.05 | 0.01F | <0.05 | 0.3F | <0.05 | 0.0002F |
| | | 7-Jul-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 2053.81 | 2056.81 | 0.04F | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 71.4 | <3 | <0.05 | <0.05 | 0.06 | 0.7 | <0.05 | <0.0005 |
| | | 4-Aug-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 2053.81 | 2056.81 | 0.1F | <0.002 | <0.002 | <0.02 | <0.01 | 0.02F | 0.0002F | 57.1 | <3 | <0.05 | 0.02F | 0.38 | 0.5 | <0.05 | 0.0002F |
| RES-009 | TEST 38 | 26-Aug-08 | N | 278.9 | 281.09 | 0.15F | <0.002 | 0.0035 | <0.02 | <0.01 | 0.04F | <0.0005 | 3.2 | 4 | <0.05 | <0.05 | 0.01F | 0.3F | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 278.9 | 281.09 | 0.08F | <0.002 | 0.0025 | <0.02 | <0.01 | 0.03F | <0.0005 | 2.3 | 4F | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 278.9 | 281.09 | 0.12 | <0.002 | 0.0017 | 0.003 | <0.01 | 0.02 | <0.0005 | 2.1 | 2 | <0.05 | 0.02 | <0.05 | 0.1 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 278.9 | 281.09 | 0.13 | <0.002 | 0.0017 | 0.004 | 0.002 | 0.01 | <0.0005 | 2.2 | 1 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 278.9 | 281.09 | 0.12 | <0.002 | 0.0015 | <0.02 | <0.01 | 0.03 | <0.0005 | 1.8 | <5 | <0.05 | <0.05 | 0.02 | <0.5 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 278.9 | 281.09 | 0.24 | <0.002 | 0.0019 | <0.02 | <0.01 | <0.05 | <0.0005 | 2.2 | <5 | <0.05 | <0.05 | <0.05 | 0.1 | 0.03 | <0.0005 |
| | | 7-Oct-08 | N | 278.9 | 281.09 | 0.14F | <0.002 | 0.0016 | <0.02 | <0.01 | 0.01F | <0.0005 | 2.3 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 278.9 | 281.09 | 0.18F | <0.002 | 0.0012 | 0.01F | <0.01 | <0.05 | <0.0005 | 2.5 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 278.9 | 281.09 | 0.15F | <0.002 | 0.0016F | <0.02 | <0.01 | 0.01F | <0.0005 | 2.5 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | 0.02F | <0.0005 |
| | | 28-Oct-08 | N | 278.9 | 281.09 | 0.16F | <0.002 | 0.0013F | <0.02 | <0.01 | <0.05 | <0.0005 | 2.6 | <5 | <0.05 | <0.05 | 0.01F | <0.5 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 278.9 | 281.09 | 0.12F | <0.002 | 0.0012F | <0.02 | <0.01 | <0.05 | <0.0005 | 2.6 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009 | TEST 38 | 11-Nov-08 | N | 278.9 | 281.09 | 0.14F | <0.002 | 0.0012F | <0.02 | <0.01 | <0.05 | <0.0005 | 2.8 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 278.9 | 281.09 | 0.12F | <0.002 | 0.0009F | <0.02 | <0.01 | <0.05 | <0.0005 | 2.6 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | 0.0001F |
| | | 25-Nov-08 | N | 278.9 | 281.09 | 0.07F | <0.002V1 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 2.3 | <5 | <0.05 | <0.05 | 0.01F | <0.5 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 278.9 | 281.09 | 0.11F | <0.002 | 0.0008F | 0.003F | <0.01 | <0.05 | <0.0005 | 2.6 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 278.9 | 281.09 | 0.07F | <0.002 | 0.0005F | <0.02 | <0.01 | <0.05 | <0.0005 | 2.7 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 278.9 | 281.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 278.9 | 281.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 39 | 26-Aug-08 | N | 645.59 | 647.52 | 0.28 | <0.002 | 0.0099 | <0.02 | <0.01 | 0.49 | <0.0005 | 1.9 | 6 | <0.05 | 0.01F | 0.01F | 1.5 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 645.59 | 647.52 | 0.29 | <0.002 | 0.0062 | <0.02 | <0.01 | 0.43 | <0.0005 | 1.4 | 5 | <0.05 | <0.05 | <0.05 | 1.2 | 0.05 | <0.0005 |
| | | 9-Sep-08 | N | 645.59 | 647.52 | 0.27 | <0.002 | 0.0035 | 0.004 | <0.01 | 0.31 | <0.0005 | 1.2 | 3 | <0.05 | <0.05 | <0.05 | 1.1M2 | 0.04 | <0.0005 |
| | | 16-Sep-08 | N | 645.59 | 647.52 | 0.23 | <0.002 | 0.0042 | 0.004 | 0.002 | 0.29 | <0.0005 | 1.3 | 2 | <0.05 | <0.05 | <0.05 | 1.1 | 0.04 | <0.0005 |
| | | 23-Sep-08 | N | 645.59 | 647.52 | 0.3 | <0.002 | 0.0038 | <0.02 | <0.01 | 0.35 | <0.0005 | 1.5 | 1 | <0.05 | <0.05 | 0.02 | 1.3 | 0.07 | 0.0001 |
| | | 30-Sep-08 | N | 645.59 | 647.52 | 0.3 | <0.002 | 0.0033 | <0.02 | <0.01 | 0.23 | <0.0005 | 1.2 | <5 | <0.05 | <0.05 | <0.05 | 1.1 | 0.08 | <0.0005 |
| | | 7-Oct-08 | N | 645.59 | 647.52 | 0.3 | <0.002 | 0.0029 | <0.02 | <0.01 | 0.19 | <0.0005 | 1.2 | <5 | <0.05 | <0.05 | <0.05 | 0.9 | 0.07 | <0.0005 |
| | | 14-Oct-08 | N | 645.59 | 647.52 | 0.28 | <0.002 | 0.0023 | 0.008F | <0.01 | 0.18 | <0.0005 | 1.6 | <5 | <0.05 | <0.05 | 0.01F | 0.9 | 0.1 | <0.0005 |
| | | 21-Oct-08 | N | 645.59 | 647.52 | 0.29 | <0.002 | 0.0021 | <0.02 | <0.01 | 0.13 | <0.0005 | 1.6 | <5 | <0.05 | <0.05 | <0.05 | 0.8 | 0.09 | <0.0005 |
| | | 28-Oct-08 | N | 645.59 | 647.52 | 0.23 | <0.002 | 0.0016F | <0.02 | <0.01 | 0.13 | <0.0005 | 1.7 | <5 | <0.05 | <0.05 | <0.05 | 0.7 | 0.05 | <0.0005 |
| | | 4-Nov-08 | N | 645.59 | 647.52 | 0.21 | <0.002 | 0.0017F | <0.02 | <0.01 | 0.12 | <0.0005 | 2 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | 0.06 | <0.0005 |
| | | 11-Nov-08 | N | 645.59 | 647.52 | 0.26 | <0.002 | 0.002 | <0.02 | <0.01 | 0.1 | <0.0005 | 2.3 | <5 | <0.05 | <0.05 | <0.05 | 0.7 | 0.09 | <0.0005 |
| | | 18-Nov-08 | N | 645.59 | 647.52 | 0.2 | <0.002 | 0.0015F | <0.02 | <0.01 | 0.07 | <0.0005 | 2 | <5 | <0.05 | <0.05 | <0.05 | 0.6 | 0.06 | <0.0005 |
| | | 25-Nov-08 | N | 645.59 | 647.52 | 0.14F | <0.002 | 0.001F | <0.02 | <0.01 | 0.07 | <0.0005 | 2.3 | <5 | <0.05 | <0.05 | 0.02F | 0.6 | 0.05 | <0.0005 |
| | | 2-Dec-08 | N | 645.59 | 647.52 | 0.18F | <0.002 | 0.0015F | <0.02 | <0.01 | 0.07 | <0.0005 | 2.4 | <5 | <0.05 | <0.05 | <0.05 | 0.7 | 0.09 | <0.0005 |
| | | 9-Dec-08 | N | 645.59 | 647.52 | 0.17F | <0.002 | 0.0014F | <0.02 | <0.01 | 0.06 | <0.0005 | 2.3 | <5 | <0.05 | <0.05 | <0.05 | 0.6 | 0.06 | <0.0005 |
| | | 16-Dec-08 | N | 645.59 | 647.52 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 645.59 | 647.52 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 40 | 26-Aug-08 | N | 804.84 | 807 | 0.08F | <0.002 | 0.0042 | 0.039 | <0.01 | 0.43 | <0.0005 | 30.7 | 8 | <0.05 | <0.05 | <0.05 | 1.2 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 804.84 | 807 | <0.2 | <0.002 | 0.0032 | 0.019F | <0.01 | 0.62 | <0.0005 | 76.1 | 7 | <0.05 | <0.05 | <0.05 | 1.2 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 804.84 | 807 | 0.07 | <0.002 | 0.0013 | 0.017 | <0.01 | 0.51 | <0.0005 | 98.1 | 2 | <0.05 | <0.05 | <0.05 | 0.9 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 804.84 | 807 | 0.04 | <0.002 | 0.0007 | 0.011 | 0.002 | 0.27 | <0.0005 | 53.4 | <5 | <0.05 | <0.05 | <0.05 | 0.5 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 804.84 | 807 | 0.05 | <0.002 | 0.0008 | 0.013 | <0.01 | 0.39 | <0.0005 | 119 | <5 | <0.05 | <0.05 | 0.02 | 0.7 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 804.84 | 807 | 0.03 | <0.002 | 0.0009 | 0.004 | <0.01 | 0.31 | <0.0005 | 90.6 | <5 | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009 | TEST 40 | 7-Oct-08 | N | 804.84 | 807 | 0.06F | <0.002 | 0.0008F | 0.011F | 0.013 | 0.28 | <0.0005 | 100 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 804.84 | 807 | <0.2 | <0.002 | 0.0006F | 0.018F | <0.01 | 0.21 | <0.0005 | 94.3 | <5 | <0.05 | <0.05 | 0.01F | 0.4F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 804.84 | 807 | <0.2 | <0.002 | 0.0011F | 0.004F | <0.01 | 0.19 | <0.0005 | 80.2 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 804.84 | 807 | <0.2 | <0.002 | <0.002 | 0.016F | <0.01 | 0.16 | <0.0005 | 70.2 | <5 | <0.05 | <0.05 | 0.01F | 0.3F | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 804.84 | 807 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | 0.14 | <0.0005 | 83.7 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 804.84 | 807 | 0.04F | <0.002 | 0.0006F | 0.007F | <0.01 | 0.13 | <0.0005 | 77.2 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 804.84 | 807 | <0.2 | <0.002 | <0.002 | 0.008F | <0.01 | 0.15 | <0.0005 | 87.7 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 804.84 | 807 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | 0.1 | <0.0005 | 78.3 | <5 | <0.05 | <0.05 | 0.02F | 0.3F | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 804.84 | 807 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | 0.07 | <0.0005 | 71.7 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 804.84 | 807 | <0.2 | <0.002 | 0.0006F | 0.01F | <0.01 | 0.15 | <0.0005 | 121 | <5 | <0.05 | <0.05 | 0.01F | 0.5 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 804.84 | 807 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 804.84 | 807 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 41 | 26-Aug-08 | FD | 804.84 | 807 | 0.07F | <0.002 | 0.0049 | 0.037 | <0.01 | 0.51 | <0.0005 | 35.1 | 10 | <0.05 | <0.05 | 0.01F | 1.2 | <0.05 | <0.0005 |
| | | 2-Sep-08 | FD | 804.84 | 807 | <0.2 | 0.0006F | 0.0029 | 0.018F | <0.01 | 0.7 | <0.0005 | 80.4 | 6 | <0.05 | <0.05 | <0.05 | 1.1 | <0.05 | <0.0005 |
| | | 9-Sep-08 | FD | 804.84 | 807 | 0.04 | 0.0006 | 0.0012 | 0.017 | <0.01 | 0.52 | <0.0005 | 92.5 | 1 | <0.05 | 0.01 | <0.05 | 0.9 | <0.05 | <0.0005 |
| | | 16-Sep-08 | FD | 804.84 | 807 | 0.05 | <0.002 | 0.001 | 0.011 | <0.01 | 0.3 | <0.0005 | 56.5 | <5 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 23-Sep-08 | FD | 804.84 | 807 | 0.03 | <0.002 | 0.0012 | 0.01 | <0.01 | 0.34 | <0.0005 | 95.4 | <5 | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 30-Sep-08 | FD | 804.84 | 807 | <0.2 | 0.0005 | 0.0011 | 0.01 | <0.01 | 0.27 | <0.0005 | 77.8 | <5M1 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | 0.0002 |
| | | 7-Oct-08 | FD | 804.84 | 807 | <0.2 | <0.002 | 0.0007F | 0.011F | <0.01 | 0.23 | <0.0005 | 75 | <5 | <0.05 | <0.05 | <0.05 | 0.6M2 | <0.05 | <0.0005 |
| | | 14-Oct-08 | FD | 804.84 | 807 | 0.04F | <0.002 | <0.001 | 0.01F | <0.01 | 0.08 | <0.0005 | 22M1 | <5 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | 0.0001F |
| | | 21-Oct-08 | FD | 804.84 | 807 | 0.06F | <0.002 | 0.0008F | 0.004F | <0.01 | 0.15 | <0.0005 | 64 | <5M1 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 28-Oct-08 | FD | 804.84 | 807 | <0.2 | <0.002 | 0.0007F | 0.008F | <0.01 | 0.12 | <0.0005 | 69.8 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 4-Nov-08 | FD | 804.84 | 807 | <0.2 | <0.002V1 | 0.0007F | 0.008F | <0.01 | 0.12 | <0.0005 | 77 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | <0.05 | <0.0005 |
| | | 11-Nov-08 | FD | 804.84 | 807 | <0.2 | <0.002 | <0.002 | 0.007F | <0.01 | 0.11 | <0.0005 | 76.3 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 18-Nov-08 | FD | 804.84 | 807 | <0.2 | <0.002 | <0.002 | 0.008F | <0.01 | 0.1 | <0.0005 | 76.2 | <5 | <0.05 | <0.05 | <0.05 | 0.3F | <0.05 | <0.0005 |
| | | 25-Nov-08 | FD | 804.84 | 807 | <0.2 | <0.002 | 0.0005F | 0.008F | <0.01 | 0.08 | <0.0005 | 71.6 | <5M1 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | <0.0005 |
| | | 2-Dec-08 | FD | 804.84 | 807 | <0.2 | <0.002 | 0.0005F | <0.02 | <0.01 | 0.06 | <0.0005 | 62.5 | <5M1 | <0.05 | <0.05 | <0.05 | 0.2F | <0.05 | 0.0002F |
| | | 9-Dec-08 | FD | 804.84 | 807 | <0.2 | <0.002 | 0.0005F | 0.007F | <0.01 | 0.07 | <0.0005 | 73.5 | <5M1 | <0.05 | <0.05 | 0.01F | 0.3F | <0.05 | <0.0005 |
| | | 16-Dec-08 | FD | 804.84 | 807 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | FD | 804.84 | 807 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 42 | 26-Aug-08 | N | 994.67 | 997.67 | 0.04F | <0.002 | 0.0045 | 0.14D1 | <0.05D1 | 0.26FD1 | 0.0003F | 275 | 65 | <0.05 | <0.05 | 0.02F | 1.4 | <0.05 | 0.0008 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009 | TEST 42 | 2-Sep-08 | N | 994.67 | 997.67 | 0.07F | <0.002 | 0.0007F | 0.069 | <0.01 | 0.1 | 0.0002F | 39.5 | 1F | <0.05 | <0.05 | <0.05 | 1.4 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 994.67 | 997.67 | 0.08 | <0.002 | 0.0017 | 0.033 | <0.01 | 0.11 | <0.0005 | 12.5 | <5 | <0.05 | 0.01 | <0.05 | 4.5 | <0.05 | <0.0005 |
| | | 16-Sep-08 | N | 994.67 | 997.67 | 0.13 | <0.002 | 0.0015 | 0.027 | <0.01 | 0.02 | <0.0005 | 5.3 | <5 | <0.05 | 0.01 | <0.05 | 1.5 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 994.67 | 997.67 | 0.22 | <0.002 | 0.0018 | 0.007 | <0.01 | 0.02 | <0.0005 | 2.7 | <5 | <0.05 | 0.01 | <0.05 | 1.1 | 0.02 | 0.0002 |
| | | 30-Sep-08 | N | 994.67 | 997.67 | 0.2 | <0.002 | 0.0014 | 0.016 | <0.01 | <0.05 | <0.0005 | 3.2 | <5 | <0.05 | <0.05 | <0.05 | 0.7 | 0.02 | 0.0002 |
| | | 7-Oct-08 | N | 994.67 | 997.67 | 0.12F | <0.002 | 0.001 | 0.023 | <0.01 | 0.01F | <0.0005 | 2.8 | <5 | <0.05 | <0.05 | <0.05 | 0.4F | 0.02F | <0.0005 |
| | | 14-Oct-08 | N | 994.67 | 997.67 | 0.13F | <0.002 | 0.001 | 0.029 | <0.01 | 0.01F | <0.0005 | 4.1 | <5 | <0.05 | <0.05 | 0.01F | 0.4F | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 994.67 | 997.67 | 0.17F | <0.002 | 0.0018F | 0.027 | <0.01 | 0.01F | <0.0005 | 4 | <5 | <0.05 | <0.05 | <0.05 | 0.7 | 0.04F | 0.0001F |
| | | 28-Oct-08 | N | 994.67 | 997.67 | 0.09F | <0.002 | 0.0014F | 0.035 | <0.01 | 0.01F | <0.0005 | 4.1 | <5 | <0.05 | <0.05 | <0.05 | 0.7 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 994.67 | 997.67 | 0.09F | <0.002 | 0.0017F | 0.045 | <0.01 | <0.05 | <0.0005 | 5.1 | <5 | <0.05 | <0.05 | <0.05 | 1 | <0.05 | 0.0001F |
| | | 11-Nov-08 | N | 994.67 | 997.67 | 0.09F | <0.002 | 0.001F | 0.038 | <0.01 | <0.05 | <0.0005 | 4.2 | <5 | <0.05 | <0.05 | <0.05 | 0.6 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 994.67 | 997.67 | 0.08F | <0.002 | 0.0012F | 0.067 | <0.01 | 0.02F | <0.0005 | 6.1 | <5 | <0.05 | <0.05 | <0.05 | 0.8 | 0.02F | <0.0005 |
| | | 25-Nov-08 | N | 994.67 | 997.67 | 0.14F | <0.002 | 0.0019F | 0.099 | <0.01 | 0.04F | <0.0005 | 8.7 | <5 | <0.05 | <0.05 | <0.05 | 2.9 | 0.05 | 0.0001F |
| | | 2-Dec-08 | N | 994.67 | 997.67 | 0.1F | <0.002 | 0.0019F | 0.052 | <0.01 | <0.05 | <0.0005 | 5.2 | <5 | <0.05 | <0.05 | <0.05 | 1 | 0.02F | 0.0003F |
| | | 9-Dec-08 | N | 994.67 | 997.67 | 0.09F | <0.002 | 0.0015F | 0.06 | <0.01 | <0.05 | <0.0005 | 5.4 | <5 | <0.05 | <0.05 | <0.05 | 0.8 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 994.67 | 997.67 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 994.67 | 997.67 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-009E | TEST 43 | 26-Aug-08 | N | 1351.03 | 1354.03 | 21.2 | <0.002 | 0.002 | 0.134D1 | 0.005FD1 | 0.09FD1 | 0.0244 | 224 | 26 | <0.05 | 0.77 | 106D1 | 24D1 | 6.74 | 0.0053 |
| | | 2-Sep-08 | N | 1351.03 | 1354.03 | 4.91 | 0.0005F | <0.001 | 0.048 | 0.002F | 0.03F | 0.0008 | 19.3 | 1F | <0.05 | 0.03F | 8.6 | 5.5 | 0.69 | 0.001 |
| | | 9-Sep-08 | N | 1351.03 | 1354.03 | 4.24 | 0.0014 | <0.001 | 0.052 | <0.01 | <0.05 | 0.0008 | 12.3 | <5 | <0.05 | 0.03 | 17.7 | 5.1D2 | 0.54 | 0.0005 |
| | | 16-Sep-08 | N | 1351.03 | 1354.03 | 3.98 | <0.002 | <0.001 | 0.039 | 0.002 | 0.01 | 0.0007 | 9.9 | <5 | <0.05 | 0.03 | 20.4 | 3.9D1 | 1.04 | 0.0006 |
| | | 23-Sep-08 | N | 1351.03 | 1354.03 | 3.29 | <0.002 | <0.001 | 0.03 | <0.01 | <0.05 | 0.0009 | 6.5 | <5 | <0.05 | 0.03 | 32.3 | 2.5D2 | 1.18 | 0.0004 |
| | | 30-Sep-08 | N | 1351.03 | 1354.03 | 3.07 | <0.002 | <0.001 | 0.02 | <0.01 | <0.05 | 0.001 | 5.7 | <5 | <0.05 | 0.01 | 30 | 1.8D1 | 1.34 | 0.0006 |
| | | 7-Oct-08 | N | 1351.03 | 1354.03 | 3.14 | <0.002 | <0.001 | 0.015F | <0.01 | <0.05 | 0.0009 | 5 | <5 | <0.05 | 0.02F | 30 | 1.4FD1 | 1.3 | 0.0006 |
| | | 14-Oct-08 | N | 1351.03 | 1354.03 | 3.6 | <0.002 | <0.001 | 0.011F | <0.01 | <0.05 | 0.0009 | 5.8 | <5 | <0.05 | 0.03F | 31.3 | 1.5FD1M2 | 1.28 | 0.0005 |
| | | 21-Oct-08 | N | 1351.03 | 1354.03 | 3.47 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | 0.001 | 5.5 | <5 | <0.05 | 0.01F | 29 | 2FD1 | 1.5 | 0.0007 |
| | | 28-Oct-08 | N | 1351.03 | 1354.03 | 3.44 | <0.002 | <0.002 | 0.01F | <0.01 | <0.05 | 0.001 | 5.2 | <5 | <0.05 | 0.03F | 30.3 | 1.7FD2 | 1.52 | 0.0005 |
| | | 4-Nov-08 | N | 1351.03 | 1354.03 | 4.3 | <0.002 | <0.002 | 0.01F | 0.002F | <0.05 | 0.001 | 5.5 | <5 | <0.05 | 0.02F | 31 | 2.5FD1 | 2.14 | 0.0004F |
| | | 11-Nov-08 | N | 1351.03 | 1354.03 | 4.02 | <0.002 | <0.002 | 0.01F | 0.003F | <0.05 | 0.0011 | 5.3 | <5 | <0.05 | 0.02F | 29.9 | 2.1FD2 | 1.88 | 0.0002F |
| | | 18-Nov-08 | N | 1351.03 | 1354.03 | 3.7 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | 0.001 | 4.6 | <5 | <0.05 | 0.02F | 26.3 | 2FD2 | 1.79 | 0.0004F |
| | | 25-Nov-08 | N | 1351.03 | 1354.03 | 3.81 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | 0.0009 | 4.6 | <5 | <0.05 | 0.03F | 26.2B3 | 1.8 | 1.32 | 0.0004F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 43 | 2-Dec-08 | N | 1351.03 | 1354.03 | 4.59 | <0.002 | <0.002 | 0.003F | <0.01 | <0.05 | 0.0012 | 5.8 | <5 | <0.05 | 0.01F | 34.2 | 2.1 | 1.61 | 0.0005 |
| | | 9-Dec-08 | N | 1351.03 | 1354.03 | 4.87 | <0.002 | <0.002 | 0.013F | <0.01 | <0.05 | 0.0013 | 7.3 | <5 | <0.05 | 0.02F | 35.6 | 2.7FD1 | 1.44 | 0.0003F |
| | | 16-Dec-08 | N | 1351.03 | 1354.03 | 4.3 | <0.002 | <0.002 | 0.023 | <0.01 | <0.05 | 0.0011 | 5.9 | <5 | <0.05 | 0.02F | 34.5 | 2.1FD1 | 1.64 | 0.0005 |
| | | 23-Dec-08 | N | 1351.03 | 1354.03 | 3.38 | -- | <0.002 | 0.009F | 0.004F | -- | 0.0009 | 3.7 | <5 | -- | 0.02F | 25 | 1.9FD1 | 1.26 | 0.0004F |
| | | 30-Dec-08 | N | 1351.03 | 1354.03 | 3.81 | -- | <0.002 | 0.008F | <0.01 | -- | 0.001 | 4.3 | <5 | -- | 0.02F | 29.5 | 1.2FD1 | 1.56 | 0.0002F |
| | | 6-Jan-09 | N | 1351.03 | 1354.03 | 4.21 | -- | <0.002 | 0.011F | 0.002F | -- | 0.0011 | 4.7 | <5 | -- | 0.01F | 32.7 | 1.9FD1 | 2.07 | 0.0004F |
| | | 13-Jan-09 | N | 1351.03 | 1354.03 | 3.4 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | 0.0009 | 3.3 | <5 | <0.05 | 0.02F | 23.5 | 1.6FD1 | 1.69 | 0.0004F |
| | | 20-Jan-09 | N | 1351.03 | 1354.03 | 3.58 | -- | <0.002 | 0.007F | <0.01 | -- | 0.0009 | 3.2 | 1F | -- | 0.02F | 23.6 | 1.5FD1 | 1.93 | 0.0004F |
| | | 27-Jan-09 | N | 1351.03 | 1354.03 | 4.42 | -- | <0.002 | 0.007F | <0.01 | -- | 0.001 | 3.8 | 1F | -- | 0.02F | 27 | 1.6FD1 | 1.98 | 0.0002F |
| | | 3-Feb-09 | N | 1351.03 | 1354.03 | 5.26 | -- | <0.002 | 0.007F | 0.002F | -- | 0.0012 | 4.1 | <5 | -- | 0.02F | 31 | 1.9FD1 | 2.37 | 0.0005 |
| | | 10-Feb-09 | N | 1351.03 | 1354.03 | 4.51 | -- | <0.002 | 0.008F | <0.01 | -- | 0.001 | 3.6 | <5 | -- | 0.02F | 26 | 1.9FD1 | 2.56 | 0.0004F |
| | | 17-Feb-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1351.03 | 1354.03 | 4.7 | <0.002V1 | <0.002 | 0.008F | <0.01 | <0.05 | 0.0009 | 3.4 | <3 | <0.05 | 0.02F | 24.6 | 1.8 | 1.79 | 0.0003F |
| | | 17-Mar-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1351.03 | 1354.03 | 3.58 | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | 0.0008 | 2.5 | <3 | <0.05 | 0.02F | 17.6 | 1.4 | 1.66 | 0.0001F |
| | | 14-Apr-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1351.03 | 1354.03 | 5.52 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0011 | 2.9 | <3 | <0.05 | 0.02F | 27.8 | 1.8 | 2.03 | 0.0002F |
| | | 12-May-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1351.03 | 1354.03 | 4.45 | <0.002 | <0.002 | 0.004F | 0.002F | <0.05 | 0.0008 | 2.2 | <3 | <0.05 | 0.02F | 21.8 | 1.2 | 3.19 | 0.0002F |
| | | 9-Jun-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1351.03 | 1354.03 | 7.63 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0013 | 2.7 | <3 | <0.05 | 0.02F | 29 | 1.5 | 6.01 | 0.0007 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 43 | 7-Jul-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1351.03 | 1354.03 | 9.43 | <0.002 | <0.002 | <0.02 | 0.003F | <0.05 | 0.0015 | 3.4 | <3 | <0.05 | 0.01F | 40.1 | 1.6 | 6.86 | 0.0004F |
| | | 4-Aug-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1351.03 | 1354.03 | 11 | <0.002 | <0.002 | 0.003F | 0.003F | 0.02F | 0.0015 | 4.2 | <3 | <0.05 | 0.03F | 38.5 | 1.6 | 4.36 | 0.0005 |
| | TEST 44 | 26-Aug-08 | N | 1510.74 | 1527.19 | 5.14 | 0.0008F | 0.0021 | 0.15 | 0.028 | 0.04F | 0.0445 | 68 | 5 | <0.05 | 1.35 | 42.5 | 3.1D1 | 4.69 | 0.0013 |
| | | 2-Sep-08 | N | 1510.74 | 1527.19 | 9.8D1 | <0.002 | 0.0016 | 0.023 | 0.043 | 0.04F | 0.0424 | 66.8 | 3F | <0.05 | 1.55 | 118D1 | 6.7D1 | 2.2 | 0.0003F |
| | | 9-Sep-08 | N | 1510.74 | 1527.19 | 10.6D2 | 0.0006 | 0.0012 | 0.011D2 | 0.047D2 | 0.03D2 | 0.0409 | 52.7 | 1 | <0.05 | 1.22D2 | 159D2 | 9D2 | 2.7 | 0.0005 |
| | | 16-Sep-08 | N | 1510.74 | 1527.19 | 9.55 | <0.002 | 0.0011 | 0.004 | 0.041 | <0.05 | 0.0327 | 32 | <5 | <0.05 | 0.82 | 134D1 | 7.2D1 | 3.64 | 0.0005 |
| | | 23-Sep-08 | N | 1510.74 | 1527.19 | 8.63D2 | <0.002 | 0.0012 | <0.02 | 0.039D2 | <0.05 | 0.0388 | 24.3 | <5 | <0.05 | 0.59 | 140D2 | 4D2 | 5.8 | 0.0003 |
| | | 30-Sep-08 | N | 1510.74 | 1527.19 | 9.6 | <0.002 | 0.0013 | <0.02 | 0.039 | <0.1D1 | 0.0486 | 20.1 | <5 | <0.05 | 0.49 | 149D1 | 5D1 | 8.5 | 0.0003 |
| | | 7-Oct-08 | N | 1510.74 | 1527.19 | 9.66D1 | <0.002 | 0.0007F | 0.003F | 0.038D1 | 0.01F | 0.0509B7 | 16.3 | <5 | <0.05 | 0.38 | 179D1 | 3FD1 | 10.5 | 0.0001F |
| | | 14-Oct-08 | N | 1510.74 | 1527.19 | 7.09D1 | <0.002 | <0.001 | <0.03D1 | 0.026D1 | <0.05 | 0.0362 | 10.8 | <5 | <0.05 | 0.25 | 139D1 | <10D1 | 9.03 | <0.0005 |
| | | 21-Oct-08 | N | 1510.74 | 1527.19 | 8.05D1 | <0.002 | 0.0011F | <0.02 | 0.023D1 | <0.05 | 0.0436 | 10.4 | <5 | <0.05 | 0.21 | 160D1 | 3FD1 | 13.4 | 0.0003F |
| | | 28-Oct-08 | N | 1510.74 | 1527.19 | 5.76D2 | <0.002 | 0.0009F | <0.03D2 | 0.021 | <0.05 | 0.0329 | 7.6 | <5 | <0.05 | 0.15 | 131D2 | <10D2 | 12.1 | 0.0001F |
| | | 4-Nov-08 | N | 1510.74 | 1527.19 | 6.3D2 | <0.002 | 0.0008F | <0.02 | 0.019 | <0.1D2 | 0.035 | 7.2 | <5 | <0.1D2 | 0.13 | 147D2 | 2FD1 | 15.1 | 0.0009 |
| | | 11-Nov-08 | N | 1510.74 | 1527.19 | 5.72D2 | <0.002 | 0.0009F | <0.02 | 0.017 | <0.1D2 | 0.0342 | 6.6 | <5 | <0.05 | 0.12 | 140D2 | <10D2 | 13.7 | <0.0005 |
| | | 18-Nov-08 | N | 1510.74 | 1527.19 | 5.22 | <0.002 | 0.001F | <0.02 | 0.013 | <0.05 | 0.0312 | 5.8 | <5 | <0.05 | 0.09 | 126D2 | 10D2M2V | 14.8 | <0.0005 |
| | | 25-Nov-08 | N | 1510.74 | 1527.19 | 5.26 | <0.002 | 0.0006F | <0.02 | 0.013 | <0.05 | 0.0302 | 6 | <5 | <0.05 | 0.1 | 129D1B3 | 1.2 | 16.5 | <0.0005 |
| | | 2-Dec-08 | N | 1510.74 | 1527.19 | 3.78D1 | <0.002 | 0.0007F | <0.02 | 0.007F | <0.1D1 | 0.0251 | 5 | <5 | <0.1D1 | 0.07 | 115D1 | 1 | 13.7 | 0.0002F |
| | | 9-Dec-08 | N | 1510.74 | 1527.19 | 3.76 | <0.002 | 0.0006F | <0.03D1 | 0.008FD1 | <0.1D1 | 0.0229 | 4.7 | <5 | <0.05 | 0.07 | 109D1M3 | <20D1 | 15.8 | <0.0005 |
| | | 16-Dec-08 | N | 1510.74 | 1527.19 | 3.18D1 | <0.002 | 0.0006F | <0.02 | 0.005F | <0.05 | 0.0214 | 4.8 | <5 | <0.1D1 | 0.07 | 100D1 | <20D1 | 16.1 | 0.0001F |
| | | 23-Dec-08 | N | 1510.74 | 1527.19 | 3.67D1 | -- | 0.0007F | <0.03D2 | <0.02D2 | -- | 0.021 | 4.5 | <5 | -- | 0.06 | 118D1M3 | <20D1 | 16.8M3 | <0.0005 |
| | | 30-Dec-08 | N | 1510.74 | 1527.19 | 4.01 | -- | 0.0007F | 0.004F | <0.05D1 | -- | 0.0203 | 5.6 | <5 | -- | 0.07 | 136D1 | <20D1 | 21.9 | <0.0005 |
| | | 6-Jan-09 | N | 1510.74 | 1527.19 | 3.58 | -- | <0.002 | <0.02 | 0.005FD1 | -- | 0.0195 | 4.8 | <5 | -- | 0.05 | 115D1 | <20D1 | 21.5 | 0.0001F |
| | | 13-Jan-09 | N | 1510.74 | 1527.19 | 3.39 | <0.002 | 0.0007F | <0.02 | 0.003F | <0.05 | 0.018 | 4.6 | <5 | <0.05 | 0.05 | 103D1B7 | <20D1 | 19.9 | 0.0001F |
| | | 20-Jan-09 | N | 1510.74 | 1527.19 | 3.92 | -- | 0.0008F | <0.02 | 0.004F | -- | 0.0193 | 5.5 | 1F | -- | 0.06 | 108D1 | <20D1 | 27.1 | <0.0005 |
| | | 27-Jan-09 | N | 1510.74 | 1527.19 | 3.68 | -- | 0.0006F | <0.02 | 0.002F | -- | 0.0168 | 5.1 | <5 | -- | 0.05 | 105D1 | <20D1 | 26.2 | 0.0001F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 44 | 3-Feb-09 | N | 1510.74 | 1527.19 | 3.53 | -- | 0.0006F | <0.02 | 0.003F | -- | 0.0161 | 5.1 | <5 | -- | 0.05 | 98.2D1 | <20D1 | 28.1 | <0.0005 |
| | | 10-Feb-09 | N | 1510.74 | 1527.19 | 4.53 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0187 | 6.5 | <5 | -- | 0.06 | 116D2 | <20D1 | 38D2 | 0.0024 |
| | | 17-Feb-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1510.74 | 1527.19 | 5.52 | <0.002V1 | 0.0005F | 0.005F | 0.004F | <0.05 | 0.0192 | 9.7 | <3 | 0.01F | 0.07 | 125D2 | 1 | 75.5 | 0.0002F |
| | | 17-Mar-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1510.74 | 1527.19 | 6.95 | <0.002 | 0.0013F | <0.02 | 0.003F | 0.01F | 0.0202 | 12.9 | <3 | 0.01F | 0.1 | 123D1 | 1.3 | 175 | 0.0003F |
| | | 14-Apr-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1510.74 | 1527.19 | 5.58 | <0.002 | 0.0027 | <0.02 | 0.002F | <0.05 | 0.0148 | 14.6 | <3 | <0.05 | 0.11 | 94.3 | 1.3 | 214 | 0.0013 |
| | | 12-May-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1510.74 | 1527.19 | 4.81 | <0.002 | 0.0027 | 0.003F | <0.01 | <0.05 | 0.0099 | 13.7 | <3 | <0.05 | 0.09 | 66.7 | 1.3 | 241 | 0.0002F |
| | | 9-Jun-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1510.74 | 1527.19 | 6.48D1 | <0.002 | 0.0044 | <0.02 | <0.02D1 | <0.1D1 | 0.0085 | 20 | <3 | 0.02FD1 | 0.1 | 59.8 | 1.8 | 304 | 0.0003F |
| | | 7-Jul-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1510.74 | 1527.19 | 6.45 | <0.002 | 0.0039 | <0.02 | 0.006F | 0.03F | 0.0067 | 23.7 | <3 | 0.01F | 0.11 | 58.2 | 1.8 | 326 | 0.0002F |
| | | 4-Aug-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1510.74 | 1527.19 | 4.8 | <0.002 | 0.0015F | <0.02 | <0.01 | 0.01F | 0.0042 | 19.4 | <3 | 0.04F | 0.1 | 47.6 | 1.8 | 285 | 0.0004F |
| | | 1-Sep-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 44 | 8-Sep-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 1510.74 | 1527.19 | 3.35 | <0.002 | 0.0017F | <0.02 | <0.01 | 0.02F | 0.0027 | 15.4 | <30D1 | <0.05 | 0.08 | 34.2 | 2FD1 | 216 | 0.0001F |
| | | 29-Sep-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 1510.74 | 1527.19 | 1.33D1 | <0.002 | 0.0007F | <0.03D1 | <0.02D1 | <0.1D1 | 0.001 | 7.4 | <3 | <0.1D1 | 0.05 | 16.3 | 0.6 | 133 | 0.0001F |
| | | 27-Oct-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 1510.74 | 1527.19 | 1.3 | <0.002 | 0.0011F | <0.02 | <0.01 | <0.05 | 0.0011 | 7.3 | <3 | <0.05 | 0.05 | 17.3 | 0.6 | 164 | 0.0001F |
| | | 24-Nov-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 45 | 26-Aug-08 | FD | 1510.74 | 1527.19 | 3.83 | 0.0006F | 0.0018 | 0.078 | 0.02 | 0.02F | 0.0291 | 41.2 | 3F | <0.05 | 0.87 | 29 | 2FD1 | 3.08 | 0.0003F |
| | | 2-Sep-08 | FD | 1510.74 | 1527.19 | 7.27M3 | <0.002 | 0.001 | 0.014F | 0.027 | 0.02F | 0.0278 | 39.7 | 2F | <0.05 | 0.97 | 74.9M3 | 4.5D1 | 1.57 | 0.0004F |
| | | 9-Sep-08 | FD | 1510.74 | 1527.19 | 6.97 | 0.0005 | <0.001 | 0.006 | 0.032 | <0.05 | 0.0254 | 32.9 | <5 | <0.1D2 | 0.75 | 89.8D2 | 5D2 | 1.83D2 | 0.0002 |
| | | 16-Sep-08 | FD | 1510.74 | 1527.19 | 4.21 | <0.002 | <0.001 | <0.02 | 0.023 | <0.05 | 0.0151 | 11.3 | <5 | <0.05 | 0.35 | 72.1 | 2D1 | 2.6 | <0.0005 |
| | | 23-Sep-08 | FD | 1510.74 | 1527.19 | 4.46 | <0.002 | 0.0008 | <0.02 | 0.022 | <0.05 | 0.0179 | 11.1 | <5 | <0.05 | 0.27 | 73.1 | 2D2 | 3.13 | 0.0002 |
| | | 30-Sep-08 | FD | 1510.74 | 1527.19 | 4.73 | <0.002 | 0.0009 | <0.02 | 0.022 | <0.05 | 0.023 | 8.8 | <5 | <0.05 | 0.25 | 81.3 | <10D1 | 4.11 | 0.0002 |
| | | 7-Oct-08 | FD | 1510.74 | 1527.19 | 4.21 | <0.002 | <0.001 | <0.02 | 0.018 | <0.05 | 0.0214B7 | 5.8 | <5 | <0.05 | 0.17 | 74.4 | <10D1 | 4.04 | 0.0001F |
| | | 14-Oct-08 | FD | 1510.74 | 1527.19 | 4.14 | <0.002 | <0.001 | <0.02 | 0.018 | <0.05 | 0.0199 | 5.5 | <5 | <0.05 | 0.15 | 78.7 | <10D1 | 5.04 | 0.0002F |
| | | 21-Oct-08 | FD | 1510.74 | 1527.19 | 3.32 | <0.002 | 0.0006F | <0.02 | 0.01 | <0.05 | 0.0189 | 3.9 | <5 | <0.05 | 0.09 | 69.2 | <10D1 | 6.31 | <0.0005 |
| | | 28-Oct-08 | FD | 1510.74 | 1527.19 | 2.76 | <0.002 | <0.002 | <0.02 | 0.009F | <0.05 | 0.0155 | 3.2 | <5 | <0.05 | 0.08 | 64.7 | <10D2 | 5.59 | 0.0003F |
| | | 4-Nov-08 | FD | 1510.74 | 1527.19 | 3.67 | <0.002 | 0.0006F | <0.02 | 0.011 | <0.05 | 0.022 | 4.2 | <5 | <0.05 | 0.08 | 81.7 | <10D1 | 8.44 | <0.0005 |
| | | 11-Nov-08 | FD | 1510.74 | 1527.19 | 3.08 | <0.002 | <0.002 | <0.02 | 0.009F | <0.05 | 0.019 | 3.4 | <5 | <0.05 | 0.07 | 73.3 | <10D2 | 7.28 | <0.0005 |
| | | 18-Nov-08 | FD | 1510.74 | 1527.19 | 2.76 | <0.002 | 0.0006F | <0.02 | 0.007F | <0.05 | 0.017 | 3.2 | <5 | <0.05 | 0.06 | 75.1 | <10D2V1 | 8.15 | 0.0002F |
| | | 25-Nov-08 | FD | 1510.74 | 1527.19 | 2.15 | <0.002 | <0.002 | <0.02 | 0.006F | <0.05 | 0.0137 | 2.7 | <5 | <0.05 | 0.05 | 60.8B3 | 0.5 | 7.83 | <0.0005 |
| | | 2-Dec-08 | FD | 1510.74 | 1527.19 | 2.01 | <0.002 | <0.002 | <0.02 | 0.003F | <0.05 | 0.0135 | 2.6 | <5 | <0.05 | 0.04F | 59 | 0.5 | 9.49 | 0.0002F |
| | | 9-Dec-08 | FD | 1510.74 | 1527.19 | 1.63 | <0.002 | <0.002 | <0.02 | 0.004F | <0.05 | 0.0099 | 2 | <5 | <0.05 | 0.03F | 45.6 | <10D1 | 7.04 | 0.0001F |
| | | 16-Dec-08 | FD | 1510.74 | 1527.19 | 1.24D1 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0088 | 1.9 | <5 | <0.1D1 | 0.03F | 37.9D1 | <10D1 | 6.78 | 0.0001F |
| | | 23-Dec-08 | FD | 1510.74 | 1527.19 | 1.81 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0093 | 2.2 | <5 | -- | 0.02F | 49 | 4FD1 | 7.85M3 | <0.0005 |
| | | 30-Dec-08 | FD | 1510.74 | 1527.19 | 1.93 | -- | 0.0005F | <0.02 | 0.003F | -- | 0.0101 | 2.7 | <5 | -- | 0.04F | 58 | <10D1 | 10.2 | 0.001 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 45 | 6-Jan-09 | FD | 1510.74 | 1527.19 | 1.87 | -- | <0.002 | 0.004F | 0.002F | -- | 0.0101 | 2.5 | <5 | -- | 0.03F | 55.8 | <10D1 | 9.36 | 0.0003F |
| | | 13-Jan-09 | FD | 1510.74 | 1527.19 | 1.44 | <0.002 | <0.002 | <0.02 | 0.002F | <0.05 | 0.008 | 2 | <5 | <0.05 | 0.02F | 41.3 | <10D1 | 8.4 | 0.0001F |
| | | 20-Jan-09 | FD | 1510.74 | 1527.19 | 2.14 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0098 | 2.6 | 1F | -- | 0.03F | 54.4 | <10D1 | 11.4 | <0.0005 |
| | | 27-Jan-09 | FD | 1510.74 | 1527.19 | 1.53 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0072 | 2 | <5 | -- | 0.02F | 40 | <10D1 | 9.31 | <0.0005 |
| | | 3-Feb-09 | FD | 1510.74 | 1527.19 | 3.22 | -- | 0.0005F | <0.02 | 0.002F | -- | 0.0133 | 4.1 | <5 | -- | 0.04F | 73.4 | <10D1 | 17.6 | <0.0005 |
| | | 10-Feb-09 | FD | 1510.74 | 1527.19 | 1.64 | <0.002 | 0.0006F | <0.02 | 0.002F | <0.05 | 0.0081 | 2.4 | <5H3 | <0.05 | 0.03F | 43D2 | <10D2H3 | 12.2 | <0.0005 |
| | | 17-Feb-09 | FD | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 46 | 26-Aug-08 | FD | 1510.74 | 1527.19 | 1.65 | 0.0004F | 0.001 | 0.072 | 0.008F | 0.02F | 0.0142 | 20.9 | 2 | <0.05 | 0.4 | 13.6 | 1.3 | 1.29 | 0.0009 |
| | | 2-Sep-08 | FD | 1510.74 | 1527.19 | 2.71 | <0.002 | 0.0006F | 0.007F | 0.011 | 0.01F | 0.0127 | 16.6 | <5 | <0.05 | 0.4 | 30.4 | 2FD1 | 0.61 | <0.0005 |
| | | 9-Sep-08 | FD | 1510.74 | 1527.19 | 3.02 | <0.002 | <0.001 | 0.005 | 0.013 | <0.05 | 0.0111 | 11.8 | <5 | <0.05 | 0.31 | 41.8 | 1.7D2 | 0.83 | 0.0004 |
| | | 30-Sep-08 | FD | 1510.74 | 1527.19 | 2.49 | <0.002 | <0.001 | <0.02 | 0.009 | <0.05 | 0.0129 | 4.5 | <5 | <0.05 | 0.11 | 42.8 | 2D1 | 2.33 | 0.0003 |
| | | 7-Oct-08 | FD | 1510.74 | 1527.19 | 2.38 | <0.002 | <0.001 | <0.02 | 0.008F | <0.05 | 0.0127B7 | 3.3 | <5 | <0.05 | 0.08 | 42.2 | <5D1 | 2.81 | 0.0004F |
| | | 14-Oct-08 | FD | 1510.74 | 1527.19 | 1.39 | <0.002 | <0.001 | <0.02 | 0.006F | 0.01F | 0.0071 | 2.1 | <5 | <0.05 | 0.06 | 28.6 | <5D1 | 2.5 | 0.0003F |
| | | 21-Oct-08 | FD | 1510.74 | 1527.19 | 1.67 | <0.002 | 0.0005F | <0.02 | 0.003F | <0.05 | 0.0079 | 2 | <5 | <0.05 | 0.04F | 31.6 | <5D1 | 2.58 | 0.0002F |
| | | 28-Oct-08 | FD | 1510.74 | 1527.19 | 0.88 | <0.002 | <0.002 | <0.02 | 0.004F | <0.05 | 0.0047 | 1.3 | <5 | <0.05 | 0.04F | 20.2 | <5D2 | 2.25 | <0.0005 |
| | | 4-Nov-08 | FD | 1510.74 | 1527.19 | 1.15 | <0.002 | <0.002 | <0.02 | 0.004F | <0.05 | 0.0054 | 1.3 | <5 | <0.05 | 0.03F | 22.7 | <5D1 | 2.53 | 0.0002F |
| | | 11-Nov-08 | FD | 1510.74 | 1527.19 | 1.52 | <0.002 | <0.002 | <0.02 | 0.005F | <0.05 | 0.0075 | 1.7 | <5 | <0.05 | 0.04F | 31.9 | <5D2 | 3.37 | <0.0005 |
| | | 18-Nov-08 | FD | 1510.74 | 1527.19 | 0.96 | <0.002 | <0.002 | <0.02 | 0.003F | <0.05 | 0.0052 | 1.3 | <5 | <0.05 | 0.03F | 22.7 | <5D2V1 | 3.07 | 0.0002F |
| | | 25-Nov-08 | FD | 1510.74 | 1527.19 | 0.69 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0035 | 1.1 | <5 | <0.05 | 0.02F | 17.8B3 | 0.2F | 2.64 | 0.0001F |
| | | 2-Dec-08 | FD | 1510.74 | 1527.19 | 0.57 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0029 | 0.6F | <5 | <0.05 | 0.01F | 14.7 | 0.1F | 2.37 | 0.0002F |
| | | 9-Dec-08 | FD | 1510.74 | 1527.19 | 0.5 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0024 | 0.6F | <5 | <0.05 | <0.05 | 13.3 | <5D1M2 | 2.45 | <0.0005 |
| | | 16-Dec-08 | FD | 1510.74 | 1527.19 | 0.73 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0029 | 0.7F | <5 | <0.05 | 0.03F | 17.3M3 | <5D1 | 2.15 | <0.0005 |
| | | 23-Dec-08 | FD | 1510.74 | 1527.19 | 0.6 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0027 | 0.7F | <5 | -- | 0.02F | 15.4 | <5D1 | 2.08 | 0.0001F |
| | | 30-Dec-08 | FD | 1510.74 | 1527.19 | 0.51 | -- | <0.002 | <0.02M1 | <0.01 | -- | 0.0022 | 0.7FM1 | <5 | -- | 0.02FM1 | 14.2M3 | <5D1 | 2.42 | <0.0005 |
| | | 6-Jan-09 | FD | 1510.74 | 1527.19 | 0.4 | -- | <0.002 | 0.005F | <0.01 | -- | 0.0017 | 0.4F | <5M1 | -- | <0.05 | 11.2M3 | <5D1 | 2.06 | <0.0005 |
| | | 13-Jan-09 | FD | 1510.74 | 1527.19 | 0.38 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0016 | 0.5F | <5M1 | <0.05 | 0.01F | 9.81M3 | <5D1 | 2.08 | <0.0005 |
| | | 20-Jan-09 | FD | 1510.74 | 1527.19 | 0.38 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0014 | 0.5F | <5 | -- | <0.05 | 8.97M3 | <5D1 | 2.27 | <0.0005 |
| | | 27-Jan-09 | FD | 1510.74 | 1527.19 | 0.44 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0016 | 0.6F | <5 | -- | 0.01F | 10.6M3 | <5D1 | 2.48M2 | <0.0005 |
| | | 3-Feb-09 | FD | 1510.74 | 1527.19 | 0.47 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0016 | 0.6F | <5 | -- | 0.01F | 11.5M3 | <5D1 | 2.43 | <0.0005 |
| | | 10-Feb-09 | FD | 1510.74 | 1527.19 | 0.77 | <0.002 | 0.0005F | <0.02 | <0.01 | <0.05 | 0.0028 | 0.8F | <5H3 | <0.05 | 0.02F | 16.4M3 | <5D1H3 | 2.86 | <0.0005 |
| | | 23-Sep-08 | FD | 1510.74 | 1527.19 | 3.45 | <0.002 | <0.001 | <0.02 | 0.014 | <0.05 | 0.0137 | 8.1 | <5 | <0.05 | 0.2 | 53.8 | 1.3D2 | 2.08 | 0.0004 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 46 | 17-Feb-09 | FD | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 47 | 26-Aug-08 | N | 1597.32 | 1599.88 | 428 | 0.0017F | 0.0009F | 0.08D1 | 0.04FD1 | 0.09FD1 | 0.0084 | 345 | 21 | 0.75 | 3.28 | 240D1 | 193D1 | 347 | 0.0048 |
| | | 2-Sep-08 | N | 1597.32 | 1599.88 | 27.6 | <0.002 | <0.001 | 0.025 | <0.01 | 0.01F | 0.0014 | 43.7 | <5 | <0.05 | 0.09 | 13.7 | 32D1 | 32.9 | 0.0006 |
| | | 9-Sep-08 | N | 1597.32 | 1599.88 | 18.4 | 0.0004 | <0.001 | 0.023 | 0.002 | <0.05 | 0.0014 | 27.3 | <5 | <0.05 | 0.07 | 14.7 | 17.2 | 22.5 | 0.0002 |
| | | 16-Sep-08 | N | 1597.32 | 1599.88 | 54.9 | <0.002 | 0.001 | 0.015 | 0.006 | <0.05 | 0.0035 | 71.3 | <5 | 0.02 | 0.16 | 53 | 56D1 | 97.4 | 0.0004 |
| | | 23-Sep-08 | N | 1597.32 | 1599.88 | 20.2 | <0.002 | 0.0006 | 0.01 | 0.003 | <0.05 | 0.0018 | 28.6 | <5 | <0.05 | 0.08 | 20.3 | 15.9D2 | 63 | 0.0006 |
| | | 30-Sep-08 | N | 1597.32 | 1599.88 | 14.6 | <0.002 | <0.001 | 0.004 | <0.01 | <0.05 | 0.0011 | 22.6 | <5 | <0.05 | 0.04 | 17.7 | 31D1 | 38.3 | 0.0004 |
| | | 7-Oct-08 | N | 1597.32 | 1599.88 | 97.4D1 | <0.002 | 0.0028 | 0.006F | <0.05D1 | 0.02F | 0.0151B7 | 100 | <5 | 0.19 | 0.73 | 309D1 | 70.2D1 | 160 | 0.0002F |
| | | 14-Oct-08 | N | 1597.32 | 1599.88 | 13.3 | <0.002 | <0.001 | 0.006F | <0.01 | 0.01F | 0.0015 | 17.6 | <5 | <0.05 | 0.07 | 44.9 | 11.4D1 | 47.3 | 0.0002F |
| | | 21-Oct-08 | N | 1597.32 | 1599.88 | 10.3 | <0.002 | 0.0009F | <0.02 | <0.01 | <0.05 | 0.0018 | 11.3 | <5 | 0.04F | 0.06 | 41.7 | 5.8D1 | 48.8 | 0.0002F |
| | | 28-Oct-08 | N | 1597.32 | 1599.88 | 24.6 | <0.002 | 0.0007F | 0.007F | 0.003F | <0.05 | 0.0026 | 29.8 | <5 | 0.06 | 0.1 | 22.9 | 19.6D2 | 134 | 0.0002F |
| | | 4-Nov-08 | N | 1597.32 | 1599.88 | 12.7 | <0.002 | 0.0011F | 0.006F | <0.01 | <0.05 | 0.002 | 15.6 | <5 | 0.05 | 0.06 | 37 | 9.8D2 | 58.7 | 0.0003F |
| | TEST 47S | 11-Nov-08 | N | 1597.32 | 1599.88 | 15.5 | <0.002 | <0.04D2 | 0.009F | 0.003F | <0.05 | 0.0031 | 16.4 | <5 | 0.04F | 0.12 | 87.1 | 11.8D2 | 53 | <0.0005 |
| | | 18-Nov-08 | N | 1597.32 | 1599.88 | 4.74 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.001 | 4.9 | <5 | <0.05 | 0.03F | 14.1 | 3.8D2V1 | 24.6 | <0.0005 |
| | | 25-Nov-08 | N | 1597.32 | 1599.88 | 3.8 | <0.002 | <0.002 | 0.003F | <0.01 | <0.05 | 0.0007 | 3.9 | <5 | 0.01F | 0.03F | 9.1B3 | 2.6 | 19.4 | 0.0002F |
| | | 2-Dec-08 | N | 1597.32 | 1599.88 | 4.12 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0008 | 4.1 | <5 | <0.05 | 0.02F | 7.66 | 2.8 | 21.1 | <0.0005 |
| | | 9-Dec-08 | N | 1597.32 | 1599.88 | 4.72 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0008 | 4.1 | <5 | 0.02F | 0.02F | 9.94 | 3.6D1 | 22.7 | <0.0005 |
| | | 16-Dec-08 | N | 1597.32 | 1599.88 | 2.54D1 | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | 0.0008 | 4 | <5 | <0.1D1 | 0.03F | 5.55D1 | 2.9 | 24.4 | 0.0001F |
| | | 23-Dec-08 | N | 1597.32 | 1599.88 | 4.88 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0007 | 3.4 | <5M1 | -- | 0.03F | 11.6M3 | 1.4FD1M2 | 25.4M3 | <0.0005 |
| | | 30-Dec-08 | N | 1597.32 | 1599.88 | 5.32 | -- | <0.002N1 | 0.005F | <0.01 | -- | 0.0008 | 4.5 | <5 | -- | 0.04F | 12.2 | 2.9 | 32.4 | <0.0005 |
| | | 6-Jan-09 | N | 1597.32 | 1599.88 | 4.86 | -- | <0.002 | 0.006F | <0.01 | -- | 0.0007 | 3.7 | <5 | -- | 0.01F | 11.3 | 2.8 | 30.2 | <0.0005 |
| | | 13-Jan-09 | N | 1597.32 | 1599.88 | 4.1 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0006 | 2.8 | <5 | 0.04F | 0.02F | 8.95 | 2.2 | 23.8 | <0.0005 |
| | | 20-Jan-09 | N | 1597.32 | 1599.88 | 4.6 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0006 | 3.4 | 1F | -- | 0.03F | 10.6 | 2.6FD1 | 28.9 | <0.0005 |
| | | 27-Jan-09 | N | 1597.32 | 1599.88 | 5.06 | -- | <0.002N1 | <0.02 | <0.01 | -- | 0.0007 | 3.3 | <5 | -- | 0.02F | 10.9 | 2.6 | 32.6 | <0.0005 |
| | | 3-Feb-09 | N | 1597.32 | 1599.88 | 5.22 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0007 | 3.4 | <5 | -- | 0.03F | 12.2 | 2.7FD1 | 35.7 | <0.0005 |
| | | 10-Feb-09 | N | 1597.32 | 1599.88 | 5.22 | <0.002 | 0.0005F | <0.02 | <0.01 | <0.05 | 0.0008 | 3.3 | <5H3 | 0.06 | 0.03F | 12.4 | 2.5FD1H3 | 36.5 | <0.0005 |
| | | 17-Feb-09 | N | 1597.32 | 1599.88 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 48 | 26-Aug-08 | N | 1634.46 | 1637.47 | 89.5 | 0.0009F | 0.0018 | 0.13D1 | 0.01FD1 | 0.1FD1 | 0.0295 | 225 | 6 | <0.05 | 6.94 | 255D1 | 75D1M2 | 11.7 | 0.0053 |
| | | 2-Sep-08 | N | 1634.46 | 1637.47 | 28.8 | <0.002 | <0.001 | 0.043 | 0.007F | 0.02F | 0.0024 | 46.3 | <5 | <0.05 | 0.33 | 41.4 | 36D1 | 1.35 | 0.0007 |
| | | 9-Sep-08 | N | 1634.46 | 1637.47 | 4.76 | <0.002 | <0.001 | 0.016 | <0.01 | <0.05 | 0.0011 | 7.8 | <5 | <0.05V1 | 0.08 | 17.5 | 4.6 | 0.48 | 0.0005 |
| | | 16-Sep-08 | N | 1634.46 | 1637.47 | 11 | <0.002 | <0.001 | 0.012 | 0.003 | <0.05 | 0.0018 | 16.6 | <5 | <0.05 | 0.11 | 24.2 | 10.3 | 3.39 | 0.0004 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 48 | 23-Sep-08 | N | 1634.46 | 1637.47 | 8.49 | <0.002 | <0.001 | 0.014 | 0.003 | <0.05 | 0.0018 | 13.7 | <5 | <0.05 | 0.09 | 31 | 7 | 3.08 | 0.0006 |
| | | 30-Sep-08 | N | 1634.46 | 1637.47 | 25.5 | <0.002 | 0.0006 | 0.006 | 0.004 | <0.1D1 | 0.0058 | 45 | <5 | <0.05 | 0.42 | 118D1 | 25D1 | 7.63 | 0.0006 |
| | | 7-Oct-08 | N | 1634.46 | 1637.47 | 23.9D1 | <0.002 | <0.001 | 0.005F | 0.004FD1 | <0.05 | 0.0095B7 | 31.3 | <5 | <0.05 | 0.46 | 213D1 | 37D1 | 6.62 | 0.0003F |
| | | 14-Oct-08 | N | 1634.46 | 1637.47 | 20.9D1 | <0.002 | <0.001 | <0.03D1 | <0.02D1 | <0.05 | 0.0062 | 27.1 | <5 | <0.05 | 0.4 | 134D1 | 18D1 | 3.82 | 0.0002F |
| | | 21-Oct-08 | N | 1634.46 | 1637.47 | 7.31 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0022 | 8 | <5 | <0.05 | 0.11 | 40.9 | 5FD1 | 1.53 | 0.0001F |
| | | 28-Oct-08 | N | 1634.46 | 1637.47 | 17.8D2 | <0.002 | <0.002 | <0.03D2 | 0.005F | <0.05 | 0.0046 | 18.9 | <5 | <0.05 | 0.26 | 98.4D2 | 15D2 | 6.66 | 0.0002F |
| | | 4-Nov-08 | N | 1634.46 | 1637.47 | 15D2 | <0.002 | 0.0006F | 0.004F | 0.005F | <0.1D2 | 0.0075 | 11.4 | <5 | <0.1D2 | 0.22 | 182D2 | 11D1 | 6.26 | 0.0009 |
| | TEST 48S | 11-Nov-08 | N | 1634.46 | 1637.47 | 9.8D2 | <0.002 | <0.002N1 | 0.007F | 0.005F | <0.3D2 | 0.0096 | 9.3 | <5 | <0.05 | 0.23 | 236D2 | 8FD2 | 3.93 | <0.0005 |
| | | 18-Nov-08 | N | 1634.46 | 1637.47 | 2.09 | <0.002 | <0.002 | 0.008F | <0.01 | <0.05 | 0.0004F | 3.2 | <5 | <0.05 | 0.02F | 22 | 2FD2V1 | 0.04F | 0.0139 |
| | | 25-Nov-08 | N | 1634.46 | 1637.47 | 2.65 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0023 | 2.2 | <5 | <0.05 | 0.04F | 39.9B3M3 | 1.4 | 1.45 | 0.0002F |
| | | 2-Dec-08 | N | 1634.46 | 1637.47 | 2.73 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0029 | 2.1 | <5 | <0.05 | 0.04F | 44.4 | 1.5 | 1.02 | <0.0005 |
| | | 9-Dec-08 | N | 1634.46 | 1637.47 | 2.8 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0027 | 2.1 | <5 | <0.05 | 0.04F | 42.3 | <10D1 | 1.33 | <0.0005 |
| | | 16-Dec-08 | N | 1634.46 | 1637.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1634.46 | 1637.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 49 | 26-Aug-08 | N | 1739.63 | 1742.63 | 100 | 0.0004F | 0.0014 | 0.115D1 | <0.02D1 | 0.09FD1 | 0.0214 | 230 | 23 | <0.05 | 0.7 | 133D1 | 120D1 | 44 | 0.0105 |
| | | 2-Sep-08 | N | 1739.63 | 1742.63 | 17.4 | <0.002 | <0.001 | 0.038 | <0.01 | 0.03F | 0.0008 | 42.9 | 1F | <0.05 | 0.05 | 18.6 | 26D1M2 | 44.9 | 0.0058 |
| | | 9-Sep-08 | N | 1739.63 | 1742.63 | 5.48 | <0.002 | <0.001 | 0.021 | <0.01 | <0.05 | 0.0002 | 10 | <5 | <0.05V1 | 0.02 | 6.61 | 10.3 | 7.39 | 0.0036 |
| | | 16-Sep-08 | N | 1739.63 | 1742.63 | 16.1 | <0.002 | <0.001 | 0.034 | <0.01 | <0.05 | 0.002 | 31.4 | 2 | <0.05 | 0.09 | 51.1 | 24D1 | 0.46 | 0.0169 |
| | | 23-Sep-08 | N | 1739.63 | 1742.63 | 10.5 | <0.002 | <0.001 | 0.037 | <0.01 | <0.05 | 0.0009 | 17.9 | <5 | <0.05 | 0.04 | 28.1 | 13.8 | 0.16 | 0.0077 |
| | | 30-Sep-08 | N | 1739.63 | 1742.63 | 20.5 | <0.002 | <0.001 | 0.046 | <0.01 | <0.05 | 0.0031 | 40 | <5 | <0.05 | 0.12 | 97.3 | 27D1 | 0.33 | 0.031 |
| | | 7-Oct-08 | N | 1739.63 | 1742.63 | 28.7D1 | <0.002 | <0.001 | 0.037 | 0.02<D1 | <0.05 | 0.0048B7 | 52.5 | 1F | <0.05 | 0.21 | 213D1 | 39D1M2 | 0.62 | 0.0391B7 |
| | | 14-Oct-08 | N | 1739.63 | 1742.63 | 11.3 | <0.002 | <0.001 | 0.03 | <0.01 | 0.01F | 0.0014 | 16.5 | <5 | <0.05 | 0.06 | 54.9 | 12D1 | 0.2 | 0.0175 |
| | | 21-Oct-08 | N | 1739.63 | 1742.63 | 6.76 | <0.002 | <0.002 | 0.019F | <0.01 | <0.05 | 0.0009 | 8.3 | <5 | <0.05 | 0.03F | 32.5 | 9D1M2 | 0.2 | 0.0203 |
| | | 28-Oct-08 | N | 1739.63 | 1742.63 | 9.26 | <0.002 | <0.002 | 0.033 | <0.01 | <0.05 | 0.0014 | 13.1 | 2F | <0.05 | 0.06 | 60.8 | 11D2 | 0.35 | 0.0262 |
| | | 4-Nov-08 | N | 1739.63 | 1742.63 | 35.3D2 | <0.002 | 0.0007F | 0.062 | <0.01 | <0.3D2 | 0.0082 | 51.1 | 1F | <0.3D2 | 0.35 | 364D2 | 34D1 | 2.14 | 0.0999 |
| | TEST 49S | 11-Nov-08 | N | 1739.63 | 1742.63 | 6.94 | <0.04D2 | <0.04D2 | 0.031 | <0.01 | <0.05 | <0.01D2 | 11.1 | <5 | <0.05 | 0.07 | 85.1 | 9D2 | 0.11 | 0.04D2 |
| | | 18-Nov-08 | N | 1739.63 | 1742.63 | 3.41 | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | 0.0031 | 2.7 | <5 | <0.05 | 0.06 | 59.9 | 2FD2V1 | 2.17 | 0.0015 |
| | | 25-Nov-08 | N | 1739.63 | 1742.63 | 1.43 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | 0.0002F | 2.1 | <5 | <0.05 | 0.02F | 15.9B3 | 1.7 | 0.06 | 0.0085 |
| | | 2-Dec-08 | N | 1739.63 | 1742.63 | 1.41 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0003F | 2 | <5 | <0.05 | <0.05 | 18.2 | 1.8 | 0.03F | 0.0075 |
| | | 9-Dec-08 | N | 1739.63 | 1742.63 | 1.42 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0002F | 1.6 | <5 | <0.05 | <0.05 | 18.6 | <10D1 | 0.05 | 0.0083 |
| | | 16-Dec-08 | N | 1739.63 | 1742.63 | 1.96 | <0.002 | <0.002 | 0.006F | <0.01 | <0.05 | 0.0003F | 2.4 | <5 | <0.05 | 0.02F | 23.5 | 2FD1 | 0.08 | 0.0096 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 49S | 23-Dec-08 | N | 1739.63 | 1742.63 | 2.27 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0004F | 2.5 | <5 | -- | 0.02F | 24.7 | 2FD1 | 0.11 | 0.0108 |
| | | 30-Dec-08 | N | 1739.63 | 1742.63 | 1.78 | -- | <0.002 | 0.005F | <0.01 | -- | 0.0003F | 2.3 | <5 | -- | 0.01F | 21.6 | 28D1 | 0.12 | 0.0086 |
| | | 6-Jan-09 | N | 1739.63 | 1742.63 | 1.92 | -- | <0.002 | 0.006F | <0.01 | -- | 0.0003F | 2.4 | <5 | -- | 0.01F | 22.8 | 3FD1 | 0.13 | 0.0079 |
| | | 13-Jan-09 | N | 1739.63 | 1742.63 | 2.15 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0004F | 2.3 | <5 | <0.05 | 0.02F | 22.1 | 3FD1 | 0.14 | 0.0077 |
| | | 20-Jan-09 | N | 1739.63 | 1742.63 | 2.12 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0004F | 2.4 | 1F | -- | 0.02F | 24.1 | 2FD1 | 0.16 | 0.0062 |
| | | 27-Jan-09 | N | 1739.63 | 1742.63 | 1.84 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0004F | 2.1 | <5 | -- | 0.02F | 22.2 | 2FD1 | 0.17 | 0.0056B7 |
| | | 3-Feb-09 | N | 1739.63 | 1742.63 | 2.62 | -- | <0.002 | <0.02 | <0.01 | -- | 0.0005 | 3 | <5 | -- | 0.02F | 30 | 2FD1 | 0.21 | 0.0057 |
| | | 10-Feb-09 | N | 1739.63 | 1742.63 | 2.05 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0005 | 2.2 | <5H3 | <0.05 | 0.03F | 28.2 | 2FD2H3 | 0.22 | 0.0051 |
| | | 17-Feb-09 | N | 1739.63 | 1742.63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 50 | 26-Aug-08 | N | 1829.95 | 1832.48 | 101M3 | <0.002 | 0.0021 | 0.09 | 0.065 | 0.04F | 0.0078 | 410M3 | 7 | <0.05 | 0.81 | 2.16M3 | 93.2D1 | 92.6M3 | 0.0072 |
| | | 2-Sep-08 | N | 1829.95 | 1832.48 | 81.6 | <0.002 | 0.0034 | 0.047 | 0.071 | 0.01F | 0.0725 | 212 | <5 | <0.05 | 0.39 | 79.2 | 115D1 | 3.57 | 0.0025 |
| | | 9-Sep-08 | N | 1829.95 | 1832.48 | 69.1D2 | <0.002 | 0.0029 | 0.03D2 | 0.078D2 | <0.1D2 | 0.073 | 152 | <5 | <0.05V1 | 0.38D2 | 176D2 | 103D2 | 2.18 | 0.0029 |
| | | 16-Sep-08 | N | 1829.95 | 1832.48 | 57.2 | <0.002 | 0.0031 | 0.016 | 0.063 | <0.05 | 0.0488 | 112 | <5 | <0.05 | 0.27 | 158D1 | 83D1 | 2.89 | 0.0028 |
| | | 23-Sep-08 | N | 1829.95 | 1832.48 | 77.4D2 | <0.002 | 0.005D2 | 0.006 | 0.09D2 | <0.05 | 0.066 | 136 | <5 | <0.05 | 0.3 | 276D2 | 111D2 | 5 | 0.0018 |
| | | 30-Sep-08 | N | 1829.95 | 1832.48 | 55.1 | <0.002 | 0.0042 | 0.004 | 0.048 | <0.1D1 | 0.0493 | 106 | <5 | <0.05 | 0.2 | 196D1 | 83D1 | 4.72 | 0.0019 |
| | | 7-Oct-08 | N | 1829.95 | 1832.48 | 44.6D1 | <0.002 | 0.0029 | 0.009F | 0.03D1 | <0.05 | 0.0322B7 | 91.4 | <5 | <0.05 | 0.16 | 196D1 | 71D1 | 3.38 | 0.0013FD1 |
| | | 14-Oct-08 | N | 1829.95 | 1832.48 | 34.9D1 | <0.002 | 0.0018 | 0.006FD1 | 0.02D1 | <0.05 | 0.0206 | 72.5 | <5 | <0.05 | 0.12 | 161D1 | 38D1 | 2.81 | 0.0016 |
| | | 21-Oct-08 | N | 1829.95 | 1832.48 | 36.3D1 | <0.002 | 0.0024 | 0.004F | 0.014FD1 | <0.05 | 0.0156 | 59.8 | <5 | <0.05 | 0.07 | 113D1 | 41D1 | 3.55 | 0.0009 |
| | | 28-Oct-08 | N | 1829.95 | 1832.48 | 20.8D2 | <0.002 | 0.0017F | 0.009FD2 | 0.01 | <0.05 | 0.0132 | 52.8 | <5 | <0.05 | 0.08 | 112D2 | 30D2 | 1.81 | 0.0004F |
| | | 4-Nov-08 | N | 1829.95 | 1832.48 | 30.3 | <0.002 | 0.0017F | 0.006F | 0.015 | <0.05 | 0.0098 | 43.6 | <5 | <0.05 | 0.05 | 63.4 | 47D1M2 | 2.58 | 0.0006 |
| | | 11-Nov-08 | N | 1829.95 | 1832.48 | 25.6D2 | <0.002 | 0.0017F | 0.006F | 0.013 | <0.1D2 | 0.0153 | 71.3 | <5 | <0.05 | 0.1 | 126D2 | 43D2 | 2.71 | 0.0004F |
| | | 18-Nov-08 | N | 1829.95 | 1832.48 | 26 | <0.002 | 0.0029 | 0.005F | 0.011 | <0.05 | 0.0153 | 67.5 | <5 | <0.05 | 0.1 | 156D2 | 43D2 | 2.28 | 0.0005 |
| | | 25-Nov-08 | N | 1829.95 | 1832.48 | 28.7 | <0.002 | <0.01D1 | 0.006F | 0.012 | <0.05 | 0.016D1 | 68.8 | <5 | <0.05 | 0.11 | 213D1B3 | 31.3 | 2.83 | <0.003D1 |
| | | 2-Dec-08 | N | 1829.95 | 1832.48 | 18D1 | <0.002 | 0.002 | <0.02 | 0.005F | <0.1D1 | 0.0122 | 52.4 | <5 | <0.1D1 | 0.09 | 167D1 | 33D2 | 1.79 | 0.0004F |
| | | 9-Dec-08 | N | 1829.95 | 1832.48 | 19.2 | <0.002 | 0.0023 | <0.03D1 | 0.008FD1 | <0.1D1 | 0.0129 | 52.1 | <5 | <0.05 | 0.1 | 198D1 | 25.9 | 2.19 | 0.0004F |
| | | 16-Dec-08 | N | 1829.95 | 1832.48 | 15.1D1 | <0.002 | 0.002 | 0.01F | 0.006F | <0.05 | 0.0107 | 51.6 | 1F | <0.1D1 | 0.1 | 161D1 | 29D1 | 2.14 | 0.0004F |
| | | 23-Dec-08 | N | 1829.95 | 1832.48 | 19.6D1 | -- | 0.0024 | <0.08D1 | <0.05D2 | -- | 0.01 | 43.7 | <5 | -- | 0.09 | 207D1 | 25D1 | 1.86 | 0.0002F |
| | | 30-Dec-08 | N | 1829.95 | 1832.48 | 18.4 | -- | 0.0019F | 0.007F | <0.05D1 | -- | 0.0093 | 49.4 | <5 | -- | 0.09 | 215D1 | 57D1 | 1.91 | 0.0003F |
| | | 6-Jan-09 | N | 1829.95 | 1832.48 | 15.8 | -- | 0.0012F | 0.007F | 0.005FD1 | -- | 0.0093 | 39.5 | <5 | -- | 0.07 | 191D1 | 28D1 | 1.78 | 0.0003F |
| | | 13-Jan-09 | N | 1829.95 | 1832.48 | 15.4 | <0.002 | 0.0023 | <0.02 | 0.005F | <0.05 | 0.0098 | 40.8 | <5 | <0.05 | 0.08 | 211D1B7 | 27D1 | 1.84 | 0.0002F |
| | | 20-Jan-09 | N | 1829.95 | 1832.48 | 15.5 | -- | 0.0023 | <0.02 | 0.005F | -- | 0.0093 | 41.9 | 2F | -- | 0.08 | 247D1 | 26D1 | 2.33 | 0.0002F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 50 | 27-Jan-09 | N | 1829.95 | 1832.48 | 16.5 | -- | 0.0016F | <0.02 | 0.005F | -- | 0.0078 | 40 | <5 | -- | 0.08 | 218D1 | 29D1 | 2.15 | <0.0005 |
| | | 3-Feb-09 | N | 1829.95 | 1832.48 | 16.5 | -- | 0.0022 | <0.02 | 0.005F | -- | 0.0075 | 41.8 | <5 | -- | 0.08 | 224D1 | 26D1 | 2.01 | 0.0001F |
| | | 10-Feb-09 | N | 1829.95 | 1832.48 | 16.9 | <0.002 | 0.0032 | <0.02 | 0.006F | <0.05 | 0.0082 | 42.1 | <5H3 | <0.05 | 0.09 | 230D2 | 29D1H3 | 1.96 | 0.0001F |
| | | 17-Feb-09 | N | 1829.95 | 1832.48 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 51 | 26-Aug-08 | N | 1867.87 | 1844.35 | 0.13F | <0.002 | 0.0012 | 0.151 | <0.01 | 0.03F | <0.0005 | 116 | 29 | <0.05 | <0.05 | 0.03F | 2.8 | 0.1 | <0.0005 |
| | | 2-Sep-08 | N | 1867.87 | 1844.35 | 0.03F | <0.002 | 0.0009F | 0.036 | <0.01 | 0.02F | <0.0005 | 124 | 20 | <0.05 | <0.05 | 0.02F | 1.6 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1867.87 | 1844.35 | 0.05 | <0.002 | <0.001 | 0.028 | <0.01 | 0.02 | <0.0005 | 157 | 19 | <0.05V1 | 0.01 | 0.03 | 1.1 | <0.05V1 | <0.0005 |
| | | 16-Sep-08 | N | 1867.87 | 1844.35 | 0.06 | <0.002 | <0.001 | 0.023 | <0.01 | 0.01 | <0.0005 | 104 | 5 | <0.05 | <0.05 | 0.02 | 2.5 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1867.87 | 1844.35 | 0.03 | <0.002 | 0.0007 | 0.018 | <0.01 | 0.01 | 0.0001 | 170 | 5 | <0.05 | <0.05 | 0.1 | 1.4 | <0.05 | <0.0005 |
| | | 30-Sep-08 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.001 | 0.016 | <0.01 | <0.05 | <0.0005 | 140 | 2 | <0.05 | <0.05 | 0.04 | 1.3 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1867.87 | 1844.35 | 0.04F | <0.002 | <0.001 | 0.024 | <0.01 | 0.01F | <0.0005 | 145 | 1FM1 | <0.05 | <0.05 | 0.04F | 0.9 | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 1867.87 | 1844.35 | 0.04F | <0.002 | <0.001 | 0.019F | <0.01 | 0.01F | 0.0001F | 149 | <5M1 | <0.05 | <0.05 | 0.05 | 0.9 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1867.87 | 1844.35 | 0.04F | <0.002 | 0.0006F | 0.011F | <0.01 | <0.05 | 0.0001F | 124 | <5 | <0.05 | <0.05 | 0.02F | 0.7 | <0.05 | <0.0005 |
| | | 28-Oct-08 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.021 | <0.01 | 0.01F | 0.0002F | 200M2 | <5 | <0.05 | <0.05 | 0.03F | 1.1 | <0.05 | <0.0005 |
| | | 4-Nov-08 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.021 | <0.01 | <0.05 | 0.0002F | 191M2 | <5 | <0.05 | <0.05 | 0.02F | 1.4 | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.012F | <0.01 | <0.05 | <0.0005 | 104 | <5M1 | <0.05 | <0.05 | 0.04F | 1 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.014F | <0.01 | <0.05 | 0.0002F | 124 | <5 | <0.05 | <0.05 | 0.04F | 1.1V1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1867.87 | 1844.35 | 0.06FM2 | <0.002 | <0.002 | 0.015F | <0.01 | <0.05 | 0.0002F | 136 | <5 | <0.05 | <0.05 | <0.05M3 | 13D1 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.011F | <0.01 | <0.05 | 0.0003F | 138 | <5M1 | <0.05 | <0.05 | 0.04F | 1.2 | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.013F | <0.01 | <0.05 | 0.0002F | 140 | <5 | <0.05 | <0.05 | 0.06 | 1.5 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.019F | <0.01 | <0.05 | 0.0001F | 92.4 | 1F | <0.05 | <0.05 | 0.05 | 1 | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1867.87 | 1844.35 | <0.2 | -- | <0.002 | 0.006F | <0.01 | -- | 0.0002F | 109 | <5 | -- | <0.05 | 0.06 | 1 | <0.05 | 0.0001F |
| | | 30-Dec-08 | N | 1867.87 | 1844.35 | <0.2 | -- | <0.002 | 0.015F | <0.01 | -- | 0.0002F | 122 | <5 | -- | <0.05 | 0.12 | 1.1 | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1867.87 | 1844.35 | 0.04F | -- | <0.002 | 0.013F | <0.01 | -- | 0.0003F | 118 | <5 | -- | <0.05 | 0.04F | 1.1 | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | 0.0002F | 88.2 | <5 | 0.01F | <0.05 | 0.03F | 0.9 | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1867.87 | 1844.35 | <0.2 | -- | <0.002 | 0.012F | <0.01 | -- | 0.0003F | 127 | 1F | -- | <0.05 | 0.03F | 1 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1867.87 | 1844.35 | <0.2 | -- | <0.002 | 0.009F | <0.01 | -- | 0.0002F | 92.3 | 1F | -- | <0.05 | 0.03F | 0.6 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1867.87 | 1844.35 | <0.2 | -- | <0.002 | 0.013F | <0.01 | -- | 0.0003F | 138 | <5 | -- | <0.05 | 0.09 | 1.1 | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1867.87 | 1844.35 | 0.06F | -- | <0.002 | 0.009F | <0.01 | -- | 0.0001F | 85.1 | <5 | -- | <0.05 | 0.04F | 1 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 51 | 3-Mar-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1867.87 | 1844.35 | <0.2 | <0.002V1 | <0.002 | 0.018F | <0.01 | <0.05 | 0.0002F | 127 | <3 | <0.05 | <0.05 | 0.02F | 1.4 | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.012F | <0.01 | <0.05 | 0.0003F | 103 | <3 | <0.05 | <0.05 | 0.02F | 1.3 | <0.05 | <0.0005 |
| | | 14-Apr-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.012F | <0.01 | <0.05 | 0.0004F | 104 | <3 | <0.05 | <0.05 | 0.02F | 1.2 | <0.05 | <0.0005 |
| | | 12-May-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.016F | <0.01 | <0.05 | 0.0003F | 114 | <3 | <0.05 | <0.05 | <0.05 | 1.1 | <0.05 | <0.0005 |
| | | 9-Jun-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | 0.0004F | 98.5 | <3 | <0.05 | 0.04F | 0.02F | 1 | <0.05 | 0.0002F |
| | | 7-Jul-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.013F | <0.01 | <0.05 | 0.0004F | 117 | <3 | <0.05 | <0.05 | 0.02F | 1 | <0.05 | <0.0005 |
| | | 4-Aug-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1867.87 | 1844.35 | <0.2 | <0.002 | <0.002 | 0.015F | <0.01 | 0.02F | 0.0006 | 165 | <3 | <0.05 | 0.01F | 0.01F | 1.3 | 0.04F | 0.0001F |
| | TEST 52 | 26-Aug-08 | N | 1899 | 1901.88 | 0.07F | <0.002 | 0.0037 | 0.093 | <0.01 | 0.03F | <0.0005 | 532 | 23 | <0.05 | <0.05 | 0.04F | 3.1 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 1899 | 1901.88 | 0.03F | 0.0012F | <0.001 | 0.033 | <0.01 | <0.05 | <0.0005 | 374 | 49 | <0.05 | <0.05 | 0.25 | 6.1 | <0.05 | <0.0005 |
| | | 9-Sep-08 | N | 1899 | 1901.88 | <0.2 | 0.0018 | <0.001 | 0.05 | <0.01 | <0.05 | <0.0005 | 158 | 56 | <0.05V1 | 0.01 | 0.22 | 5.5 | <0.05V1 | 0.0001 |
| | | 16-Sep-08 | N | 1899 | 1901.88 | 0.04 | <0.002 | <0.001 | 0.037 | <0.01 | <0.05 | 0.0001 | 277 | 70D1 | <0.05 | <0.05 | 0.07 | 2 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | 0.0007 | 0.029 | <0.01 | <0.05 | <0.0005 | 198 | 59 | <0.05 | <0.05 | 0.05 | 1.6 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 52 | 30-Sep-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | 0.0009 | 0.034 | <0.01 | <0.05 | 0.0001 | 276 | 42 | <0.05 | <0.05 | 0.18 | 2.5 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.001 | 0.046 | <0.01 | <0.05 | <0.0005 | 186 | 35 | <0.05 | <0.05 | 0.1 | 3 | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.001 | 0.054 | <0.01 | <0.05 | 0.0001F | 218 | 35 | <0.05 | 0.01F | 0.17 | 3.4 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 1899 | 1901.88 | 0.05F | <0.002 | 0.0005F | 0.066 | <0.01 | <0.05 | 0.0003F | 332 | 35 | <0.05 | <0.05 | 0.19 | 3 | <0.05 | 0.0001F |
| | | 28-Oct-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | 0.07 | <0.01 | <0.05 | 0.0005 | 438 | 29 | <0.05 | 0.02F | 0.39 | 3.2 | <0.05 | 0.0004F |
| | | 4-Nov-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | 0.043 | <0.01 | <0.05 | 0.0002F | 225 | 14 | <0.05 | <0.05 | 0.24 | 3.4 | <0.05 | 0.0001F |
| | TEST 52S | 11-Nov-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | 0.037 | <0.01 | <0.05 | 0.0001F | 109 | 15 | <0.05 | <0.05 | 0.1 | 1.9 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | <0.0005 | 50.5 | 2F | <0.05 | <0.05 | 0.05 | 0.8V1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | 0.009F | <0.01 | <0.05 | 0.0002F | 54 | <5 | <0.05 | <0.05 | 0.07 | 0.8 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 49.6 | 1F | <0.05 | <0.05 | 0.05 | 0.7 | <0.05 | <0.0005 |
| | | 9-Dec-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | 0.005F | <0.01 | <0.05 | <0.0005 | 44.7 | <5 | <0.05 | <0.05 | 0.05 | 0.6 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 45.2 | 1F | <0.05 | 0.01F | 0.04F | 0.4F | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 1899 | 1901.88 | 0.07FD1 | -- | <0.002 | <0.03D1 | <0.02D1 | -- | <0.0005 | 40.6 | <5 | -- | <0.05 | 0.05 | 0.2F | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 1899 | 1901.88 | <0.2 | -- | <0.002 | 0.007F | <0.01 | -- | <0.0005 | 47.6 | <5 | -- | <0.05 | 0.06 | 0.4F | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 1899 | 1901.88 | <0.2 | -- | <0.002 | 0.006F | <0.01 | -- | <0.0005 | 41.2 | <5 | -- | <0.05 | 0.03F | 0.4F | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 36.6 | <5 | <0.05 | <0.05 | 0.03F | 0.4F | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 1899 | 1901.88 | <0.2 | -- | <0.002 | 0.003F | <0.01 | -- | <0.0005 | 57.7 | 1F | -- | <0.05 | 0.05 | 0.5 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 1899 | 1901.88 | <0.2 | -- | <0.002 | <0.02 | <0.01 | -- | <0.0005 | 40.5 | 1F | -- | <0.05 | 0.05 | 0.4F | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 1899 | 1901.88 | <0.2 | -- | <0.002 | 0.003F | <0.01 | -- | <0.0005 | 44.3 | <5 | -- | <0.05 | 0.06 | 0.4F | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 1899 | 1901.88 | <0.2 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 35.1 | <5H3 | <0.05 | 0.01F | 0.08 | 0.3FH3 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 1899 | 1901.88 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 53 | 26-Aug-08 | N | 1984.74 | 1987.74 | 1.6 | <0.002 | 0.0007F | 0.055D1 | <0.02D1 | 0.06FD1 | 0.0044 | 763D1 | 13 | <0.05 | 0.75 | 2 | 4.9 | 44.3 | 0.0032 |
| | | 2-Sep-08 | N | 1984.74 | 1987.74 | 2.01 | <0.002 | <0.001 | 0.029 | 0.005F | 0.02F | 0.0049 | 600 | 3F | <0.05 | 0.27 | 29.5 | 6D1 | 2.67 | 0.0031 |
| | | 9-Sep-08 | N | 1984.74 | 1987.74 | 0.99D2 | 0.0006 | <0.001 | 0.026D2 | 0.006D2 | <0.1D2 | 0.0087 | 644 | 7 | <0.05V1 | 0.24D2 | 158D2 | 4D2 | <0.05V1 | 0.0069 |
| | | 16-Sep-08 | N | 1984.74 | 1987.74 | 0.92 | <0.002 | <0.001 | 0.024 | 0.007 | <0.05 | 0.0064 | 604 | 5 | <0.05 | 0.1 | 150D1 | 4D1 | <0.05 | 0.0099 |
| | | 23-Sep-08 | N | 1984.74 | 1987.74 | 1.3D2 | <0.002 | <0.001 | 0.019 | <0.05D2 | <0.05 | 0.0091 | 602 | 3 | <0.05 | 0.11 | 218D2 | 4D2 | <0.05 | 0.0233 |
| | | 30-Sep-08 | N | 1984.74 | 1987.74 | 0.94 | <0.002 | <0.001 | 0.016 | <0.01 | <0.05 | 0.0018 | 535 | <5 | <0.05 | 0.02 | 62.6 | 3.5D1 | <0.05 | 0.0129 |
| | | 7-Oct-08 | N | 1984.74 | 1987.74 | 1.09D1 | <0.002 | <0.001 | 0.02 | <0.02D1 | <0.05 | 0.0048B7 | 579 | 3F | <0.05 | 0.07 | 153D1 | 3FD1 | <0.05 | 0.0225 |
| | | 14-Oct-08 | N | 1984.74 | 1987.74 | 0.8D1 | <0.002 | <0.001 | 0.021FD1 | <0.02D1 | <0.05 | 0.0038 | 598 | 4F | <0.05 | 0.05 | 111D1 | 4FD1 | <0.05 | 0.0151 |
| | | 21-Oct-08 | N | 1984.74 | 1987.74 | 0.64 | <0.002 | <0.002 | 0.018F | <0.01 | <0.05 | 0.0031 | 576 | 4F | <0.05 | 0.02F | 91.7 | 4FD1 | <0.05 | 0.0134 |
| | | 28-Oct-08 | N | 1984.74 | 1987.74 | 0.59D2 | <0.002 | <0.002 | 0.021FD2 | <0.02D2 | <0.1D2 | 0.0053 | 605D2 | 2F | <0.1D2 | 0.05FD2 | 135D2 | 5D2 | <0.1D2 | 0.0215 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 53 | 4-Nov-08 | N | 1984.74 | 1987.74 | 0.64 | <0.002 | <0.002 | 0.023 | <0.01 | <0.05 | 0.0026 | 539 | 1F | <0.05 | 0.02F | 83.2 | 6D1 | <0.05 | 0.0194 |
| | | 11-Nov-08 | N | 1984.74 | 1987.74 | 0.45 | <0.002 | <0.002 | 0.025 | <0.01 | <0.05 | 0.0026 | 566 | 2F | <0.05 | 0.02F | 81.4 | 6D2 | <0.05 | 0.0173 |
| | | 18-Nov-08 | N | 1984.74 | 1987.74 | 0.52 | <0.002 | <0.002 | 0.022 | <0.01 | <0.05 | 0.0029 | 608 | 1F | <0.05 | 0.02F | 90.8 | 6D2V1 | <0.05 | 0.0179 |
| | | 25-Nov-08 | N | 1984.74 | 1987.74 | 0.43 | <0.002 | <0.002 | 0.026 | <0.01 | <0.05 | 0.001 | 606 | <5 | <0.05 | 0.02F | 40.6 | 4.7M2 | <0.05 | 0.0101 |
| | | 2-Dec-08 | N | 1984.74 | 1987.74 | 0.35 | <0.002 | <0.002 | 0.025 | <0.01 | <0.05 | 0.0031 | 501 | 3F | <0.05 | 0.02F | 78.2 | 8D2 | <0.05 | 0.0154 |
| | | 9-Dec-08 | N | 1984.74 | 1987.74 | 0.35 | <0.002 | <0.002 | 0.031 | <0.01 | <0.05 | 0.0038 | 490 | 2F | <0.05 | 0.02F | 88 | 7D1 | <0.05 | 0.0195 |
| | | 16-Dec-08 | N | 1984.74 | 1987.74 | 0.13F | <0.002 | <0.002 | 0.026 | <0.01 | <0.05 | 0.0033 | 434 | 1F | <0.05 | 0.02F | 79 | 6D1 | <0.05 | 0.0161 |
| | | 23-Dec-08 | N | 1984.74 | 1987.74 | 0.45 | -- | <0.002 | 0.021 | <0.01 | -- | 0.0041 | 378 | <5 | -- | 0.02F | 89.6 | 4FD1 | <0.05 | 0.0181 |
| | | 30-Dec-08 | N | 1984.74 | 1987.74 | 0.21 | -- | <0.002 | 0.027 | <0.01 | -- | 0.0027 | 388 | <5 | -- | 0.03F | 68.2 | 4FD1 | <0.05 | 0.0157 |
| | | 6-Jan-09 | N | 1984.74 | 1987.74 | 0.28 | -- | <0.002 | 0.026 | <0.01 | -- | 0.0036 | 298 | 1F | -- | 0.02F | 76.6 | 6D1 | <0.05 | 0.0183 |
| | | 13-Jan-09 | N | 1984.74 | 1987.74 | 0.17F | <0.002 | <0.002 | 0.024 | <0.01 | <0.05 | 0.004 | 228 | 1F | 0.01F | 0.02F | 64 | 6D1 | <0.05 | 0.0143 |
| | | 20-Jan-09 | N | 1984.74 | 1987.74 | 0.15F | -- | <0.002 | 0.025 | <0.01 | -- | 0.0035 | 296 | 1F | -- | 0.02F | 67.2 | 6D1 | <0.05 | 0.0156 |
| | | 27-Jan-09 | N | 1984.74 | 1987.74 | 0.17F | -- | <0.002 | 0.021 | <0.01 | -- | 0.0041 | 305 | 1F | -- | 0.02F | 75 | 6D1 | <0.05 | 0.0191B7 |
| | | 3-Feb-09 | N | 1984.74 | 1987.74 | 0.16F | -- | <0.002 | 0.019F | <0.01 | -- | 0.005 | 272 | <5 | -- | 0.03F | 80.3 | 4FD1 | <0.05 | 0.0215 |
| | | 10-Feb-09 | N | 1984.74 | 1987.74 | 0.21 | 0.0012F | <0.002 | 0.02 | <0.01 | <0.05 | 0.0057 | 265 | <5H3 | <0.05 | 0.03F | 83.6 | <5D2H3 | <0.05 | 0.0217 |
| | | 17-Feb-09 | N | 1984.74 | 1987.74 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 54 | 26-Aug-08 | N | 2056.38 | 2075 | 0.06F | <0.002 | 0.0012 | 0.083 | <0.01 | 0.05 | 0.0002F | 549 | 5 | <0.05 | 0.14 | 0.04F | 1.7 | <0.05 | <0.0005 |
| | | 2-Sep-08 | N | 2056.38 | 2075 | <0.3D1 | <0.002 | 0.0009F | 0.024FD1 | <0.02D1 | 0.02F | <0.0005 | 586D1 | 6 | <0.1D1 | 0.02FD1 | <0.1D1 | 1.8 | <0.1D1 | <0.0005 |
| | | 9-Sep-08 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.001 | 0.018 | <0.01 | 0.02 | <0.0005 | 582 | 1 | <0.05V1 | 0.02 | 0.02 | 1.6 | <0.05V1 | <0.0005 |
| | | 16-Sep-08 | N | 2056.38 | 2075 | 0.07 | <0.002 | 0.0006 | 0.016 | <0.01 | 0.01 | <0.0005 | 552 | <5 | <0.05 | 0.01 | 0.03 | 1.5 | <0.05 | <0.0005 |
| | | 23-Sep-08 | N | 2056.38 | 2075 | <0.2 | <0.002 | 0.0007 | 0.013 | <0.01 | <0.05 | 0.0001 | 478 | <5 | <0.05 | 0.02 | 0.1 | 1.2 | <0.05 | <0.0005B4 |
| | | 30-Sep-08 | N | 2056.38 | 2075 | 0.07 | <0.002 | <0.001 | 0.012 | <0.01 | <0.05 | 0.0002 | 527 | <5 | <0.05 | 0.01 | 0.05 | 1.3 | <0.05 | <0.0005 |
| | | 7-Oct-08 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.001 | 0.012F | <0.01 | 0.01F | 0.0001F | 483 | <5 | <0.05 | 0.03F | 0.11 | 0.7 | <0.05 | <0.0005 |
| | | 14-Oct-08 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.001 | 0.012F | <0.01 | <0.05 | 0.0002F | 553 | <5 | <0.05 | 0.03F | 0.22 | 1.1 | <0.05 | <0.0005 |
| | | 21-Oct-08 | N | 2056.38 | 2075 | 0.06F | <0.002 | 0.0006F | 0.007F | <0.01 | <0.05 | 0.0002F | 487 | <5 | <0.05 | 0.02F | 0.23 | 0.8 | <0.05 | 0.0001F |
| | | 28-Oct-08 | N | 2056.38 | 2075 | <0.3D2 | <0.002 | <0.002 | 0.015FD2 | <0.02D2 | <0.1D2 | 0.0002F | 592D2 | <5 | <0.1D2 | 0.04FD2 | 0.28D2 | 1.1 | <0.1D2 | <0.0005 |
| | | 4-Nov-08 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.002 | 0.014F | <0.01 | <0.05 | 0.0003F | 518 | <5 | <0.05 | 0.02F | 0.35 | 1.2 | <0.05 | <0.0005 |
| | | 11-Nov-08 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.002 | 0.011F | 0.002F | 0.01F | 0.0003F | 516 | <5 | <0.05 | 0.03F | 0.52 | 1.1 | <0.05 | <0.0005 |
| | | 18-Nov-08 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.002 | 0.01F | <0.01 | <0.05 | 0.0003F | 508 | <5 | <0.05 | 0.03F | 0.55 | 1 | <0.05 | <0.0005 |
| | | 25-Nov-08 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.002 | 0.012F | <0.01 | 0.01F | 0.0003F | 490 | <5 | <0.05 | 0.03F | 0.78 | 1 | <0.05 | <0.0005 |
| | | 2-Dec-08 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.002 | 0.006F | <0.01 | <0.05 | 0.0003F | 472 | <5 | <0.05 | 0.02F | 0.78 | 1.1 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 54 | 9-Dec-08 | N | 2056.38 | 2075 | 0.05F | <0.002 | 0.0005F | 0.011F | <0.01 | <0.05 | 0.0003F | 481 | <5 | <0.05 | 0.02F | 0.87 | 1 | <0.05 | <0.0005 |
| | | 16-Dec-08 | N | 2056.38 | 2075 | <0.3D1 | <0.002 | <0.002 | <0.03D1 | <0.01 | <0.05 | 0.0003F | 395 | 1F | <0.1D1 | 0.03F | 0.75D1 | 0.8 | <0.05 | <0.0005 |
| | | 23-Dec-08 | N | 2056.38 | 2075 | 0.26 | -- | <0.002 | 0.012F | <0.01 | -- | 0.0003F | 484 | <5 | -- | 0.03F | 1.06 | 0.9 | <0.05 | <0.0005 |
| | | 30-Dec-08 | N | 2056.38 | 2075 | 0.03F | -- | <0.002 | 0.017F | <0.01 | -- | 0.0004F | 469M3 | <5 | -- | 0.04F | 1.12 | 0.3F | <0.05 | <0.0005 |
| | | 6-Jan-09 | N | 2056.38 | 2075 | 0.1F | -- | <0.002 | 0.009F | <0.01 | -- | 0.0003F | 416 | <5 | -- | 0.02F | 0.9 | 0.9 | <0.05 | <0.0005 |
| | | 13-Jan-09 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.002 | 0.009F | 0.002F | <0.05 | 0.0004F | 446 | <5 | 0.01F | 0.03F | 1.09 | 1 | <0.05 | <0.0005 |
| | | 20-Jan-09 | N | 2056.38 | 2075 | <0.2 | -- | <0.002 | 0.008F | <0.01 | -- | 0.0003F | 386 | 1F | -- | 0.03F | 1.02 | 0.8 | <0.05 | <0.0005 |
| | | 27-Jan-09 | N | 2056.38 | 2075 | <0.2 | -- | <0.002 | 0.008F | <0.01 | -- | 0.0004F | 480 | 1F | -- | 0.02F | 1.18 | 1 | <0.05 | <0.0005 |
| | | 3-Feb-09 | N | 2056.38 | 2075 | <0.2 | -- | <0.002 | 0.008F | <0.01 | -- | 0.0004F | 465 | <5 | -- | 0.02F | 1.52 | 0.9 | <0.05 | <0.0005 |
| | | 10-Feb-09 | N | 2056.38 | 2075 | 0.39 | -- | <0.002 | 0.009F | <0.01 | -- | 0.0004F | 520 | <5 | -- | 0.03F | 1.34 | 1 | <0.05 | <0.0005 |
| | | 17-Feb-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 2056.38 | 2075 | <0.2 | <0.002V1 | 0.0005F | 0.011F | 0.002F | <0.05 | 0.0004F | 469 | <3 | <0.05 | 0.03F | 1.86 | 1.1 | <0.05 | <0.0005 |
| | | 17-Mar-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 2056.38 | 2075 | 0.05F | <0.002 | <0.002 | 0.008F | 0.003F | <0.05 | 0.0005 | 476 | <3 | 0.01F | 0.03F | 2.07 | 1 | <0.05 | <0.0005 |
| | | 14-Apr-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.002 | 0.009F | 0.003F | <0.05 | 0.0006 | 469 | <3 | <0.05 | 0.03F | 2.36 | 1.1 | <0.05 | 0.0002F |
| | | 12-May-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.002 | 0.01F | 0.003F | <0.05 | 0.0007 | 459 | <3 | <0.05 | 0.02F | 2.52 | 1.2 | <0.05 | <0.0005 |
| | | 9-Jun-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 2056.38 | 2075 | 0.05F | <0.002 | <0.002 | 0.007F | <0.01 | <0.05 | 0.0009 | 507 | <3 | <0.05 | 0.03F | 3.1 | 1.3 | <0.05 | 0.0003F |
| | | 7-Jul-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Aluminum MG/L | Antimony MG/L | Arsenic MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | TEST 54 | 14-Jul-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 2056.38 | 2075 | <0.2 | <0.002 | <0.002 | 0.011F | 0.006F | <0.05 | 0.0009 | 423 | <3 | <0.05 | 0.02F | 3.84 | 1.3 | <0.05 | <0.0005 |
| | | 4-Aug-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 2056.38 | 2075 | <0.2 | 0.0009F | <0.002 | 0.013F | 0.005F | 0.02F | 0.001 | 501 | <3 | 0.01F | 0.03F | 4.44 | 1.5 | <0.05 | 0.0042 |
| | | 1-Sep-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Sep-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 2056.38 | 2075 | 0.13F | <0.002 | <0.002 | 0.009F | 0.007F | <0.05 | 0.001 | 413 | <50D1 | <0.05 | 0.03F | 5.65 | <10D1 | 0.05 | 0.0001F |
| | | 29-Sep-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 2056.38 | 2075 | 0.06F | <0.002 | <0.002 | 0.004F | <0.01 | <0.05 | 0.0007 | 371 | <3 | <0.05 | 0.02F | 5.27 | 1.1 | <0.05 | <0.0005 |
| | | 27-Oct-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 2056.38 | 2075 | 0.13FD1 | <0.002 | <0.002 | 0.006F | 0.005F | <0.1D1 | 0.0007 | 416 | <3 | <0.05 | 0.02F | 4.84 | 1.1 | <0.05 | <0.0005 |
| | | 24-Nov-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 1-Dec-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Dec-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Dec-09 | N | 2056.38 | 2075 | <0.3D1 | <0.002 | <0.002 | 0.007F | 0.004F | <0.05 | 0.0006 | 329 | <3 | <0.05 | <0.05 | 4.14 | 0.9 | <0.05 | <0.0005 |
| | | 22-Dec-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 29-Dec-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-Jan-10 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 12-Jan-10 | N | 2056.38 | 2075 | 0.04F | <0.002 | <0.002 | 0.005F | 0.004F | <0.05 | 0.0006 | 283 | <3 | 0.01F | <0.05 | 3.42 | 0.8 | <0.05 | <0.0005 |
| | | 19-Jan-10 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-Jan-10 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-001C | TEST 1 | 26-Aug-08 | N | 1639 | 1642 | 6.9 | 0.616 | <0.001 | 0.08 | <0.05 | 59.9 | 0.0248 | 13.8 | <0.03 | 359 | 0.0002 | 0.0107 | 0.007 | 0.02 |
| | | 2-Sep-08 | N | 1639 | 1642 | 0.6F | 0.064 | <0.001 | 0.02F | <0.05 | 17.8 | 0.0128 | 8.8 | <0.03 | 82.7 | <0.0005 | 0.002 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1639 | 1642 | <2D2 | 0.095 | <0.001 | <0.05 | <0.05 | 5.7 | 0.0021 | 3.7 | <0.03M2 | 12.6 | <0.0005 | 0.0004 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1639 | 1642 | 0.3 | 0.099 | <0.001 | 0.02 | <0.05 | 12.6 | 0.0029 | 8.1 | 0.01 | 30.8 | <0.0005 | 0.001 | <0.03 | 0.01 |
| | | 23-Sep-08 | N | 1639 | 1642 | 0.2 | 0.104 | <0.001 | 0.02 | <0.05 | 6.7 | 0.0019 | 5.5M1 | <0.03M2 | 10.4 | <0.0005 | 0.0004 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1639 | 1642 | <1 | 0.066 | <0.001 | <0.05 | <0.05 | 6.1 | 0.0016 | 3.6 | <0.03M2 | 5.4 | <0.0005 | 0.0002 | <0.03 | <0.05M1 |
| | | 7-Oct-08 | N | 1639 | 1642 | <1 | 0.099 | <0.001 | <0.05 | <0.05 | 8.5 | 0.0025 | 4.6 | <0.03M2 | 9.2 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1639 | 1642 | 0.5F | 0.177 | <0.001 | <0.05 | <0.05 | 11.5 | 0.0026 | 6.1 | <0.03M2R1 | 11.7 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1639 | 1642 | 0.4F | 0.179 | <0.001 | <0.05 | <0.05 | 7.2 | 0.0017 | 4.4M1 | <0.03M2 | 6.5 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1639 | 1642 | 0.3F | 0.165 | <0.001 | 0.02F | <0.05 | 7.8 | 0.0021 | 4.6 | <0.03 | 8.3 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 1639 | 1642 | 0.2F | 0.075 | <0.001 | <0.05 | <0.05 | 5.1 | 0.0011 | 3.4M1 | <0.03M2 | 2.2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | TEST 1S | 11-Nov-08 | N | 1639 | 1642 | 1.1 | 0.479 | <0.001 | 0.02F | <0.05 | 15.3 | 0.0113 | 6.5M1 | <0.03M2 | 11.6 | <0.0005 | 0.0007 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1639 | 1642 | 0.4F | 0.197 | <0.001 | <0.05M1 | <0.05 | 5.5 | 0.0026 | 2.7M1 | <0.03M2 | 2.2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1639 | 1642 | 0.4F | 0.325 | <0.001 | <0.05 | <0.05 | 5.2 | 0.0017 | 1.5F | <0.03M2 | 2.2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1639 | 1642 | 0.4F | 0.301 | <0.001 | <0.05 | <0.05 | 3.6 | 0.0008 | 1.2F | <0.03 | 1.6F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1639 | 1642 | <1 | 0.259 | <0.001 | <0.05 | <0.05 | 2.9 | 0.0006 | 1.2F | <0.03 | 1F | <0.0005 | <0.0005 | <0.03 | 0.01F |
| | | 16-Dec-08 | N | 1639 | 1642 | <1 | 0.252 | <0.001 | <0.05 | <0.05 | 3.6 | 0.0005 | 0.9F | <0.03 | 1.2F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1639 | 1642 | <1 | 0.206 | -- | 0.01F | <0.05 | 1.9F | 0.0002F | 0.6F | -- | 0.6F | <0.0005 | <0.0005 | -- | <0.05 |
| | | 30-Dec-08 | N | 1639 | 1642 | 0.3F | 0.304 | -- | <0.05 | <0.05 | 2.8 | 0.0005 | 0.8F | -- | 1F | <0.0005 | <0.0005 | -- | <0.05 |
| | | 6-Jan-09 | N | 1639 | 1642 | <1 | 0.247 | -- | <0.05 | <0.05 | 2.8 | 0.0007 | 0.9F | -- | 1.1F | <0.0005 | <0.0005 | -- | <0.05 |
| | | 13-Jan-09 | N | 1639 | 1642 | 0.6F | 0.25 | <0.001 | <0.05 | <0.05 | 2.3 | 0.0005 | 0.6F | <0.03M2 | 0.8F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1639 | 1642 | 0.3FM1 | 0.279 | -- | <0.05M1 | <0.05 | 2.5 | 0.0007 | 0.8F | -- | 0.9F | <0.0005 | <0.0005 | -- | <0.05 |
| | | 27-Jan-09 | N | 1639 | 1642 | 0.2F | 0.267 | -- | <0.05 | <0.05 | 2.3 | 0.0004FM1 | 0.8F | -- | 0.8F | <0.0005 | <0.0005 | -- | <0.05 |
| | | 3-Feb-09 | N | 1639 | 1642 | 0.2F | 0.264 | -- | <0.05M1 | <0.05 | 2.1 | 0.0005 | 0.6F | -- | 0.7F | <0.0005 | <0.0005 | -- | <0.05 |
| | | 10-Feb-09 | N | 1639 | 1642 | 0.3F | 0.312 | <0.001H3 | <0.05 | <0.05 | 2.5 | 0.0007M1 | 0.8F | <0.03M2 | 0.8F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 17-Feb-09 | N | 1639 | 1642 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 2 | 26-Aug-08 | N | 1745 | 1748 | 21D2 | 2.29 | <0.001 | <0.3D2 | <0.3D2 | 28.5 | 0.0095 | 6.1 | <0.03 | 87.5 | 0.0001 | 0.0015 | <0.03 | <0.3D2 |
| | | 2-Sep-08 | N | 1745 | 1748 | 12.6 | 1.37 | <0.001 | 0.05 | <0.05 | 19.9 | 0.0064 | 7.6 | <0.03M2 | 41.9 | <0.0005 | 0.0012 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1745 | 1748 | 10.7 | 1.27 | <0.001 | 0.03 | <0.05 | 16.9 | 0.0033 | 8.1 | 0.02 | 23.1 | <0.0005 | 0.0013 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1745 | 1748 | 8.3 | 0.979 | <0.001 | 0.04 | <0.05 | 14.2 | 0.0023 | 6.8 | <0.03 | 14.8 | <0.0005 | 0.001 | <0.03 | 0.01 |
| | | 23-Sep-08 | N | 1745 | 1748 | 6.5 | 0.756 | <0.001 | 0.04 | <0.05 | 12.7 | 0.0023 | 7.8 | <0.03 | 7.9 | <0.0005 | 0.0009 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-001C | TEST 2 | 30-Sep-08 | N | 1745 | 1748 | 7.4 | 0.982 | <0.001 | 0.02 | <0.05 | 15.8 | 0.0023 | 8.7 | <0.03 | 6.9 | <0.0005 | 0.0012 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1745 | 1748 | 5.2 | 0.634 | <0.001 | 0.02F | <0.05 | 11.4 | 0.0021 | 6.4 | <0.03 | 3.9 | <0.0005 | 0.0009 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1745 | 1748 | 4.9 | 0.691 | <0.001 | 0.01F | <0.05 | 10.6 | 0.0021 | 6.4 | <0.03 | 3 | <0.0005 | 0.001 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1745 | 1748 | 3.5 | 0.541 | <0.001 | <0.05 | <0.05 | 8.6 | 0.0015 | 6.8 | <0.03 | 1.8F | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1745 | 1748 | 3.4 | 0.537 | <0.001 | 0.02F | <0.05 | 8.7 | 0.0015 | 6.3M1 | <0.03M2 | 1.9F | <0.0005 | 0.001 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 1745 | 1748 | 4.8 | 0.874 | <0.001 | 0.02F | <0.05 | 12.4 | 0.0019 | 10.6 | <0.03 | 2.2 | <0.0005 | 0.0011 | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1745 | 1748 | 2.6 | 0.539 | <0.001 | 0.03F | 0.01F | 8.2 | 0.0015 | 7 | <0.03 | 1.1F | <0.0005 | 0.0009 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1745 | 1748 | 0.3F | 0.096 | <0.001 | <0.05 | <0.05 | 2.1 | 0.0003F | 1.5F | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1745 | 1748 | 1.8 | 0.493 | <0.001 | <0.05 | <0.05 | 8 | 0.0015 | 5.7 | <0.03 | 0.9F | <0.0005 | 0.001 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1745 | 1748 | 1.1 | 0.275 | <0.001 | <0.05 | <0.05 | 5.5 | 0.0009 | 3.7 | <0.03 | 0.7F | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1745 | 1748 | 1.3 | 0.399 | <0.001 | <0.05 | <0.05 | 6 | 0.0011 | 4.9 | <0.05D1M2 | 0.9F | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1745 | 1748 | 0.7F | 0.208 | <0.001 | <0.05 | <0.05 | 5.9 | 0.0008 | 2.9 | <0.03 | 0.6F | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1745 | 1748 | 0.5F | 0.209 | -- | 0.02F | <0.05 | 4.7 | 0.0007 | 3 | -- | 0.6F | <0.0005 | 0.0004F | -- | <0.05 |
| | | 30-Dec-08 | N | 1745 | 1748 | 0.6F | 0.198 | -- | <0.05 | <0.05 | 4.2 | 0.0007 | 2.9 | -- | 0.4F | <0.0005 | 0.0004F | -- | <0.05 |
| | | 6-Jan-09 | N | 1745 | 1748 | 0.5F | 0.218 | -- | <0.05 | <0.05 | 4.4 | 0.0009 | 3.3 | -- | 0.8F | <0.0005 | 0.0004F | -- | <0.05 |
| | | 13-Jan-09 | N | 1745 | 1748 | <1 | 0.205 | <0.001 | <0.05 | <0.05 | 4.9 | 0.0009 | 3.6 | <0.03 | 0.5F | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1745 | 1748 | 0.8F | 0.207 | -- | <0.05 | <0.1D1 | 4.5 | 0.0009 | 4.4 | -- | 0.5F | <0.0005 | 0.0004F | -- | <0.05 |
| | | 27-Jan-09 | N | 1745 | 1748 | 0.8F | 0.233 | -- | 0.01F | <0.05 | 4.3 | 0.0008 | 3.9 | -- | 0.5F | <0.0005 | 0.0004F | -- | <0.05 |
| | | 3-Feb-09 | N | 1745 | 1748 | 0.8F | 0.219 | -- | <0.05 | <0.05 | 4.7 | 0.0008 | 4.9 | -- | 0.5F | <0.0005 | 0.0004F | -- | <0.05 |
| | | 10-Feb-09 | N | 1745 | 1748 | 1 | 0.266 | -- | <0.05 | <0.05 | 5.4 | 0.0009 | 6.1M1 | -- | 0.6F | <0.0005 | 0.0006 | -- | <0.05 |
| | | 17-Feb-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1745 | 1748 | 0.8F | 0.26 | <0.001 | 0.01F | <0.05 | 5 | 0.0004F | 4.5M1 | <0.03M2 | 0.6F | <0.0005 | 0.0004F | <0.03 | <0.05L1 |
| | | 17-Mar-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1745 | 1748 | 0.7F | 0.227 | <0.001 | 0.02F | <0.05 | 4.3 | 0.0004F | 4.5M1 | <0.03M2 | 0.4F | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 14-Apr-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-001C | TEST 2 | 5-May-09 | N | 1745 | 1748 | 0.6F | 0.22 | <0.001 | <0.05 | <0.05 | 4.2 | 0.0007 | 3.9 | <0.03M2 | 0.4F | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 12-May-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1745 | 1748 | 0.4F | 0.18 | <0.001 | <0.05 | <0.05 | 4.4 | 0.0007 | 4.6 | <0.03M2 | 0.4F | <0.0005 | 0.0003F | 0.005F | <0.05 |
| | | 9-Jun-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1745 | 1748 | 0.4F | 0.156 | <0.001 | 0.01F | <0.05 | 4.8 | 0.0009 | 5.1M1 | <0.03M2 | 0.5F | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 7-Jul-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1745 | 1748 | 0.8FM1 | 0.228 | <0.001 | 0.03F | <0.05 | 6.4 | 0.0013 | 7.7M1 | <0.03M2 | 0.9F | <0.0005 | 0.0004F | <0.03M1 | <0.05M1 |
| | | 4-Aug-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1745 | 1748 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1745 | 1748 | 0.7F | 0.19 | <0.001 | <0.05 | 0.01FM1 | 5.4 | 0.001 | 8M1 | <0.03M2 | 0.7F | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | TEST 3 | 26-Aug-08 | N | 1771.75 | 1791.4 | 21D2 | 0.07 | <0.001 | 0.28D2 | <0.3D2 | 24.8 | 0.007 | 27 | <0.03 | 80.7 | 0.0001 | 0.0004 | <0.03 | <0.3D2 |
| | | 2-Sep-08 | N | 1771.75 | 1791.4 | 21 | 0.103 | <0.001 | 0.24 | <0.05 | 18 | 0.0072 | 17.9 | <0.03 | 53.9 | 0.0001F | 0.0007 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1771.75 | 1791.4 | 17.7 | 0.098 | <0.001 | 0.16 | <0.05 | 12.3 | 0.0061 | 14 | <0.03 | 30.3 | 0.0001 | 0.0006 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1771.75 | 1791.4 | 20.3 | 0.113 | <0.001 | 0.14 | <0.05 | 10.5 | 0.0051 | 15.1 | <0.03 | 20.7 | <0.0005 | 0.0005 | <0.03 | 0.01 |
| | | 23-Sep-08 | N | 1771.75 | 1791.4 | 13.7 | 0.091 | <0.001 | 0.12 | <0.05 | 7.3 | 0.0052 | 13.9 | <0.03 | 12.4 | <0.0005 | 0.0005 | 0.009 | <0.05 |
| | | 30-Sep-08 | N | 1771.75 | 1791.4 | 15.5 | 0.101 | <0.001 | 0.09 | <0.05 | 8.3 | 0.0047 | 13.3 | <0.03 | 9.9 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1771.75 | 1791.4 | 13.4 | 0.085 | <0.001 | 0.08 | <0.05 | 5.7 | 0.0041 | 11 | <0.03 | 6.4 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1771.75 | 1791.4 | 15.4 | 0.108 | <0.001 | 0.08 | <0.05 | 5.8 | 0.0043 | 12.9 | 0.02F | 5.4 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1771.75 | 1791.4 | 14.6 | 0.106 | <0.001 | 0.09 | <0.05 | 4.6 | 0.0044B7 | 13.7 | <0.03 | 3.4 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1771.75 | 1791.4 | 9.9 | 0.077 | <0.001 | 0.07 | <0.05 | 3.4 | 0.0038 | 10.6 | <0.03 | 2.5 | <0.0005 | 0.0004F | 0.009F | <0.05 |
| | | 4-Nov-08 | N | 1771.75 | 1791.4 | 11 | 0.082 | <0.001 | 0.06 | <0.05 | 3.5 | 0.0036 | 11.7 | <0.03 | 1.7F | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1771.75 | 1791.4 | 10.5 | 0.084 | <0.001 | 0.07 | <0.05 | 3.3 | 0.0041 | 10.6 | <0.03 | 1.3F | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1771.75 | 1791.4 | 11.9 | 0.096 | <0.001 | 0.07 | <0.05 | 3.5 | 0.0048M1 | 11.9 | <0.03 | 1.1F | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1771.75 | 1791.4 | 9.4 | 0.073 | <0.001 | 0.05 | <0.05 | 3.2 | 0.0039 | 8.6 | <0.03 | 0.7F | <0.0005 | 0.0004F | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-001C | TEST 3 | 2-Dec-08 | N | 1771.75 | 1791.4 | 9.9 | 0.073 | <0.001 | 0.05 | <0.05 | 3.3 | 0.0034 | 9.1 | <0.03 | 0.6F | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1771.75 | 1791.4 | 10.2 | 0.078 | <0.001 | 0.05 | <0.05 | 2.7 | 0.0036 | 9.7 | <0.05D1 | 0.5F | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1771.75 | 1791.4 | 8 | 0.06 | 0.0002F | 0.05 | <0.05 | 3.2 | 0.0031 | 7.2 | <0.03 | 0.4F | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1771.75 | 1791.4 | 9.9 | 0.092 | -- | 0.06 | <0.05 | 2.9 | 0.0037 | 9.3 | -- | 0.4F | <0.0005 | 0.0006 | -- | <0.05 |
| | | 30-Dec-08 | N | 1771.75 | 1791.4 | 7.4 | 0.06 | -- | 0.04F | <0.05 | 1.9F | 0.0031 | 7.5 | -- | <2 | <0.0005 | 0.0004F | -- | <0.05 |
| | | 6-Jan-09 | N | 1771.75 | 1791.4 | 8.9 | 0.08 | -- | 0.06 | <0.05 | 2.6 | 0.0038 | 9.1 | -- | 0.5F | <0.0005 | 0.0005 | -- | <0.05 |
| | | 13-Jan-09 | N | 1771.75 | 1791.4 | 7.7 | 0.056 | <0.001 | 0.04F | <0.05 | 2.2 | 0.0034 | 7.9 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1771.75 | 1791.4 | 7.6 | 0.064 | -- | 0.04F | <0.05 | 2.3 | 0.0036 | 8.9 | -- | <2 | <0.0005 | 0.0006 | -- | <0.05 |
| | | 27-Jan-09 | N | 1771.75 | 1791.4 | 7.2 | 0.066 | -- | 0.05 | <0.05 | 2.2 | 0.0034 | 7.9 | -- | <2 | <0.0005 | 0.0004F | -- | <0.05 |
| | | 3-Feb-09 | N | 1771.75 | 1791.4 | 9.2 | 0.081 | -- | 0.05 | <0.05 | 2.6 | 0.0034 | 10.8 | -- | <2 | <0.0005 | 0.0007 | -- | <0.05 |
| | | 10-Feb-09 | N | 1771.75 | 1791.4 | 7.6 | 0.069 | <0.001H3 | 0.06 | 0.03F | 2.2 | 0.0041 | 9.2 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 17-Feb-09 | N | 1771.75 | 1791.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 4 | 26-Aug-08 | N | 1855 | 1858 | 46D2 | 0.293 | <0.001 | <0.5D2 | <0.5D2 | 57.7 | 0.178 | 53.4 | <0.03 | 341 | 0.0002 | 0.0035 | <0.03 | <0.5D2 |
| | | 2-Sep-08 | N | 1855 | 1858 | 25.1 | 0.171 | <0.001 | 0.05 | <0.05 | 32.1 | 0.0371 | 25.1 | <0.03 | 146 | 0.0001F | 0.0011 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1855 | 1858 | 16.5 | 0.175 | <0.001 | 0.02 | <0.05 | 20.4 | 0.0145 | 16.9 | 0.01 | 7.6 | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1855 | 1858 | 30 | 0.199 | <0.001 | 0.04 | <0.05 | 23.1 | 0.0227 | 24.2 | <0.03 | 2.1 | <0.0005 | 0.0008 | <0.03 | 0.01 |
| | | 23-Sep-08 | N | 1855 | 1858 | 3.6 | 0.036 | <0.001 | 0.02 | <0.05 | 2.9 | 0.0047 | 5 | <0.03 | <2 | <0.0005 | 0.0001 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1855 | 1858 | 6.7 | 0.059 | <0.001 | <0.05 | <0.05 | 4.9 | 0.0082 | 9.4 | <0.03 | 0.3 | <0.0005 | 0.0004 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1855 | 1858 | 12.5 | 0.134 | <0.001 | 0.02F | <0.05 | 5.3 | 0.0099 | 13.5 | <0.03 | 0.6F | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1855 | 1858 | 11.5 | 0.108 | <0.001 | <0.05 | <0.05 | 4.8 | 0.0116 | 16.4 | <0.03 | 0.6F | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1855 | 1858 | 11.6 | 0.113 | <0.001 | 0.01F | <0.05 | 3.9 | 0.0114B7 | 16.2 | <0.03 | 0.4F | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1855 | 1858 | 5.8 | 0.086 | <0.001 | 0.02F | <0.05 | 2.2 | 0.0097 | 13.3 | <0.03 | 0.9F | <0.0005 | 0.0005 | 0.005F | <0.05 |
| | | 4-Nov-08 | N | 1855 | 1858 | 3.3 | 0.055 | <0.001 | 0.01F | <0.05 | 0.8F | 0.003 | 4.4 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | TEST 4S | 11-Nov-08 | N | 1855 | 1858 | 12.4 | 0.123 | <0.001 | 0.03F | <0.05 | 2.9 | 0.0158 | 15.3 | <0.03 | 0.3F | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1855 | 1858 | 2.7 | 0.093 | <0.001 | 0.02F | <0.05 | 0.9F | 0.0046 | 3.6 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1855 | 1858 | 2.7 | 0.06 | <0.001 | <0.05 | <0.05 | 1F | 0.0052 | 3.6 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1855 | 1858 | 2.3 | 0.061 | <0.001 | <0.05 | <0.05 | 0.8F | 0.0035 | 2.7 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1855 | 1858 | 1.6 | 0.028F | <0.001 | <0.05 | <0.05 | 0.4F | 0.0033 | 2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1855 | 1858 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1855 | 1858 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 5 | 26-Aug-08 | FD | 1855 | 1858 | 46D2 | 0.284 | <0.001 | <0.5D2 | <0.5D2 | 57 | 0.175 | 53.7 | <0.03 | 325 | 0.0003 | 0.0035 | <0.03 | <0.5D2 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-001C | TEST 5 | 2-Sep-08 | FD | 1855 | 1858 | 33.9 | 0.176 | <0.001 | 0.05 | <0.05 | 42.5 | 0.052 | 33.5 | <0.03 | 160 | 0.0001F | 0.0017 | <0.03 | <0.05 |
| | | 9-Sep-08 | FD | 1855 | 1858 | 19.2 | 0.174 | <0.001 | 0.02 | <0.05 | 19.8 | 0.0198 | 18 | <0.03 | 4.4 | <0.0005 | 0.0009 | <0.03 | <0.05 |
| | | 16-Sep-08 | FD | 1855 | 1858 | 19.4 | 0.17 | <0.001 | 0.03 | <0.05 | 14.6 | 0.0145 | 15.2 | 0.01 | 1.7 | <0.0005 | 0.0007 | <0.03 | 0.01 |
| | | 23-Sep-08 | FD | 1855 | 1858 | 16 | 0.151 | <0.001 | 0.03 | <0.05 | 10 | 0.0194 | 15.6 | <0.03 | 0.8 | <0.0005 | 0.0008 | 0.006 | <0.05 |
| | | 30-Sep-08 | FD | 1855 | 1858 | 11.7 | 0.103 | <0.001 | <0.05 | <0.05 | 6 | 0.0123 | 11.8 | <0.03 | 0.4 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 7-Oct-08 | FD | 1855 | 1858 | 6.8 | 0.061 | <0.001 | <0.05 | <0.05 | 2.5 | 0.0081 | 8.2 | 0.01F | <2 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 14-Oct-08 | FD | 1855 | 1858 | 8.8 | 0.076 | <0.001 | <0.05 | <0.05 | 2.8 | 0.0097 | 12.2 | <0.03 | 0.5F | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 21-Oct-08 | FD | 1855 | 1858 | 6.4 | 0.067 | <0.001 | <0.05 | <0.05 | 1.8F | 0.0086B7 | 11.3 | <0.03 | <2 | <0.0005 | 0.0005 | 0.006F | <0.05 |
| | | 28-Oct-08 | FD | 1855 | 1858 | 10.9 | 0.134 | <0.001 | 0.03F | <0.05 | 2.6 | 0.0144 | 17 | <0.03 | 0.7F | <0.0005 | 0.0011 | 0.009F | <0.05 |
| | | 4-Nov-08 | FD | 1855 | 1858 | 2.5 | 0.032 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0033 | 4 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 11-Nov-08 | FD | 1855 | 1858 | 2.8 | 0.039 | <0.001 | 0.02F | <0.05 | 0.7F | 0.0047 | 4.3 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 18-Nov-08 | FD | 1855 | 1858 | 3.9 | 0.052 | <0.001 | 0.02F | <0.05 | 1.3F | 0.007 | 8.2 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 25-Nov-08 | FD | 1855 | 1858 | 3.3 | 0.051 | <0.001 | <0.05 | <0.05 | 1.2F | 0.0058 | 6.3 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 2-Dec-08 | FD | 1855 | 1858 | 2.5 | 0.042 | <0.001 | <0.05 | <0.05 | 0.9F | 0.0037 | 4.5 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 9-Dec-08 | FD | 1855 | 1858 | 3.1 | 0.052 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0048 | 6 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 16-Dec-08 | FD | 1855 | 1858 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | FD | 1855 | 1858 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 6 | 26-Aug-08 | N | 1873 | 1876 | 29D2 | 0.14 | <0.01D2 | 0.25 | <0.3D2 | 44.3 | 0.213B7 | 22.9 | 0.01 | 232 | 0.0003 | 0.0068 | <0.03 | <0.3D2 |
| | | 2-Sep-08 | N | 1873 | 1876 | 6.3 | 0.027F | <0.001 | 0.17 | <0.05 | 20.2 | 0.0179 | 22.5 | <0.03 | 97.4 | 0.0001F | 0.0024 | 0.018F | <0.05 |
| | | 9-Sep-08 | N | 1873 | 1876 | 2.7 | 0.028 | <0.001 | 0.06 | <0.05 | 9.7 | 0.0113 | 12.6 | 0.01 | 41 | <0.0005 | 0.0015 | 0.012 | <0.05 |
| | | 16-Sep-08 | N | 1873 | 1876 | 2.3 | 0.02 | <0.001 | 0.06 | <0.05 | 12.3 | 0.0119 | 23.4 | <0.03 | 51.9 | <0.0005 | 0.0013 | 0.02 | <0.05 |
| | | 23-Sep-08 | N | 1873 | 1876 | 1.1 | 0.017 | <0.001 | 0.03 | <0.05 | 5.2 | 0.0056 | 8.6 | <0.03 | 17.9 | <0.0005 | 0.0009 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1873 | 1876 | 0.7 | 0.005 | <0.001 | <0.05 | <0.05 | 7.1 | 0.0079 | 7.5 | <0.03 | 16.8 | <0.0005 | 0.0003 | 0.008 | <0.05 |
| | | 7-Oct-08 | N | 1873 | 1876 | 0.7F | 0.007F | <0.001 | <0.05 | <0.05 | 6 | 0.005 | 5.2 | <0.03 | 12.9 | <0.0005 | 0.0002F | 0.005F | <0.05 |
| | | 14-Oct-08 | N | 1873 | 1876 | 0.9F | 0.009F | <0.001 | <0.05 | <0.05 | 5.8 | 0.004 | 4.2 | <0.03 | 11.1 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1873 | 1876 | 2.2 | 0.022F | <0.001 | 0.02F | <0.05 | 7.8 | 0.0065B7 | 7.1 | <0.03 | 18.1 | <0.0005 | 0.0012 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1873 | 1876 | 1.5 | 0.032 | <0.001 | 0.03F | <0.05 | 4.9 | 0.0054 | 5.9 | <0.03 | 14 | <0.0005 | 0.001 | 0.008F | <0.05 |
| | | 4-Nov-08 | N | 1873 | 1876 | 1 | 0.01F | <0.001 | 0.01F | <0.05 | 4.9 | 0.0047 | 5.5 | <0.03 | 9.6 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1873 | 1876 | 0.7F | 0.007F | <0.001 | <0.05 | <0.05 | 3.5 | 0.0032 | 2.5 | <0.03 | 5 | <0.0005 | 0.0002F | <0.03 | 0.01F |
| | | 18-Nov-08 | N | 1873 | 1876 | 0.9F | 0.01F | <0.001 | 0.02F | <0.05 | 3.9 | 0.0031 | 2.9 | <0.03 | 5.3 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1873 | 1876 | 0.9F | 0.008F | <0.001 | <0.05 | <0.05 | 3.8 | 0.0028 | 2.3 | <0.03 | 5.1 | <0.0005 | 0.0001F | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-001C | TEST 6 | 2-Dec-08 | N | 1873 | 1876 | 0.8F | <0.03 | <0.001 | <0.05 | <0.05 | 3.2 | 0.0019 | 1.8F | <0.03 | 3.9 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1873 | 1876 | 0.8F | 0.012F | <0.001 | <0.05 | <0.05 | 3.4 | 0.0025 | 2.1 | <0.03 | 4.6 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1873 | 1876 | 1.2 | 0.013F | <0.001 | <0.05 | <0.05 | 5.5 | 0.0035 | 3.4 | <0.03 | 8 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1873 | 1876 | 0.8F | 0.02F | -- | 0.02F | <0.05 | 3.9 | 0.0024 | 2.3 | -- | 5.4 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 30-Dec-08 | N | 1873 | 1876 | 1.1 | 0.013F | -- | <0.05 | <0.05 | 3.8 | 0.0027 | 2.9 | -- | 5.5 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 6-Jan-09 | N | 1873 | 1876 | 0.9F | 0.019F | -- | <0.05 | <0.05 | 3.9 | 0.0032 | 2.6 | -- | 5.5 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 13-Jan-09 | N | 1873 | 1876 | 0.9F | 0.005F | <0.001 | <0.05 | <0.05 | 3.6 | 0.0027 | 2.6 | <0.03 | 4.8 | <0.0005 | 0.0002F | 0.007F | <0.05 |
| | | 20-Jan-09 | N | 1873 | 1876 | 2.3 | 0.035 | -- | 0.01F | <0.05 | 6.6 | 0.0053 | 6 | -- | 9.5 | <0.0005 | 0.0005 | -- | <0.05 |
| | | 27-Jan-09 | N | 1873 | 1876 | 1.1 | 0.018F | -- | <0.05 | <0.05 | 3.8 | 0.0038 | 3.1 | -- | 4.8 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 3-Feb-09 | N | 1873 | 1876 | 1.4 | 0.016F | -- | <0.05 | <0.05 | 4.7 | 0.0035 | 3.9 | -- | 5.4 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 10-Feb-09 | N | 1873 | 1876 | 1.7 | 0.021F | -- | <0.05 | <0.05 | 4.6 | 0.0032 | 4.7 | -- | 4.9 | <0.0005 | 0.0001F | -- | <0.05 |
| | | 17-Feb-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1873 | 1876 | 1.5 | 0.025F | <0.001 | <0.05 | <0.05 | 4.6 | 0.0029 | 3 | <0.03 | 4.1 | <0.0005 | <0.0005 | <0.03 | <0.05L1 |
| | | 17-Mar-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1873 | 1876 | 2.1 | 0.026F | <0.001 | 0.01FM1 | <0.05 | 4.2 | 0.0033 | 3.7 | <0.03 | 4.3 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 14-Apr-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1873 | 1876 | 2.4 | 0.029F | <0.001 | <0.05 | <0.05 | 4.8 | 0.0036 | 3.3 | <0.03 | 4.3 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 12-May-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1873 | 1876 | 3 | 0.032 | <0.001 | <0.05 | <0.05 | 7.3 | 0.007 | 6.2 | <0.03 | 7.2 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 9-Jun-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1873 | 1876 | 4.3 | 0.043 | <0.001 | <0.05 | <0.05 | 7.8 | 0.0084B1 | 6.4 | <0.03 | 4.7 | <0.0005 | 0.0003F | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-001C | TEST 6 | 7-Jul-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1873 | 1876 | 5.9 | 0.047 | <0.001 | 0.03F | <0.05 | 12.7 | 0.0125 | 10.6 | <0.03 | 7.2 | <0.0005 | 0.001 | <0.03 | <0.05 |
| | | 4-Aug-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1873 | 1876 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1873 | 1876 | 4.6 | 0.039 | <0.001 | <0.05 | 0.02F | 8.4 | 0.0093 | 8.3 | <0.03 | 1.7F | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | TEST 7 | 26-Aug-08 | N | 2041 | 2044 | 137D2 | 2.41 | <0.001 | <0.5D2 | <0.3D2 | 103 | 0.0316B7 | 10 | <0.03 | 59.4 | 0.0004 | 0.0037 | <0.03 | <0.3D2 |
| | | 2-Sep-08 | N | 2041 | 2044 | 20.8 | 0.266 | <0.001 | 0.02F | <0.05 | 34.8 | 0.0039 | 7.1 | <0.03 | 2.2 | 0.0001F | 0.0007 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 2041 | 2044 | 9.6 | 0.168 | <0.001 | 0.01 | <0.05 | 17.4 | 0.0024 | 4.2 | 0.01 | 0.8 | <0.0005 | 0.0003 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 2041 | 2044 | 15.5 | 0.397 | <0.001 | 0.03 | <0.05 | 29.4 | 0.0032 | 7.4 | <0.03 | 0.9 | <0.0005 | 0.0004 | <0.03 | 0.02 |
| | | 23-Sep-08 | N | 2041 | 2044 | 11.2 | 0.346 | <0.001 | 0.03 | <0.05 | 24.6 | 0.0031 | 6.3 | <0.03 | 0.3 | <0.0005 | 0.0003 | 0.005 | <0.05 |
| | | 30-Sep-08 | N | 2041 | 2044 | 9.1 | 0.379 | <0.001 | <0.05 | <0.05 | 22.6 | 0.003 | 5 | <0.03 | <2 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 2041 | 2044 | 6.5 | 0.354 | <0.001 | 0.01F | <0.05 | 19.9 | 0.0021 | 4.1 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 2041 | 2044 | 3.3 | 0.241 | <0.001 | <0.05 | <0.05 | 12.3 | 0.0015 | 2.8 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 2041 | 2044 | 3.4 | 0.296 | <0.001 | 0.01F | <0.05 | 12.4 | 0.0019 | 3.5 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 2041 | 2044 | 2.4 | 0.304 | <0.001 | 0.02F | <0.05 | 11.3 | 0.0017 | 3.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 2041 | 2044 | 2.2 | 0.284 | <0.001 | 0.01F | <0.05 | 9.6 | 0.0013 | 2.8 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 2041 | 2044 | 2.4 | 0.342 | <0.001 | 0.02F | <0.05 | 10 | 0.0016 | 2.7 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 2041 | 2044 | 3.7 | 0.529 | <0.001 | 0.03F | <0.05 | 13.7 | 0.0027 | 3.7 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 2041 | 2044 | 1.7 | 0.354 | <0.001 | <0.05 | <0.05 | 8.3 | 0.0014 | 2.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 2041 | 2044 | 1.4 | 0.339 | <0.001 | <0.05 | <0.05 | 6.9 | 0.0009 | 2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 2041 | 2044 | 1.5 | 0.46 | <0.001 | <0.05 | <0.05 | 7.5 | 0.001 | 2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 2041 | 2044 | 1 | 0.304 | <0.001 | <0.05 | <0.05 | 6.6 | 0.0007 | 1.6F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 2041 | 2044 | 1.1 | 0.331 | -- | 0.02F | <0.05 | 6.8 | 0.0009 | 1.8F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 30-Dec-08 | N | 2041 | 2044 | 1.2 | 0.476 | -- | <0.05 | <0.05 | 6.2 | 0.0011 | 1.6F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 6-Jan-09 | N | 2041 | 2044 | 1.2 | 0.418 | -- | <0.05 | <0.05 | 7.8 | 0.0014 | 2.1 | -- | <2 | <0.0005 | <0.0005 | -- | 0.01F |
| | | 13-Jan-09 | N | 2041 | 2044 | 1.2 | 0.514 | <0.001 | <0.05 | <0.05 | 7.8 | 0.0013 | 2.5 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 2041 | 2044 | 1.3 | 0.475 | -- | 0.02F | <0.05 | 8 | 0.0015 | 3 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 27-Jan-09 | N | 2041 | 2044 | 1.1 | 0.505 | -- | <0.05 | <0.05 | 7.2 | 0.0017 | 2.9 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-001C | TEST 7 | 3-Feb-09 | N | 2041 | 2044 | 1.1 | 0.53 | -- | <0.05 | <0.05 | 8.2 | 0.0015 | 3.2 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 10-Feb-09 | N | 2041 | 2044 | 0.9F | 0.461 | <0.001H3 | 0.03F | <0.05 | 6.9 | 0.0019 | 2.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 17-Feb-09 | N | 2041 | 2044 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 8 | 26-Aug-08 | FD | 2041 | 2044 | 150D2 | 2.54 | <0.001 | <0.5D2 | <0.3D2 | 104 | 0.0655B7 | 11.8 | 0.01 | 123 | 0.0004 | 0.005 | <0.03 | <0.3D2 |
| | | 2-Sep-08 | FD | 2041 | 2044 | 95.9 | 1.02 | <0.001 | 0.07 | <0.05 | 80 | 0.0104 | 9.6 | <0.03 | 10.9 | 0.0002F | 0.0014 | <0.03 | <0.05 |
| | | 9-Sep-08 | FD | 2041 | 2044 | 60 | 1.03 | <0.001 | 0.04 | <0.05 | 62.8 | 0.0041 | 9.1 | <0.03 | 2.3 | 0.0002 | 0.0014 | <0.03 | <0.05 |
| | | 16-Sep-08 | FD | 2041 | 2044 | 35.2 | 0.868 | <0.001 | 0.05 | <0.05 | 51.8 | 0.0051 | 8.1 | 0.01 | 1.3 | <0.0005 | 0.0004 | <0.03 | 0.02 |
| | | 23-Sep-08 | FD | 2041 | 2044 | 20.4 | 0.752 | <0.001 | 0.04 | <0.05 | 42.1 | 0.0039 | 8 | <0.03 | 0.6 | 0.0001 | 0.0004 | 0.007 | <0.05 |
| | | 30-Sep-08 | FD | 2041 | 2044 | 15 | 0.967 | <0.001 | 0.02 | <0.05 | 37.8 | 0.0034 | 6.9 | <0.03 | 0.5 | 0.0001 | 0.0003 | <0.03 | <0.05 |
| | | 7-Oct-08 | FD | 2041 | 2044 | 13 | 0.975 | <0.001 | 0.02F | <0.05 | 32.3 | 0.0026 | 5.5 | 0.01F | 0.4F | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 14-Oct-08 | FD | 2041 | 2044 | 10.4 | 1.07 | <0.001 | 0.02F | <0.05 | 27.2 | 0.0022 | 5 | 0.02F | 0.5F | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 21-Oct-08 | FD | 2041 | 2044 | 7.9 | 1.05 | <0.001 | 0.02F | <0.05 | 24.1 | 0.0022 | 5.1 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 28-Oct-08 | FD | 2041 | 2044 | 7 | 1.13 | <0.001 | 0.03F | 0.02F | 22.8 | 0.0022 | 4.9 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 4-Nov-08 | FD | 2041 | 2044 | 6.1 | 1.19 | <0.001 | 0.02F | <0.05 | 22.4 | 0.002 | 5.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 11-Nov-08 | FD | 2041 | 2044 | 5.3 | 1.4 | <0.001 | 0.03F | <0.05 | 21.5 | 0.0022 | 4.1 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 18-Nov-08 | FD | 2041 | 2044 | 4.2 | 1.4 | <0.001 | 0.03F | <0.05 | 20 | 0.0026 | 4.7 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 25-Nov-08 | FD | 2041 | 2044 | 2.7 | 1.2 | <0.001 | <0.05 | <0.05 | 16 | 0.0017 | 3.5 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | FD | 2041 | 2044 | 3.4 | 2.11 | <0.001 | <0.05 | <0.05 | 18.2 | 0.0012 | 4.4 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 0.01F |
| | | 9-Dec-08 | FD | 2041 | 2044 | 2.4 | 1.19 | <0.001 | <0.05 | <0.05 | 15.6 | 0.0017 | 3.3 | <0.05D1 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | FD | 2041 | 2044 | 1.7 | 0.99 | <0.001 | <0.05 | <0.05 | 12.6 | 0.0012 | 2.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Dec-08 | FD | 2041 | 2044 | 1.5 | 1.1 | -- | 0.02F | <0.05 | 12.1 | 0.0012 | 2.8 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 30-Dec-08 | FD | 2041 | 2044 | 1.9 | 1.47 | -- | 0.02F | <0.05 | 12.4 | 0.0012 | 3.5 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 6-Jan-09 | FD | 2041 | 2044 | 1.6 | 1.13 | -- | 0.01F | <0.05 | 13.2 | 0.0014 | 2.8 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 13-Jan-09 | FD | 2041 | 2044 | 1.4 | 1.05 | <0.001 | 0.01F | <0.05 | 11.6 | 0.0012 | 2.7 | <0.03 | <2 | <0.0005 | <0.0005 | 0.006F | <0.05 |
| | | 20-Jan-09 | FD | 2041 | 2044 | 1.4 | 0.941 | -- | 0.01F | <0.05 | 11.4 | 0.0015 | 3 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 27-Jan-09 | FD | 2041 | 2044 | 1.2 | 0.876 | -- | <0.05 | <0.05 | 9.9 | 0.0014 | 2.6 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 3-Feb-09 | FD | 2041 | 2044 | 1.2 | 0.835 | -- | <0.05 | <0.05 | 10.3 | 0.0012 | 2.8 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 10-Feb-09 | FD | 2041 | 2044 | 1.1 | 0.78 | <0.001H3 | 0.03F | <0.05 | 8.9 | 0.0016 | 2.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 17-Feb-09 | FD | 2041 | 2044 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-002A | TEST 10 | 26-Aug-08 | N | 1154 | 1156 | 38D2 | 2.87D2 | <0.001 | <1D2 | 0.2D2 | 270D2 | 1.6D2B7 | 22D2 | 0.16D2 | 61D2 | 0.0009 | 0.0033 | <0.1D2 | 0.5D2 |
| | | 2-Sep-08 | N | 1154 | 1156 | 1.8 | 0.267 | <0.001 | <0.05 | <0.05 | 23.5 | 0.314 | 14 | <0.03 | 1.4F | <0.0005 | 0.0002F | <0.03 | 0.03F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-002A | TEST 10 | 9-Sep-08 | N | 1154 | 1156 | 0.6 | 0.156 | <0.001 | <0.05 | <0.05 | 12.4 | 0.134 | 13.3 | 0.01 | 0.4 | <0.0005 | 0.0001 | <0.03 | 0.01 |
| | | 16-Sep-08 | N | 1154 | 1156 | 0.6 | 0.186 | <0.001 | <0.05 | <0.05 | 13 | 0.0843 | 13.9 | 0.01 | 0.3 | <0.0005 | 0.0001 | <0.03 | 0.03 |
| | | 23-Sep-08 | N | 1154 | 1156 | 0.2 | 0.082 | <0.001 | <0.05 | 0.01 | 3.9 | 0.0234 | 7.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1154 | 1156 | 0.3 | 0.14 | <0.001 | <0.05 | <0.05 | 5.9 | 0.0339 | 11.2 | <0.03 | <2 | <0.0005 | 0.0001 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1154 | 1156 | 0.2F | 0.151 | <0.001 | <0.05 | <0.05 | 5.4 | 0.0255 | 11 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1154 | 1156 | 0.3F | 0.122 | <0.001 | <0.05 | 0.01F | 4.4 | 0.0178 | 9.3 | 0.01F | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1154 | 1156 | 0.2F | 0.087 | <0.001 | <0.05 | <0.05 | 2.7 | 0.0122B7 | 7.3 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1154 | 1156 | 0.2F | 0.109 | <0.001 | <0.05 | 0.02F | 3.7 | 0.0165 | 9.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 1154 | 1156 | 0.4F | 0.186 | <0.001 | <0.05 | <0.05 | 5.9 | 0.0214 | 14.2 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | TEST 10S | 11-Nov-08 | N | 1154 | 1156 | 0.5F | 0.27 | <0.001 | <0.05 | 0.02F | 5.9 | 0.0625 | 6.9 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 0.01F |
| | | 18-Nov-08 | N | 1154 | 1156 | <1 | 0.087 | <0.001 | <0.05 | <0.05 | 1.9F | 0.0198 | 2.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1154 | 1156 | <1 | 0.068 | <0.001 | <0.05 | <0.05 | 1.5F | 0.0146 | 1.7F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1154 | 1156 | <1 | 0.063 | <0.001 | <0.05 | <0.05 | 1.2F | 0.0106 | 1.2F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1154 | 1156 | <1 | 0.068 | <0.001 | <0.05 | <0.05 | 0.9F | 0.0117 | 1.6F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1154 | 1156 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1154 | 1156 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 11 | 26-Aug-08 | N | 1414.6 | 1417 | 31D2 | 4.58D2 | <0.001 | <1D2 | 0.8D2 | 159D2 | 0.0212 | 9D2 | 0.11D2 | 31D2 | 0.0015 | 0.0059 | <0.1D2 | 0.4D2 |
| | | 2-Sep-08 | N | 1414.6 | 1417 | 3.3 | 1.67 | <0.001 | <0.05 | 0.23 | 24.7 | 0.0081 | 18.3 | <0.03 | 1.1F | 0.0003F | 0.0005 | <0.03 | 0.07 |
| | | 9-Sep-08 | N | 1414.6 | 1417 | 2.3 | 1.1 | <0.001 | <0.05 | 0.2 | 14.1 | 0.0117 | 24.8 | <0.03M2 | 0.6 | 0.0002 | 0.0008 | <0.03 | 0.05 |
| | | 16-Sep-08 | N | 1414.6 | 1417 | 1D2 | 0.68D2 | <0.001 | 0.02 | 0.12D2 | 12.8 | 0.0147 | 30.6 | 0.01 | 0.5 | <0.0005 | 0.0011 | <0.1D2 | 0.02 |
| | | 23-Sep-08 | N | 1414.6 | 1417 | 0.7 | 0.5 | <0.001 | 0.01 | 0.13D1 | 8.2 | 0.016 | 31.3 | <0.03M2 | <2 | 0.0001 | 0.0018 | <0.1D1 | <0.3D1 |
| | | 30-Sep-08 | N | 1414.6 | 1417 | 0.3 | 0.409 | <0.001 | <0.05 | 0.05 | 6.2 | 0.0254 | 21.2 | <0.03M2 | <2 | <0.0005 | 0.0018 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1414.6 | 1417 | <5D1 | 0.39D1 | <0.001 | <0.3D1 | <0.3D1 | 5FD1 | 0.018 | 24D1 | <0.1D1 | <8D1 | <0.0005 | 0.002 | <0.1D1 | <0.3D1 |
| | | 14-Oct-08 | N | 1414.6 | 1417 | <1 | 0.466 | <0.001 | <0.05 | 0.05 | 4.2 | 0.0122 | 19.9 | 0.03FD1 | <2 | <0.0005 | 0.0011 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1414.6 | 1417 | <1 | 0.491 | <0.001 | <0.05 | 0.04F | 2.9 | 0.008B7 | 14.6M1 | <0.03M2 | <2 | <0.0005 | 0.0007 | <0.03 | <0.1D1 |
| | | 28-Oct-08 | N | 1414.6 | 1417 | <2D2 | 0.551 | <0.001 | 0.03FD2 | 0.1D2 | 3.9D2 | 0.0177 | 19.7D2 | <0.05D2 | <3D2 | <0.0005 | 0.0015 | 0.007F | <0.1D2 |
| | | 4-Nov-08 | N | 1414.6 | 1417 | <1 | 0.255 | <0.001 | 0.01F | 0.04FD2 | 4.3 | 0.0148 | 23.7M1 | <0.03M2 | <2 | <0.0005 | 0.0016 | <0.03 | <0.1D2 |
| | | 11-Nov-08 | N | 1414.6 | 1417 | <1 | 1.16 | <0.001 | <0.05M1 | 0.09 | 4.4 | 0.0067 | 15 | <0.03M2 | <2 | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1414.6 | 1417 | <1 | 0.408 | <0.001 | <0.05 | 0.03F | 4 | 0.0076M1 | 12.6M1 | <0.03M2 | <2 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1414.6 | 1417 | <1 | 0.147M1 | <0.001 | <0.05 | 0.02FM1 | 1.9F | 0.0077 | 5.2M1 | <0.03M2 | <2 | <0.0005 | 0.0005 | <0.03M1 | <0.05M1 |
| | | 2-Dec-08 | N | 1414.6 | 1417 | <1 | 0.157 | <0.001 | <0.05 | 0.02F | 2.7 | 0.0112 | 9.5 | <0.03 | <2 | <0.0005 | 0.001 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-002A | TEST 11 | 9-Dec-08 | N | 1414.6 | 1417 | <1 | 0.064 | <0.001 | <0.05 | 0.02F | 1.4F | 0.0095B3 | 6.2M1 | <0.05D1M2 | <2 | <0.0005 | 0.0007 | <0.03 | <0.1D1 |
| | | 16-Dec-08 | N | 1414.6 | 1417 | <1 | 0.017F | <0.001 | <0.05 | <0.05 | 1.1F | 0.0072 | 4 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1414.6 | 1417 | <1 | 0.026F | -- | 0.02F | 0.02F | 1F | 0.0095 | 3.6 | -- | <2 | <0.0005 | 0.0005 | -- | <0.05 |
| | | 30-Dec-08 | N | 1414.6 | 1417 | <1 | 0.015F | -- | 0.01F | 0.02F | <2 | 0.0095 | 4.5 | -- | <2 | <0.0005 | 0.0005 | -- | 0.2 |
| | | 6-Jan-09 | N | 1414.6 | 1417 | <1 | 0.025F | -- | <0.05 | 0.02F | 0.8F | 0.0134 | 5.2 | -- | <2 | <0.0005 | 0.0006 | -- | 0.11 |
| | | 13-Jan-09 | N | 1414.6 | 1417 | <1 | 0.03FD1 | <0.001 | <0.1D1 | 0.03F | <3D1 | 0.0178 | 4.7D1 | <0.03 | <3D1 | <0.0005 | 0.0009 | <0.03 | <0.1D1 |
| | | 20-Jan-09 | N | 1414.6 | 1417 | <1 | 0.023F | -- | <0.05 | 0.03FD1 | 1.1F | 0.0175 | 7.8 | -- | <2 | <0.0005 | 0.0009 | -- | 0.02F |
| | | 27-Jan-09 | N | 1414.6 | 1417 | <1 | 0.03FD1 | -- | <0.05 | <0.1D1 | 1.7F | 0.0261 | 10.9 | -- | <2 | <0.0005 | 0.001 | -- | 0.03FD1 |
| | | 3-Feb-09 | N | 1414.6 | 1417 | <1 | 0.022F | -- | <0.1D1 | 0.02FD1 | 1.8F | 0.0223 | 9.6 | -- | <2 | <0.0005 | 0.0007 | -- | 0.01F |
| | | 10-Feb-09 | N | 1414.6 | 1417 | <1 | 0.056 | <0.001H3 | 0.03F | 0.05 | 1.3F | 0.027 | 6.8 | <0.03 | <2 | <0.0005 | 0.0006 | <0.03 | 0.12 |
| | | 17-Feb-09 | N | 1414.6 | 1417 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 12 | 26-Aug-08 | N | 1454 | 1457 | 23D1 | 2D1M1 | <0.001 | <0.3D1 | 0.48D1 | 122D1 | 0.0082B7 | 3FD1M1 | 0.28D1 | 36D1 | 0.0039 | 0.0011 | <0.1D1M1 | 0.37D1 |
| | | 2-Sep-08 | N | 1454 | 1457 | 1.1 | 0.179 | <0.001 | <0.05 | 0.02F | 24 | 0.0016 | 11.8 | <0.03M2 | 1.7F | 0.0007 | <0.0005 | <0.03 | 0.02F |
| | | 9-Sep-08 | N | 1454 | 1457 | 0.6 | 0.106 | <0.001 | <0.05 | 0.01 | 8.9 | 0.0011 | 6.3 | 0.02 | 0.5 | 0.0003 | <0.0005 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1454 | 1457 | 0.5 | 0.089 | <0.001 | <0.05 | 0.02 | 5.9 | 0.0009 | 4 | <0.03M2 | <2 | 0.0002 | <0.0005 | <0.03 | 0.01 |
| | | 23-Sep-08 | N | 1454 | 1457 | 0.7 | 0.089 | <0.001 | <0.05 | 0.03 | 6 | 0.0013 | 4.6 | <0.03 | <2 | 0.0003 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1454 | 1457 | 0.6 | 0.059 | <0.001 | <0.05 | 0.01 | 4.4 | 0.0014 | 2.8 | <0.03 | <2 | 0.0002 | <0.0005 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1454 | 1457 | 0.4F | 0.034 | <0.001 | <0.05 | 0.02F | 3.2 | 0.0012 | 2.2 | <0.03 | <2 | 0.0002F | <0.0005 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1454 | 1457 | 0.4F | 0.018F | <0.001 | <0.05 | 0.02F | 2.4 | 0.0007 | 1.6F | <0.03M2 | <2 | 0.0001F | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1454 | 1457 | 0.3F | 0.014F | <0.001 | <0.05 | <0.05 | 1.4F | 0.0005 | 1.7F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1454 | 1457 | 0.3F | 0.014F | <0.001 | <0.05 | 0.02F | 1.3F | 0.0006 | 1.6FM1 | <0.03M2 | <2 | <0.0005 | <0.0005 | 0.007F | <0.05 |
| | | 4-Nov-08 | N | 1454 | 1457 | 0.3F | 0.013F | <0.001 | <0.05 | <0.05 | 1.5F | 0.0005 | 2.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1454 | 1457 | 0.2F | 0.012F | <0.001 | <0.05 | 0.01F | 1.1F | 0.0004F | 1.6F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.01F |
| | | 18-Nov-08 | N | 1454 | 1457 | 0.2F | 0.013F | <0.001 | <0.05 | <0.05 | 1.1F | 0.0003F | 2.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1454 | 1457 | 0.2F | 0.01F | <0.001 | <0.05 | <0.05 | 1.4F | 0.0003FM1 | 1.6F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1454 | 1457 | <1 | 0.011F | <0.001 | <0.05 | <0.05 | 0.9F | 0.0002F | 1F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1454 | 1457 | <1 | 0.008F | <0.001 | <0.05 | <0.05 | 0.8F | 0.0003F | 1.3F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1454 | 1457 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.8F | 0.0001F | 1F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1454 | 1457 | <1 | 0.012F | -- | 0.01F | <0.05 | 0.9F | <0.0005 | 1.2F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 30-Dec-08 | N | 1454 | 1457 | <1 | <0.03 | -- | <0.05 | <0.05V1 | 0.3F | 0.0002F | 1.3F | -- | <2 | <0.0005 | <0.0005 | -- | 0.01F |
| | | 6-Jan-09 | N | 1454 | 1457 | <1 | 0.011F | -- | <0.05 | <0.05 | 0.6F | 0.0001F | 1.1F | -- | <2 | <0.0005 | <0.0005 | -- | 0.01F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-002A | TEST 12 | 13-Jan-09 | N | 1454 | 1457 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0001F | 1.3F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1454 | 1457 | <1 | 0.005F | -- | <0.05 | <0.05 | 0.4F | 0.0002F | 1F | -- | <2 | <0.0005 | <0.0005 | -- | 0.01F |
| | | 27-Jan-09 | N | 1454 | 1457 | <1 | 0.009F | -- | <0.05 | <0.05 | 0.5F | <0.0005 | 1.1F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 3-Feb-09 | N | 1454 | 1457 | <1 | 0.006F | -- | <0.05 | <0.05 | <2 | <0.0005 | 0.9F | -- | <2 | <0.0005 | <0.0005 | -- | 0.02F |
| | | 10-Feb-09 | N | 1454 | 1457 | <1 | 0.007F | -- | <0.05 | <0.05 | 0.7F | <0.0005 | 1.3F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 17-Feb-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1454 | 1457 | <1 | 0.017F | <0.001 | <0.05 | <0.05 | 0.8F | 0.0001F | 1.8F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.02F |
| | | 17-Mar-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1454 | 1457 | <1 | 0.02F | <0.001 | <0.05 | <0.05 | 0.7F | <0.0005 | 2.2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.02F |
| | | 14-Apr-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1454 | 1457 | <1 | 0.023F | <0.001 | <0.05 | <0.05 | 0.5F | 0.0001F | 1.6F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.02F |
| | | 12-May-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1454 | 1457 | <1 | 0.087 | <0.001 | <0.05 | 0.03F | 1.2F | 0.0004F | 3.9 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.03F |
| | | 9-Jun-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1454 | 1457 | <1 | 0.342 | <0.001 | <0.05 | 0.17 | 1.8F | 0.0028 | 7.5 | 0.01F | <2 | <0.0005 | 0.0004F | <0.1D1 | 0.38D1 |
| | | 7-Jul-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1454 | 1457 | <10D1 | 0.14FD1 | <0.001 | <0.5D1 | 0.1FD1 | <20D1 | 0.0073 | 5D1 | <0.3D1 | <20D1 | 0.0002F | 0.0018 | <0.3D1 | 0.1FD1 |
| | | 4-Aug-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-002A | TEST 12 | 18-Aug-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1454 | 1457 | <5D1 | 0.15D1 | <0.001 | <0.3D1 | 0.15 | <8D1 | 0.0098 | 8FD1 | 0.2FD1 | <8D1 | <0.0005 | 0.0025 | <0.1D1 | 0.2FD1 |
| | | 1-Sep-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Sep-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 1454 | 1457 | <10D1 | <0.3D1 | <0.001 | <0.5D1 | <0.5D1 | <20D1 | 0.01D1 | 7FD1 | <0.3D1 | <20D1 | <0.005D1 | 0.002FD1 | <0.3D1 | 0.2FD1 |
| | | 29-Sep-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 1454 | 1457 | <2D1 | <0.1D1 | <0.001 | 0.01F | 0.05 | <8D1 | 0.006 | 4.1D1 | <0.1D1 | 0.8FM3 | 0.0001F | 0.0007 | <0.1D1 | 0.08FD1 |
| | | 27-Oct-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 1454 | 1457 | <1 | 0.008F | <0.001 | 0.01F | 0.09 | 0.7F | 0.0065 | 2.6 | <0.1D1 | <2 | 0.0001F | 0.0008 | <0.1D1 | 0.08 |
| | | 24-Nov-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 1-Dec-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Dec-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Dec-09 | N | 1454 | 1457 | <1 | <0.03 | <0.001 | 0.02F | <0.3D1 | 0.7F | 0.0054 | 2.5 | <0.03 | 0.8F | <0.0005 | 0.0005 | <0.1D1 | 0.03F |
| | | 22-Dec-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 29-Dec-09 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-Jan-10 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 12-Jan-10 | N | 1454 | 1457 | <5D1 | <0.03 | <0.001 | <0.05 | 0.02F | 0.3F | 0.0055 | 2.2 | <0.03M2 | <2 | <0.0005 | 0.0004F | <0.03 | 0.06 |
| | | 19-Jan-10 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-Jan-10 | N | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 13 | 26-Aug-08 | FD | 1454 | 1457 | 21D1 | 1.82D1 | <0.001 | <0.3D1 | 0.42D1 | 118D1 | 0.007B7 | 8FD1 | 0.08FD1 | 35D1 | 0.0036 | 0.001 | <0.1D1 | 0.32D1 |
| | | 2-Sep-08 | FD | 1454 | 1457 | 1 | 0.164 | <0.001 | <0.05 | 0.02F | 19.1 | 0.0011 | 8.2 | <0.03 | 2 | 0.0006 | <0.0005 | <0.03 | 0.01F |
| | | 9-Sep-08 | FD | 1454 | 1457 | 0.6 | 0.103 | <0.001 | <0.05 | 0.01 | 9.2 | 0.0005 | 3.6 | 0.01 | 0.7 | 0.0003 | <0.0005 | <0.03 | <0.05 |
| | | 16-Sep-08 | FD | 1454 | 1457 | 0.6 | 0.093 | <0.001 | <0.05 | 0.02 | 7.8 | 0.0003 | 2.5 | <0.03 | <2 | 0.0001 | <0.0005 | <0.03 | 0.01 |
| | | 23-Sep-08 | FD | 1454 | 1457 | 0.4 | 0.038 | <0.001 | <0.05 | 0.02 | 3.6 | 0.0003 | 2 | <0.03 | <2 | 0.0001 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | FD | 1454 | 1457 | 0.8 | 0.07 | <0.001 | <0.05 | 0.01 | 6.6 | 0.0004 | 2.7 | <0.03 | <2 | 0.0002 | <0.0005 | <0.03 | <0.05 |
| | | 7-Oct-08 | FD | 1454 | 1457 | 0.5F | 0.036 | <0.001 | <0.05 | <0.05 | 4.1 | 0.0005 | 2.2 | <0.03 | <2 | 0.0001F | <0.0005 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-002A | TEST 13 | 14-Oct-08 | FD | 1454 | 1457 | 0.4F | 0.016F | <0.001 | <0.05 | 0.01F | 2.4 | 0.0002F | 1.5F | 0.01F | <2 | 0.0001F | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | FD | 1454 | 1457 | 0.4F | 0.019F | <0.001 | <0.05 | <0.05 | 2 | 0.0002F | 1.5F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | FD | 1454 | 1457 | 0.3F | 0.016F | <0.001 | <0.05 | 0.03F | 1.8F | 0.0002F | 1.3F | <0.03M2 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | FD | 1454 | 1457 | <1 | 0.01F | <0.001 | <0.05 | <0.05 | 1.1F | 0.0002F | 1.2F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 11-Nov-08 | FD | 1454 | 1457 | 0.3F | 0.015F | <0.001 | <0.05 | <0.05 | 1.3F | 0.0002FM1 | 1.2F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | FD | 1454 | 1457 | 0.2F | 0.016F | <0.001 | 0.02F | <0.05 | 1.3F | 0.0002F | 1.3F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | FD | 1454 | 1457 | 0.2F | 0.009F | <0.001 | <0.05 | <0.05 | 1.5F | 0.0001F | 1F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | FD | 1454 | 1457 | 0.2F | <0.03 | <0.001 | <0.05 | <0.05 | 1.3F | 0.0002F | 1.1F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | FD | 1454 | 1457 | <1 | 0.008F | <0.001 | <0.05 | <0.05 | 0.9F | 0.0002F | 1.2F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | FD | 1454 | 1457 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0001F | 0.7F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Dec-08 | FD | 1454 | 1457 | <1 | 0.013F | -- | <0.05 | <0.05 | 0.7F | <0.0005 | 0.8F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 30-Dec-08 | FD | 1454 | 1457 | 0.2F | 0.006F | -- | <0.05 | <0.05V1 | 0.5F | 0.0002F | 1.2F | -- | <2 | <0.0005 | <0.0005 | -- | 0.01F |
| | | 6-Jan-09 | FD | 1454 | 1457 | <1 | 0.013F | -- | <0.05 | <0.05 | 1.1F | 0.0003F | 1.2F | -- | <2 | <0.0005 | <0.0005 | -- | 0.11 |
| | | 13-Jan-09 | FD | 1454 | 1457 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0002F | 1.4F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.03F |
| | | 20-Jan-09 | FD | 1454 | 1457 | <1 | 0.011F | -- | <0.05 | 0.01F | 0.9F | 0.0003F | 1.6F | -- | <2 | 0.0001F | <0.0005 | -- | 0.03F |
| | | 27-Jan-09 | FD | 1454 | 1457 | 0.2F | 0.024F | -- | <0.05 | <0.05 | 1.4F | <0.0005 | 2.2 | -- | <2 | <0.0005 | <0.0005 | -- | 0.03F |
| | | 3-Feb-09 | FD | 1454 | 1457 | <1 | 0.011F | -- | <0.05 | <0.05 | 0.6F | <0.0005 | 1.2F | -- | <2 | <0.0005 | <0.0005 | -- | 0.02F |
| | | 10-Feb-09 | FD | 1454 | 1457 | <1 | 0.01F | <0.001H3 | <0.05 | <0.05 | 0.6F | 0.0002F | 1F | <0.03 | <2 | 0.0002F | <0.0005 | <0.03 | 0.02F |
| | | 17-Feb-09 | FD | 1454 | 1457 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 14 | 26-Aug-08 | N | 1927 | 1930 | 170D1 | 15.2 | <0.001 | <0.1D1 | 0.13D1 | 108 | 0.0645B7 | 7.7 | 0.02F | 339 | 0.0003F | 0.0008 | <0.03 | 0.1D1 |
| | | 2-Sep-08 | N | 1927 | 1930 | 38.6 | 3.54 | <0.001 | <0.05 | <0.05 | 66.8 | 0.0158 | 12.6 | <0.03 | 51.5 | 0.0002F | 0.0005 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1927 | 1930 | 15.1 | 2.25 | <0.001 | <0.05 | <0.05 | 43 | 0.0047 | 12 | 0.01 | 13.1 | 0.0001 | 0.0003 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1927 | 1930 | 10.3 | 1.92 | <0.001 | <0.05 | <0.05 | 39.2 | 0.0033 | 12.1 | <0.03 | 5.8 | <0.0005 | <0.0005 | <0.03 | 0.01 |
| | | 23-Sep-08 | N | 1927 | 1930 | 6.4 | 1.72 | <0.001 | 0.02 | <0.05 | 32.1 | 0.003 | 13 | <0.03 | 2.7 | <0.0005 | 0.0001 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1927 | 1930 | 5.1 | 1.89 | <0.001 | <0.05 | <0.05 | 30.5 | 0.0029 | 12.6 | <0.03 | 2 | <0.0005 | <0.0005 | <0.03 | 0.01 |
| | | 7-Oct-08 | N | 1927 | 1930 | 4 | 1.92 | <0.001 | <0.05 | <0.05 | 25.5 | 0.0033 | 11.6 | <0.03 | 1.5F | <0.0005 | <0.0005 | <0.03 | 0.03F |
| | | 14-Oct-08 | N | 1927 | 1930 | 3.5 | 2.13 | <0.001 | <0.05 | <0.05 | 23.4 | 0.003 | 11.9 | 0.02F | 1.5F | <0.0005 | <0.0005 | <0.03 | 0.04F |
| | | 21-Oct-08 | N | 1927 | 1930 | 2.8 | 1.78 | <0.001 | <0.05 | <0.05 | 22.6 | 0.0029 | 12.4 | <0.03 | 1F | <0.0005 | 0.0001F | <0.03 | 0.04F |
| | | 28-Oct-08 | N | 1927 | 1930 | 2.3 | 1.48 | <0.001 | <0.05 | <0.05 | 19.5 | 0.0031 | 11.2 | <0.03 | 0.9F | <0.0005 | 0.0001F | <0.03 | 0.04F |
| | | 4-Nov-08 | N | 1927 | 1930 | 2.4 | 1.6 | <0.001 | <0.05 | <0.05 | 21.5 | 0.004 | 14.3 | <0.03 | 0.9F | <0.0005 | <0.0005 | <0.03 | 0.08 |
| | | 11-Nov-08 | N | 1927 | 1930 | 1.9 | 1.33 | <0.001 | <0.05 | <0.05 | 18 | 0.0042 | 11.6 | <0.03 | 0.8F | <0.0005 | <0.0005 | <0.03 | 0.07 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-002A | TEST 14 | 18-Nov-08 | N | 1927 | 1930 | 1.9 | 1.21 | <0.001 | 0.02F | <0.05 | 19.5 | 0.0043 | 13.3 | <0.03 | 0.8F | <0.0005 | <0.0005 | <0.03 | 0.08 |
| | | 25-Nov-08 | N | 1927 | 1930 | 1.7 | 1.17 | <0.001 | <0.05 | <0.05 | 18.5 | 0.0043 | 11.5 | <0.03 | 0.8F | <0.0005 | 0.0001F | <0.03 | 0.1 |
| | | 2-Dec-08 | N | 1927 | 1930 | 1.6 | 1.01 | <0.001 | <0.05 | <0.05 | 16.6 | 0.004 | 10.8 | <0.03 | 0.6F | <0.0005 | 0.0002F | <0.03 | 0.12 |
| | | 9-Dec-08 | N | 1927 | 1930 | 1.4 | 0.915 | <0.001 | <0.05 | <0.05 | 17.4 | 0.0042B3 | 11.8 | <0.03 | 0.7F | <0.0005 | <0.0005 | <0.03 | 0.09 |
| | | 16-Dec-08 | N | 1927 | 1930 | 0.9F | 0.689 | <0.001 | <0.05 | <0.05 | 15.4 | 0.0041 | 9.7 | <0.03 | 0.4F | <0.0005 | <0.0005 | <0.03 | 0.08 |
| | | 23-Dec-08 | N | 1927 | 1930 | 0.8F | 0.638 | -- | 0.01F | <0.05 | 15.7 | 0.0044 | 9.7 | -- | 0.5F | <0.0005 | <0.0005 | -- | 0.09 |
| | | 30-Dec-08 | N | 1927 | 1930 | 0.9F | 0.571 | -- | <0.05 | 0.01F | 13.7 | 0.0038 | 10.5 | -- | 0.6F | <0.0005 | <0.0005 | -- | 0.09 |
| | | 6-Jan-09 | N | 1927 | 1930 | 0.7F | 0.489 | -- | <0.05 | 0.02F | 14.4 | 0.0043 | 10.6 | -- | 0.5F | <0.0005 | <0.0005 | -- | 0.09 |
| | | 13-Jan-09 | N | 1927 | 1930 | 0.6F | 0.438 | <0.001 | <0.05 | <0.05 | 13.2 | 0.0043 | 8.9 | <0.03 | 0.4F | <0.0005 | 0.0001F | <0.03 | 0.05 |
| | | 20-Jan-09 | N | 1927 | 1930 | 0.8F | 0.392 | -- | <0.05 | <0.05 | 13.2 | 0.0043 | 9.6 | -- | 0.5F | <0.0005 | <0.0005 | -- | 0.08 |
| | | 27-Jan-09 | N | 1927 | 1930 | 0.7F | 0.363 | -- | <0.05 | <0.05 | 12.7 | 0.0055 | 8.9 | -- | 0.5F | <0.0005 | <0.0005 | -- | 0.07 |
| | | 3-Feb-09 | N | 1927 | 1930 | 0.8F | 0.379 | -- | <0.05 | <0.05 | 13.3 | 0.0039 | 9.6 | -- | 0.5F | <0.0005 | 0.0001F | -- | 0.09 |
| | | 10-Feb-09 | N | 1927 | 1930 | 0.7F | 0.368 | -- | <0.05 | <0.05 | 12.2 | 0.0042 | 10.4 | -- | 0.5F | <0.0005 | <0.0005 | -- | 0.07 |
| | | 17-Feb-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1927 | 1930 | 0.6F | 0.3 | <0.001 | <0.05 | <0.05 | 12.4 | 0.0046 | 9.1 | <0.03 | 0.6F | 0.0001F | 0.0003F | <0.03 | 0.1 |
| | | 17-Mar-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1927 | 1930 | 0.6F | 0.213 | <0.001 | 0.01F | <0.05 | 11.8 | 0.006B7 | 9.4 | <0.03 | 0.5F | <0.0005 | 0.0005 | <0.03 | 0.08 |
| | | 14-Apr-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1927 | 1930 | 0.8F | 0.21 | <0.001 | <0.05 | <0.05 | 12.2 | 0.006 | 8.3 | <0.03 | 0.5F | <0.0005 | 0.0003F | <0.03 | 0.08 |
| | | 12-May-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1927 | 1930 | 0.7F | 0.187 | <0.001 | <0.05 | <0.05 | 12.2 | 0.0075 | 9.4 | <0.03 | 0.4F | <0.0005 | 0.0003F | <0.03 | 0.03F |
| | | 9-Jun-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-002A | TEST 14 | 23-Jun-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1927 | 1930 | 0.8F | 0.176 | <0.001 | <0.05 | 0.01F | 11.2 | 0.0111B1 | 8.1 | <0.03 | 0.6F | <0.0005 | 0.0003F | <0.03 | 0.09 |
| | | 7-Jul-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1927 | 1930 | 1.9 | 0.281 | <0.001 | <0.05 | 0.02F | 14.5 | 0.0166 | 12.7 | <0.03 | 1.1F | 0.0001F | 0.0007 | <0.03 | 0.11 |
| | | 4-Aug-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1927 | 1930 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1927 | 1930 | 2.1 | 0.262 | <0.001 | <0.05 | 0.04F | 15.4 | 0.0166 | 17 | <0.03 | 1.1F | <0.0005 | 0.0008 | <0.03 | 0.1 |
| | TEST 9 | 26-Aug-08 | N | 888 | 891 | <10D2 | <0.03 | <0.001 | <0.5D2 | <0.3D2 | 2.6 | 0.0452B7 | 1.9 | 0.02 | 2.9 | <0.0005 | <0.0005 | <0.03 | <0.3D2 |
| | | 2-Sep-08 | N | 888 | 891 | 0.4F | <0.03 | <0.001 | 0.09 | <0.05 | 6.3 | 0.339 | 3.5 | <0.03 | 19.1 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | 0.05 | <0.05 | 4 | 0.177 | 2.2 | <0.03 | 12.1 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | 0.03 | <0.05 | 1.8 | 0.0428 | 1.3 | 0.01 | 5.5 | <0.0005 | <0.0005 | <0.03 | 0.01 |
| | | 23-Sep-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | 0.03 | <0.05 | 4 | 0.0784 | 3.5 | <0.03 | 9.5 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 2.4 | 0.0328 | 2.8 | <0.03 | 3.6 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.2F | 0.014 | 0.9F | <0.03 | 1.7F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | 0.01F | <0.05 | 1.4F | 0.021 | 1.1F | 0.01F | 2.9 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | 0.02F | <0.05 | 1.7F | 0.0335B7 | 1.3F | <0.03 | 4.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | 0.03F | 0.01F | 1.7F | 0.0485 | 1.7F | <0.03 | 5.1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | 0.03F | <0.05 | 3.3 | 0.076 | 3 | <0.03 | 10.2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | TEST 9S | 11-Nov-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | 0.05 | <0.05 | 11.1 | 0.149 | 9 | <0.03 | 23.1 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | 0.01F | <0.05 | 2.4 | 0.0208 | 2.3 | <0.03 | 3.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.9F | 0.0163 | 1.3F | <0.03 | 2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 2 | 0.0153 | 1.3F | <0.03 | 2.2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 888 | 891 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.8F | 0.0097B3 | 0.9F | <0.03 | 1.3F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 888 | 891 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 888 | 891 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-005I | TEST 15 | 26-Aug-08 | N | 1317.28 | 1320.28 | 0.8F | 0.014F | <0.001 | 0.15 | <0.05 | 3.8 | 0.0333 | 8.3 | 0.01F | 104 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 2-Sep-08 | N | 1317.28 | 1320.28 | 0.8F | 0.007F | <0.001 | 0.12 | <0.05 | 3.5 | 0.023 | 6.5 | <0.03 | 100 | <0.0005 | 0.0004F | 0.006F | <0.05 |
| | | 9-Sep-08 | N | 1317.28 | 1320.28 | 0.8 | <0.03 | <0.001 | 0.11 | <0.05 | 3.1 | 0.0148 | 6.3 | 0.01 | 87.2 | <0.0005 | 0.0003 | 0.007 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 15 | 16-Sep-08 | N | 1317.28 | 1320.28 | 0.7 | <0.03 | <0.001 | 0.08 | <0.05 | 2.8 | 0.0089 | 5.3 | <0.03 | 75 | <0.0005 | 0.0001 | 0.009 | <0.05 |
| | | 23-Sep-08 | N | 1317.28 | 1320.28 | 0.6 | <0.03 | <0.001 | 0.07 | <0.05 | 2.7 | 0.0076 | 4.8 | <0.03 | 58.9 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1317.28 | 1320.28 | 0.5 | <0.03 | <0.001 | 0.05 | <0.05 | 3.4 | 0.007 | 5.5 | <0.03 | 60.2 | <0.0005 | 0.0001 | 0.006 | <0.05 |
| | | 7-Oct-08 | N | 1317.28 | 1320.28 | 0.5F | <0.03 | <0.001 | 0.05 | <0.05 | 2.8 | 0.0054 | 4.8 | <0.03 | 58.9 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1317.28 | 1320.28 | 0.5F | <0.03 | <0.001 | 0.05 | <0.05 | 2.7 | 0.0038 | 4.9 | <0.03 | 47.7 | <0.0005 | 0.0001F | 0.005F | <0.05 |
| | | 21-Oct-08 | N | 1317.28 | 1320.28 | 0.5F | <0.03 | <0.001 | 0.04F | <0.05 | 2.7 | 0.0036 | 4.6 | <0.03 | 41.6 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1317.28 | 1320.28 | 0.4F | 0.008F | <0.001 | 0.09 | <0.05 | 2.6 | 0.0031 | 4.1 | <0.03 | 37.8 | <0.0005 | <0.0005 | 0.01F | <0.05 |
| | | 4-Nov-08 | N | 1317.28 | 1320.28 | 0.4F | <0.03 | <0.001 | 0.03F | <0.05 | 2.8 | 0.0025 | 4.6 | <0.03 | 36.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1317.28 | 1320.28 | 0.4F | <0.03 | <0.001 | 0.04F | <0.05 | 2.4 | 0.0027 | 4 | <0.03 | 29.9 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1317.28 | 1320.28 | 0.5F | <0.03 | <0.001 | 0.04F | <0.05 | 2.7 | 0.0027 | 4.4 | <0.03 | 29.5 | <0.0005 | <0.0005 | 0.013F | <0.05 |
| | | 25-Nov-08 | N | 1317.28 | 1320.28 | 0.4F | <0.03 | <0.001 | <0.05 | <0.05 | 2 | 0.0019 | 2.7 | <0.03 | 23.2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1317.28 | 1320.28 | 0.4F | <0.03 | <0.001 | <0.05 | <0.05 | 2.4 | 0.0017 | 3.4 | <0.03 | 24 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1317.28 | 1320.28 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.7F | 0.0015 | 2.8 | <0.03 | 19.5 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1317.28 | 1320.28 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1317.28 | 1320.28 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 16 | 26-Aug-08 | N | 1428.18 | 1431.18 | 2.9D1 | 0.09D1 | <0.001 | 0.39D1 | 0.02FD1 | 21.2D1 | 0.244B7 | 27.7D1 | 0.03FD1 | 283D1 | <0.0005 | 0.0035 | <0.05D1 | <0.1D1 |
| | | 2-Sep-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | 0.05 | <0.05 | 2.3 | 0.0273 | 11 | <0.03 | 10.1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1428.18 | 1431.18 | <1 | 0.005 | <0.001 | 0.04 | <0.05 | 1.1 | 0.0259 | 3.8 | 0.01 | 6.2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | 0.02 | <0.05 | 0.8 | 0.0119 | 2.8 | <0.03 | 2.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | 0.01 | <0.05 | <2 | 0.0041 | 0.9 | <0.03 | 0.5 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0028 | 0.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0025 | 0.5F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0015 | 0.5F | 0.02F | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | 0.07 | <0.05 | 0.8F | 0.0484B7 | 2.6 | <0.03 | 8 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1428.18 | 1431.18 | <1 | 0.007F | <0.001 | 0.07 | 0.01F | 0.4F | 0.026 | 1.2F | <0.03 | 3.5 | <0.0005 | <0.0005 | 0.006F | <0.05 |
| | | 4-Nov-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.002 | 0.5F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | TEST 16S | 11-Nov-08 | N | 1428.18 | 1431.18 | <1 | 0.011F | <0.001 | 0.03F | <0.05 | 2.1 | 0.0762 | 7 | <0.03 | 3.1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1428.18 | 1431.18 | <1 | 0.008F | <0.001 | 0.02F | <0.05 | 0.7F | 0.0167 | 2.3 | <0.03 | 0.8F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.5F | 0.0113 | 1.3F | <0.03 | 0.5F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.8F | 0.0103 | 1.7F | <0.03 | 0.5F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0102B3 | 1.8F | <0.03 | 0.5F | <0.0005 | <0.0005 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 16S | 16-Dec-08 | N | 1428.18 | 1431.18 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1428.18 | 1431.18 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 17 | 26-Aug-08 | FD | 1428.18 | 1431.18 | 2.7D1 | 0.06D1 | <0.001M2 | 0.31D1 | <0.1D1 | 15.7D1 | 0.196B7 | 16.1D1 | 0.02FD1 | 247D1 | <0.0005 | 0.0026 | <0.05D1 | <0.1D1 |
| | | 2-Sep-08 | FD | 1428.18 | 1431.18 | <1 | 0.007F | <0.001 | 0.11 | <0.05 | 3.3 | 0.0459 | 12.5 | <0.03 | 22.3 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Sep-08 | FD | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | 0.05 | <0.05 | 1.3 | 0.0348 | 4.7 | 0.01 | 7.1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Sep-08 | FD | 1428.18 | 1431.18 | <1 | <0.03L1 | <0.001 | 0.06 | <0.05 | 1.4 | 0.0338 | 6.1 | <0.03 | 6.8 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Sep-08 | FD | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | 0.03 | <0.05 | 0.6 | 0.0195 | 3.2 | <0.03 | 2.9 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | FD | 1428.18 | 1431.18 | <1 | 0.005 | <0.001 | 0.03 | <0.05 | 1.6 | 0.0609 | 7.9 | <0.03 | 5.8 | <0.0005 | <0.0005 | 0.006 | <0.05 |
| | | 7-Oct-08 | FD | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | 0.03F | <0.05 | 1.9F | 0.0518 | 9.9 | <0.03 | 4.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 14-Oct-08 | FD | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | 0.01F | <0.05 | 2.1 | 0.0462 | 10.2 | <0.03 | 2.7 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | FD | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | 0.02F | <0.05 | 1.5F | 0.0295B7 | 6.9 | <0.03 | 1.3F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | FD | 1428.18 | 1431.18 | <2D2 | 0.01F | <0.001 | 0.02F | 0.03F | 1.3FD2 | 0.0321 | 5.2 | <0.05D2 | 0.8FD2 | <0.0005 | <0.0005 | 0.005F | <0.05 |
| | | 4-Nov-08 | FD | 1428.18 | 1431.18 | <1 | 0.006F | <0.001 | 0.01F | <0.05 | 1.1F | 0.0218 | 6.1 | <0.03 | 0.7F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | TEST 17S | 11-Nov-08 | FD | 1428.18 | 1431.18 | <1 | 0.022F | <0.001 | 0.02F | <0.05 | 1.5F | 0.05D2 | 7.2 | <0.03 | 0.4F | <0.005D2 | <0.005D2 | <0.03 | <0.05 |
| | | 18-Nov-08 | FD | 1428.18 | 1431.18 | <1 | 0.01F | <0.001 | 0.02F | <0.05 | 0.8F | 0.0254 | 3.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | FD | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.9F | 0.015 | 1.9F | <0.03 | 0.6F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | FD | 1428.18 | 1431.18 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.9F | 0.0191 | 4 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | FD | 1428.18 | 1431.18 | <1 | 0.006F | <0.001 | <0.05 | <0.05 | 0.6F | 0.0195B3 | 5.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | FD | 1428.18 | 1431.18 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | FD | 1428.18 | 1431.18 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 18 | 26-Aug-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 3.4 | 0.0034 | 2.1 | 0.01F | 1.8F | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 2-Sep-08 | N | 1499 | 1502 | 1.4 | 0.017F | 0.0003F | 0.09 | <0.05 | 43.1 | 0.0307 | 4.3 | <0.03 | 42.6 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | 0.04 | <0.05 | 11.7 | 0.0079 | 4.2 | <0.03 | 7.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1499 | 1502 | <1 | <0.03L1 | <0.001 | 0.05 | <0.05 | 9.8 | 0.0084 | 2.1 | <0.03 | 7.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | 0.03 | <0.05 | 4.8 | 0.0045 | 1.3 | <0.03 | 3.3 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | 0.05 | <0.05 | 10.6 | 0.0121 | 2.8 | <0.03 | 7.2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | 0.01F | <0.05 | 7.5 | 0.0085 | 2.7 | <0.03 | 4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 6.3 | 0.007 | 3.1 | 0.01F | 3 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 7.3 | 0.0103B7 | 4.2 | <0.03 | 3.3 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | 0.02F | 0.01F | 5.9 | 0.0104 | 3.7 | <0.03 | 2.3 | <0.0005 | <0.0005 | 0.008F | <0.05 |
| | | 4-Nov-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 4.4 | 0.0078 | 3.5 | <0.03 | 1.5F | <0.0005 | <0.0005 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 18S | 11-Nov-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | 0.02F | <0.05 | 9.4 | 0.0203D2 | 11.7 | <0.03 | 2.9 | <0.003D2 | <0.003D2 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | 0.02F | <0.05 | 3.4 | 0.0053 | 3.5 | <0.03 | 0.8F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 4.1 | 0.0062 | 3.2 | <0.03 | 0.9F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 5.6 | 0.0068 | 4.7 | <0.03 | 0.9F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1499 | 1502 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 3.1 | 0.0046B3 | 2.8 | <0.03 | 0.7F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1499 | 1502 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1499 | 1502 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 19 | 26-Aug-08 | N | 1586.46 | 1589.46 | 2.4 | 0.046 | <0.001 | 0.06 | <0.05 | 56.3 | 0.166B7 | 3.7 | <0.03 | 47.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Sep-08 | N | 1586.46 | 1589.46 | 0.4F | 0.007F | <0.001 | 0.08 | <0.05 | 28.2 | 0.0626 | 2.9 | <0.03 | 19.2 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | 0.04 | <0.05 | 15.2 | 0.0341 | 3.5 | 0.02 | 6.8 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1586.46 | 1589.46 | <1 | <0.03L1 | <0.001 | 0.03 | <0.05 | 10.4 | 0.0188 | 2.2 | <0.03 | 3.9 | <0.0005 | <0.0005 | 0.005 | <0.05 |
| | | 23-Sep-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | 0.03 | <0.05 | 7.1 | 0.0191 | 2.6 | <0.03 | 2.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | 0.02 | <0.05 | 20.1 | 0.0861 | 9.5 | <0.03 | 5.5 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 8 | 0.0315 | 4.4 | <0.03 | 1.5F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 4.9 | 0.016 | 2.7 | 0.01F | 3.1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 6.8 | 0.025B7 | 4.7 | <0.03 | 1.1F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | 0.04F | 0.02F | 3.5 | 0.0147 | 2.2 | <0.03 | 0.6F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | 0.01F | <0.05 | 5 | 0.0203 | 3.9 | <0.03 | 0.9F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | TEST 19S | 11-Nov-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | 0.02F | <0.05 | 12 | 0.057 | 10.6 | <0.03 | 1.7F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 3.3 | 0.0131 | 3.1 | <0.03 | 0.7F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 5.9 | 0.0205 | 4.6 | <0.03 | 0.6F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 2.6 | 0.0061 | 2.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1586.46 | 1589.46 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.5F | 0.0051B3 | 1.5F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1586.46 | 1589.46 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1586.46 | 1589.46 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 20 | 26-Aug-08 | N | 1632.56 | 1635.56 | 23.1 | 2.4D1 | <0.001 | <0.05 | 0.05 | 429D1 | 0.0734B7 | 25.2D1 | 0.03FD1 | 107D1 | 0.0015 | <0.0005 | <0.05D1 | 0.89 |
| | | 2-Sep-08 | N | 1632.56 | 1635.56 | 0.3F | 0.049 | <0.001 | <0.05 | <0.05 | 29.8 | 0.0033 | 12.3 | <0.03 | 4.2 | 0.0001F | <0.0005 | <0.03 | 0.01F |
| | | 9-Sep-08 | N | 1632.56 | 1635.56 | 0.4 | 0.076 | <0.001 | <0.05V1 | <0.05 | 24.7 | 0.0062 | 11.3 | 0.01 | 2.5 | 0.0001 | <0.0005 | <0.03 | 0.02 |
| | | 16-Sep-08 | N | 1632.56 | 1635.56 | 0.4 | 0.096 | <0.001 | 0.01 | <0.05 | 35.8 | 0.0053 | 19.1 | <0.03 | 2.9 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | | 23-Sep-08 | N | 1632.56 | 1635.56 | <1 | 0.04 | <0.001 | 0.01 | <0.05 | 10.5 | 0.0021 | 9.5 | <0.03 | 0.8 | <0.0005 | <0.0005 | <0.03 | 0.03 |
| | | 30-Sep-08 | N | 1632.56 | 1635.56 | 0.2 | 0.081 | <0.001 | <0.05 | <0.05 | 15.8 | 0.0032 | 11.2 | <0.03 | 1 | <0.0005 | <0.0005 | <0.03 | 0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 20 | 7-Oct-08 | N | 1632.56 | 1635.56 | <1 | 0.054 | <0.001 | <0.05 | <0.05 | 10.5 | 0.002 | 7.8 | <0.03 | 0.6F | <0.0005 | <0.0005 | <0.03 | 0.04F |
| | | 14-Oct-08 | N | 1632.56 | 1635.56 | 0.5F | 0.102 | <0.001 | <0.05 | <0.05 | 13.2 | 0.0025 | 6.5 | <0.03 | 0.9F | <0.0005 | <0.0005 | <0.03 | 0.09 |
| | | 21-Oct-08 | N | 1632.56 | 1635.56 | 0.7F | 0.117 | <0.001 | <0.05 | <0.05 | 19.1 | 0.0039B7 | 9.9 | <0.03 | 0.9F | <0.0005 | <0.0005 | <0.03 | 0.12 |
| | | 28-Oct-08 | N | 1632.56 | 1635.56 | 0.7F | 0.107 | <0.001 | <0.05 | 0.01F | 16.7 | 0.0045 | 9.2 | <0.03 | 0.6F | <0.0005 | <0.0005 | 0.008F | 0.11 |
| | | 4-Nov-08 | N | 1632.56 | 1635.56 | 0.7F | 0.11 | <0.001 | <0.05 | <0.05 | 16.1 | 0.0037 | 12.3 | <0.03 | 0.4F | <0.0005 | <0.0005 | <0.03 | 0.15 |
| | TEST 20S | 11-Nov-08 | N | 1632.56 | 1635.56 | 2 | 0.321 | <0.001 | 0.02F | <0.05 | 31.1 | 0.0077 | 18.6 | <0.03 | 0.4F | 0.0002F | <0.0005 | <0.03 | 0.47 |
| | | 18-Nov-08 | N | 1632.56 | 1635.56 | 0.5F | 0.073 | <0.001 | <0.05 | <0.05 | 7.7 | 0.002 | 5.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.12 |
| | | 25-Nov-08 | N | 1632.56 | 1635.56 | 0.5F | 0.071 | <0.001 | <0.05 | <0.05 | 7.2 | 0.0021 | 4.7 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.16 |
| | | 2-Dec-08 | N | 1632.56 | 1635.56 | 0.4F | 0.054 | <0.001 | <0.05 | <0.05 | 5.7 | 0.0014 | 3.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.12 |
| | | 9-Dec-08 | N | 1632.56 | 1635.56 | <1 | 0.056 | <0.001 | <0.05 | <0.05 | 4.7 | 0.0018 | 2.9 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.11 |
| | | 16-Dec-08 | N | 1632.56 | 1635.56 | <1 | 0.043 | <0.001 | <0.05 | <0.05 | 4.5 | 0.0018 | 2.5 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.1 |
| | | 23-Dec-08 | N | 1632.56 | 1635.56 | <1 | 0.048 | -- | <0.05 | <0.05 | 4.4 | 0.0021 | 2.3 | -- | <2 | <0.0005 | <0.0005 | -- | 0.1 |
| | | 30-Dec-08 | N | 1632.56 | 1635.56 | 0.4F | 0.065 | -- | <0.05 | <0.05V1 | 4.5 | 0.0031 | 4.1V1 | -- | <2 | <0.0005 | <0.0005 | -- | 0.16 |
| | | 6-Jan-09 | N | 1632.56 | 1635.56 | <1 | 0.06 | -- | <0.05 | <0.05 | 5 | 0.0044 | 3.2 | -- | <2 | <0.0005 | <0.0005 | -- | 0.15 |
| | | 13-Jan-09 | N | 1632.56 | 1635.56 | <1 | 0.052 | <0.001 | <0.05M1 | <0.05 | 4 | 0.0037 | 3.5 | <0.03M2 | <2 | <0.0005 | <0.0005 | <0.03 | 0.17M1 |
| | | 20-Jan-09 | N | 1632.56 | 1635.56 | 0.3F | 0.049 | -- | <0.05 | <0.05 | 3.6 | 0.0043 | 3.2 | -- | <2 | <0.0005 | <0.0005 | -- | 0.15 |
| | | 27-Jan-09 | N | 1632.56 | 1635.56 | 0.3F | 0.055 | -- | <0.05M1 | <0.05 | 3.9 | 0.0046M1 | 2.9 | -- | <2 | <0.0005 | <0.0005 | -- | 0.16M1 |
| | | 3-Feb-09 | N | 1632.56 | 1635.56 | 0.3F | 0.052 | -- | <0.05M1 | <0.05 | 3.9 | 0.0046 | 3.2 | -- | <2 | <0.0005 | <0.0005 | -- | 0.17 |
| | | 10-Feb-09 | N | 1632.56 | 1635.56 | 0.3F | 0.048 | <0.001H3 | <0.05 | 0.02F | 3.8 | 0.0058 | 3.3 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 0.18 |
| | | 17-Feb-09 | N | 1632.56 | 1635.56 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 21 | 26-Aug-08 | N | 1652 | 1654.93 | 10.9 | 1.05 | <0.001M2 | <0.05 | 0.05 | 195 | 0.139B7 | 25.3 | 0.01F | 25.5 | 0.0009 | 0.0001F | <0.03 | 0.14 |
| | | 2-Sep-08 | N | 1652 | 1654.93 | 0.3F | 0.059 | <0.001 | <0.05 | <0.05 | 26.7 | 0.0157 | 22.6 | <0.03 | 1.6F | 0.0002F | <0.0005 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1652 | 1654.93 | 0.3 | 0.048 | <0.001 | <0.05 | <0.05 | 9 | 0.0108 | 7 | <0.03M2 | 0.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1652 | 1654.93 | 1.8 | 0.399 | <0.001 | <0.05 | 0.01 | 27.3 | 0.0513 | 16.9 | <0.03M2 | 0.8 | 0.0002 | 0.0001 | <0.03 | 0.03 |
| | | 23-Sep-08 | N | 1652 | 1654.93 | 1.2 | 0.3 | <0.001 | <0.05 | 0.02 | 17.2 | 0.042 | 11 | <0.03M2 | 0.8 | 0.0002 | 0.0001 | <0.03 | 0.02 |
| | | 30-Sep-08 | N | 1652 | 1654.93 | 3.4 | 0.743 | <0.001 | <0.05 | 0.04 | 28.1 | 0.111 | 22.8 | <0.03M2 | 0.7 | 0.0003 | 0.0004 | <0.03 | 0.22 |
| | | 7-Oct-08 | N | 1652 | 1654.93 | 1.4 | 0.257 | <0.001 | 0.01F | 0.04F | 15.1 | 0.11 | 15.4M1 | 0.01FM2 | 0.5F | 0.0002F | 0.0004F | <0.03 | 0.16 |
| | | 14-Oct-08 | N | 1652 | 1654.93 | 0.4F | 0.053 | <0.001 | <0.05 | 0.07 | 11.5 | 0.0237 | 47.7 | 0.09FD1 | <2 | 0.0015 | 0.0008 | <0.03 | 0.25 |
| | | 21-Oct-08 | N | 1652 | 1654.93 | <1 | 0.023F | <0.001 | <0.05 | 0.01F | 6.5 | 0.0666B7 | 13.9 | <0.03M2 | <2 | 0.0001F | 0.0002F | 0.006F | <0.05 |
| | | 28-Oct-08 | N | 1652 | 1654.93 | 0.4F | 0.042 | <0.001 | 0.01F | 0.02F | 7.2 | 0.181 | 14.3 | <0.03M2 | <2 | <0.0005 | 0.0005 | <0.05D2 | <0.05 |
| | | 4-Nov-08 | N | 1652 | 1654.93 | 0.3F | 0.059 | <0.001 | 0.02F | <0.1D2 | 10.6 | 0.412 | 28.5M1 | <0.03M2 | <2 | 0.0001F | 0.0008 | <0.03 | 0.04FD1 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 21 | 11-Nov-08 | N | 1652 | 1654.93 | <1 | 0.032 | <0.001 | 0.02F | 0.01F | 5.5 | 0.312 | 19.2 | <0.03 | <2 | 0.0001F | 0.0006 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1652 | 1654.93 | <1 | 0.039 | <0.001 | 0.02F | <0.1D2 | 6.4 | 0.393 | 27.3M1 | <0.03M2 | <2 | <0.0005 | 0.0007 | <0.03 | 0.02FD2 |
| | | 25-Nov-08 | N | 1652 | 1654.93 | <1 | 0.017F | <0.001 | <0.05 | <0.05 | 1.6F | 0.117 | 8M1 | <0.03M2 | <2 | 0.0001F | 0.0002F | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1652 | 1654.93 | <1 | 0.03 | <0.001 | <0.05 | <0.05 | 3.8 | 0.14 | 21.3 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1652 | 1654.93 | <1 | 0.016F | <0.001 | <0.05 | <0.05 | 2.5 | 0.0968 | 13.6 | <0.03M2 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1652 | 1654.93 | <1 | 0.035 | <0.001 | <0.05 | <0.05 | 4.5 | 0.317 | 18.1 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1652 | 1654.93 | <1 | 0.025F | -- | 0.01F | <0.05 | 3.7 | 0.328 | 14 | -- | <2 | <0.0005 | 0.0004F | -- | <0.05 |
| | | 30-Dec-08 | N | 1652 | 1654.93 | <1 | 0.015F | -- | <0.05 | <0.05V1 | 2.6 | 0.362 | 19.9 | -- | 0.4F | <0.0005 | 0.0005 | -- | 0.01F |
| | | 6-Jan-09 | N | 1652 | 1654.93 | <1 | 0.029F | -- | <0.05 | <0.05 | 3.9 | 0.457D1 | 23.3 | -- | 0.4F | <0.0005 | 0.0007 | -- | 0.02F |
| | | 13-Jan-09 | N | 1652 | 1654.93 | <1 | 0.01F | <0.001 | <0.05 | 0.01F | 3.7 | 0.42D1 | 18.1 | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1652 | 1654.93 | <1 | 0.015F | -- | <0.05 | <0.05 | 3.6 | 0.52D1 | 18.1 | -- | <2 | 0.0001F | 0.0009 | -- | 0.02F |
| | | 27-Jan-09 | N | 1652 | 1654.93 | <1 | 0.018F | -- | <0.05 | 0.01F | 3.7 | 0.427D1 | 16.2M1 | -- | <2 | <0.0005 | 0.0009 | -- | 0.02F |
| | | 3-Feb-09 | N | 1652 | 1654.93 | <1 | 0.014F | -- | <0.05 | 0.02F | 3 | 0.499 | 17.4 | -- | <2 | <0.0005 | 0.0007 | -- | 0.02F |
| | | 10-Feb-09 | N | 1652 | 1654.93 | <1 | 0.016F | -- | <0.05 | <0.05 | 2.9 | 0.535D1 | 15.5 | -- | <2 | <0.0005 | 0.0008 | -- | 0.02F |
| | | 17-Feb-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1652 | 1654.93 | <1 | 0.019F | <0.001 | <0.05 | <0.05 | 2.4 | 0.601D2B7 | 15.2 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05L1 |
| | | 17-Mar-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1652 | 1654.93 | <1 | 0.01F | <0.001 | 0.01F | <0.05 | 2.2 | 0.585D1 | 13 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 14-Apr-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1652 | 1654.93 | <1 | 0.02F | <0.001 | <0.05 | <0.05 | 2.6 | 0.648D1 | 16.3 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 12-May-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1652 | 1654.93 | <1 | 0.015F | <0.001 | <0.05 | <0.05 | 2.7 | 0.717D1 | 12.9 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 9-Jun-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 21 | 16-Jun-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1652 | 1654.93 | <1 | 0.059 | <0.001 | 0.02F | 0.02F | 2.2 | 0.686D1 | 13.2 | 0.02F | <2 | <0.0005 | 0.0004F | <0.03 | 0.04F |
| | | 7-Jul-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1652 | 1654.93 | <1 | 0.025F | <0.001 | <0.05 | <0.05 | 2.4 | 0.914D1 | 12 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 4-Aug-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1652 | 1654.93 | <1 | 0.022F | <0.001 | <0.05 | 0.02F | 1.7F | 0.531D1 | 17.8 | <0.03 | <2V1 | <0.0005 | 0.0003F | <0.03 | 0.01F |
| | TEST 22 | 26-Aug-08 | N | 1654.93 | 1659.8 | 10.6 | 0.93 | <0.001 | 0.04F | 0.03F | 210 | 0.131B7 | 24.6 | <0.03 | 62.3 | 0.0016 | <0.0005 | 0.006F | 0.06 |
| | | 2-Sep-08 | N | 1654.93 | 1659.8 | 0.5F | 0.086 | <0.001 | 0.04F | <0.05 | 39.8 | 0.0338 | 19.4 | <0.03M2 | 4.1 | 0.0004F | <0.0005 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1654.93 | 1659.8 | 0.4 | 0.052 | <0.001 | <0.05 | 0.01 | 13.5 | 0.0095 | 11.5 | <0.03 | 1.1 | 0.0001 | <0.0005 | 0.006 | 0.01 |
| | | 16-Sep-08 | N | 1654.93 | 1659.8 | 0.3 | 0.05 | <0.001 | <0.05 | <0.05 | 10.8 | 0.01 | 5.8 | <0.03 | 0.6 | 0.0001 | <0.0005 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 1654.93 | 1659.8 | <1 | 0.045 | <0.001 | <0.05 | <0.05 | 6.4 | 0.0047 | 2.5 | <0.03 | 0.5 | 0.0001 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1654.93 | 1659.8 | 1 | 0.178 | <0.001 | <0.05 | <0.05 | 19.5 | 0.0166 | 9.4 | <0.03 | 1.1 | 0.0003 | <0.0005 | <0.03 | 0.02 |
| | | 7-Oct-08 | N | 1654.93 | 1659.8 | 0.9F | 0.167 | <0.001 | <0.05 | <0.05 | 9.9 | 0.0124 | 5.9 | <0.03 | 0.8F | 0.0002F | <0.0005 | <0.03 | 0.01F |
| | | 14-Oct-08 | N | 1654.93 | 1659.8 | 0.9F | 0.147 | <0.001 | <0.05 | <0.05 | 8.2 | 0.0073 | 5.2 | <0.03 | 0.4F | 0.0001F | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1654.93 | 1659.8 | 0.4F | 0.082 | <0.001 | <0.05 | <0.05 | 4.7 | 0.007B4 | 4.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1654.93 | 1659.8 | 0.9F | 0.13 | <0.001 | <0.05 | <0.05 | 6.1 | 0.0082 | 4.4 | <0.03 | 0.6F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 1654.93 | 1659.8 | 1.2 | 0.171 | <0.001 | 0.01F | <0.05 | 7.4 | 0.0132 | 10.5 | <0.03 | <2 | 0.0001F | <0.0005 | <0.03 | 0.02F |
| | TEST 22S | 11-Nov-08 | N | 1654.93 | 1659.8 | 0.5F | 0.125 | <0.001 | 0.01F | <0.05 | 4.5 | 0.0096 | 7.4 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1654.93 | 1659.8 | <1 | 0.033 | <0.001 | 0.01F | <0.05 | 1.6F | 0.0055 | 2.4 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.01F |
| | | 25-Nov-08 | N | 1654.93 | 1659.8 | <1 | 0.024F | <0.001 | <0.05 | <0.05 | 0.9F | 0.0036 | 1.4F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1654.93 | 1659.8 | <1 | 0.029F | <0.001 | <0.05 | <0.05 | 1.6F | 0.0028 | 1.3F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1654.93 | 1659.8 | <1 | 0.022F | <0.001 | <0.05 | <0.05 | 1.5F | 0.0031 | 1.3F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1654.93 | 1659.8 | <1 | 0.019F | <0.001 | <0.05 | <0.05 | 1.3F | 0.0027 | 1F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1654.93 | 1659.8 | <1 | 0.024F | -- | <0.05 | <0.05 | 1.1F | 0.0025 | 0.9F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 30-Dec-08 | N | 1654.93 | 1659.8 | <1 | 0.024F | -- | <0.05 | <0.05V1 | 0.3F | 0.0029 | 1.4F | -- | 0.3F | <0.0005 | <0.0005 | -- | <0.05 |
| | | 6-Jan-09 | N | 1654.93 | 1659.8 | <1 | 0.022F | -- | <0.05 | <0.05 | 0.9F | 0.0027 | 1.2F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 22S | 13-Jan-09 | N | 1654.93 | 1659.8 | <1 | 0.013F | <0.001 | <0.05 | <0.05 | 0.7F | 0.0024 | 0.9F | <0.03 | <2 | <0.0005 | <0.0005 | 0.006F | <0.05 |
| | | 20-Jan-09 | N | 1654.93 | 1659.8 | <1 | 0.024F | -- | <0.05 | <0.05 | 0.9F | 0.0031 | 0.9F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 27-Jan-09 | N | 1654.93 | 1659.8 | <1 | 0.027F | -- | <0.05 | <0.05 | 0.9F | 0.0035 | 1.6F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 3-Feb-09 | N | 1654.93 | 1659.8 | <1 | 0.023F | -- | <0.05 | <0.05 | 0.8F | 0.0029 | 1F | <0.03 | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 10-Feb-09 | N | 1654.93 | 1659.8 | <1 | 0.029F | <0.001H3 | <0.05 | <0.05 | 1F | 0.0049 | 1.4F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.03F |
| | | 17-Feb-09 | N | 1654.93 | 1659.8 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 23 | 26-Aug-08 | N | 1759.23 | 1761.23 | 16.2 | 1.93 | <0.001M2 | <0.05 | 0.37 | 352 | 0.0094B7 | 44.4 | <0.03M2 | 38.4 | 0.0164 | 0.0011 | <0.03 | 0.9 |
| | | 2-Sep-08 | N | 1759.23 | 1761.23 | 0.9F | 0.224 | <0.001 | <0.05 | 0.01F | 21.4 | 0.0018 | 7 | <0.03 | 1.2F | 0.0014 | 0.0001F | <0.03 | 0.04F |
| | | 9-Sep-08 | N | 1759.23 | 1761.23 | 1.1 | 0.296 | <0.001 | <0.05 | 0.03 | 16.2 | 0.0018 | 7.8 | <0.03 | 0.9 | 0.0011 | 0.0001 | <0.03 | 0.05 |
| | | 16-Sep-08 | N | 1759.23 | 1761.23 | 7 | 1.82 | <0.001 | <0.05 | 0.22 | 85.1 | 0.0112 | 54.2 | <0.03 | 2.6 | 0.0063 | 0.0011 | <0.03 | 0.37 |
| | | 23-Sep-08 | N | 1759.23 | 1761.23 | 4D2 | 0.77D2 | <0.001 | 0.06D2 | 0.36D2 | 59D2 | 0.0195 | 65D2 | <0.1D2 | <8D2 | 0.0064 | 0.0031 | <0.1D2 | 0.37D2 |
| | | 30-Sep-08 | N | 1759.23 | 1761.23 | 1.1 | 0.142 | <0.001 | <0.05 | 0.1 | 31.4 | 0.018 | 64.1 | <0.03 | 0.5 | 0.0046 | 0.0019 | <0.03 | 0.25 |
| | | 7-Oct-08 | N | 1759.23 | 1761.23 | 0.4F | 0.071 | <0.001 | <0.1D1 | 0.12 | 18.7D1 | 0.0196 | 57.7 | <0.03 | 0.4F | 0.0025 | 0.001 | <0.03 | 0.2 |
| | | 14-Oct-08 | N | 1759.23 | 1761.23 | 1.3 | 0.19 | <0.001 | <0.05 | 0.03F | 22.5 | 0.175 | 30.3 | <0.05D1 | <2 | 0.0002F | 0.0006 | <0.03 | 0.12 |
| | | 21-Oct-08 | N | 1759.23 | 1761.23 | <1 | 0.026F | <0.001 | <0.05 | 0.09 | 8.6D1 | 0.019B7 | 37.7 | <0.05D1 | <3D1 | 0.0012 | 0.0006 | <0.03 | 0.15 |
| | | 28-Oct-08 | N | 1759.23 | 1761.23 | 0.3F | 0.025F | <0.001 | 0.01F | 0.04F | 5 | 0.0149 | 29.9 | <0.03 | <2 | 0.0007 | 0.0003F | <0.03 | 0.08 |
| | | 4-Nov-08 | N | 1759.23 | 1761.23 | 0.3F | 0.032 | <0.001 | <0.05 | 0.08FD2 | 8.5 | 0.0494M1 | 50.8 | <0.03 | <2 | 0.0013 | 0.0012 | <0.1D1 | 0.85D2 |
| | | 11-Nov-08 | N | 1759.23 | 1761.23 | <1 | 0.017F | <0.001 | 0.02F | 0.04F | 4.8 | 0.0266M1 | 26.9M2 | <0.03M2 | <2 | 0.0007 | 0.0004F | <0.03 | 0.15D2 |
| | | 18-Nov-08 | N | 1759.23 | 1761.23 | <1 | 0.01F | <0.001 | 0.02F | 0.06FD2 | 6.3 | 0.0364M1 | 22.8 | <0.03 | <2 | 0.001 | 0.0011 | <0.1D2 | 0.48D2 |
| | | 25-Nov-08 | N | 1759.23 | 1761.23 | <1 | 0.014F | <0.001 | <0.05 | 0.09FD1 | 4.5 | 0.0392 | 28.2 | <0.03 | <2 | 0.0008 | 0.0008 | <0.03 | 0.43 |
| | | 2-Dec-08 | N | 1759.23 | 1761.23 | <1 | 0.012F | <0.001 | <0.05 | 0.04F | 4.1 | 0.0234 | 21.2 | <0.05D1 | <2 | 0.0005 | 0.0005 | <0.03 | 0.3 |
| | | 9-Dec-08 | N | 1759.23 | 1761.23 | <1 | 0.008F | <0.001 | <0.05 | 0.06 | 4.2 | 0.0372 | 22.3 | <0.03 | <2 | 0.0005 | 0.0006 | <0.03 | 0.52 |
| | | 16-Dec-08 | N | 1759.23 | 1761.23 | <1 | 0.008F | <0.001 | <0.05 | 0.05 | 3.8 | 0.0356 | 18 | <0.03 | <2 | 0.0005 | 0.0007 | <0.03 | 0.52 |
| | | 23-Dec-08 | N | 1759.23 | 1761.23 | <1 | 0.015F | -- | 0.02F | 0.06FD1 | 1.8F | 0.0374 | 16.6 | -- | <3D1 | 0.0004F | 0.0007 | -- | 0.54 |
| | | 30-Dec-08 | N | 1759.23 | 1761.23 | <5D1 | <0.03 | -- | <0.3D1 | <0.3D1V1 | 3 | 0.0344 | 14.5M1 | -- | <2 | 0.0005 | 0.001 | -- | 0.55D1 |
| | | 6-Jan-09 | N | 1759.23 | 1761.23 | <1 | 0.017F | -- | <0.05 | 0.08FD1 | 4FD1 | 0.0501 | 20.8 | -- | <2 | 0.0005 | 0.001 | -- | 0.61 |
| | | 13-Jan-09 | N | 1759.23 | 1761.23 | <1 | <0.05D1 | <0.001 | <0.1D1 | 0.05 | 3.2D1 | 0.0349 | 15.6D1 | <0.03 | <3D1 | 0.0005 | 0.0009 | <0.03 | 0.34D1 |
| | | 20-Jan-09 | N | 1759.23 | 1761.23 | <1 | 0.006F | -- | <0.05 | 0.05FD1 | 3.5 | 0.0372 | 13.3 | -- | <2 | 0.0006 | 0.001 | -- | 0.37 |
| | | 27-Jan-09 | N | 1759.23 | 1761.23 | <1 | 0.02FD1 | -- | 0.01F | 0.04FD1 | 3.5 | 0.0495 | 16.5 | -- | <2 | 0.0003F | 0.001 | -- | 0.42D1 |
| | | 3-Feb-09 | N | 1759.23 | 1761.23 | <1 | 0.006F | -- | <0.1D1 | 0.05FD1 | 3.3 | 0.0379 | 13.7 | -- | <2 | 0.0004F | 0.0008 | -- | 0.39 |
| | | 10-Feb-09 | N | 1759.23 | 1761.23 | <1 | 0.008F | -- | <0.05 | 0.05 | 2.6 | 0.0263 | 11.2 | -- | <2 | 0.0003F | 0.0008 | -- | 0.28 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 23 | 17-Feb-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1759.23 | 1761.23 | <1 | 0.007F | <0.001 | <0.05 | 0.04F | 2.2 | 0.0326 | 9.9 | <0.05D2 | <2 | 0.0003F | 0.0006 | <0.03 | 0.51D2 |
| | | 17-Mar-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1759.23 | 1761.23 | <1 | <0.03 | <0.001 | 0.02FD1 | 0.04FD1 | 1.9F | 0.0364B7 | 9.5 | <0.03 | <2 | 0.0003F | 0.0009 | <0.05D1 | 0.3 |
| | | 14-Apr-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1759.23 | 1761.23 | <1 | <0.03 | <0.001 | <0.05 | 0.04F | 1.7F | 0.0354 | 9.8 | <0.03 | <2 | 0.0002F | 0.0008 | <0.03 | 0.28 |
| | | 12-May-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1759.23 | 1761.23 | <1 | 0.01F | <0.001 | <0.05 | 0.06 | 2.4 | 0.0618 | 10.8 | <0.03 | <2 | 0.0003F | 0.0011 | <0.05D1 | 0.4 |
| | | 9-Jun-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1759.23 | 1761.23 | <1 | 0.022F | <0.001 | <0.05 | 0.1 | 1.6F | 0.0796B1 | 11.4 | 0.01F | <2 | 0.0005 | 0.0022 | <0.05D1 | 0.74D1 |
| | | 7-Jul-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1759.23 | 1761.23 | <1 | 0.018F | <0.001 | <0.05 | 0.09 | 2.2 | 0.071 | 10.4 | <0.05D1 | <2 | 0.0003F | 0.0027 | <0.03 | 0.28 |
| | | 4-Aug-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1759.23 | 1761.23 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1759.23 | 1761.23 | <1 | 0.008F | <0.001 | <0.05 | 0.1 | 2 | 0.0769 | 11.9 | <0.05D1 | <2V1 | 0.0002F | 0.0025 | <0.05D1 | 0.4D1 |
| | TEST 24 | 26-Aug-08 | N | 1892.81 | 1895 | 26.1 | 3.25 | <0.001 | <0.05 | 3.75 | 275 | 0.0335B7 | 41.1 | <0.03L1 | 56.3 | 0.0027 | 2.13D1 | <0.03 | 26.2 |
| | | 2-Sep-08 | N | 1892.81 | 1895 | 0.3F | 0.136 | <0.001 | <0.05 | 0.02F | 3.7 | 0.0008 | 1.6F | <0.03 | 0.3F | <0.0005 | 0.008 | <0.03 | 0.2 |
| | | 9-Sep-08 | N | 1892.81 | 1895 | 1.9 | 0.888 | <0.001 | <0.05 | 0.08 | 20.6 | 0.0034 | 17.9 | <0.03 | 1.4 | 0.0003 | 0.0722 | <0.03 | 1.1 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 24 | 16-Sep-08 | N | 1892.81 | 1895 | 2.2 | 0.976 | <0.001 | <0.05 | 0.26 | 33.6 | 0.0077 | 45.4 | <0.03 | 1.4 | 0.0004 | 0.0589 | <0.03 | 4.44 |
| | | 23-Sep-08 | N | 1892.81 | 1895 | 5.1 | 2.17 | <0.001 | <0.05 | 1.02 | 37.7 | 0.0142 | 55.7 | <0.03 | 0.7 | 0.0007 | 0.307D2 | <0.03 | 27 |
| | | 30-Sep-08 | N | 1892.81 | 1895 | 2.4 | 0.603 | <0.001 | <0.05 | 0.73 | 20.6 | 0.0159 | 52.1 | <0.03 | 0.5 | 0.0005 | 0.407D1 | <0.03 | 28.3 |
| | | 7-Oct-08 | N | 1892.81 | 1895 | 1 | 0.126 | <0.001 | <0.05 | 0.38 | 13 | 0.0135 | 44.1 | <0.03 | <2 | 0.0003F | 0.271D1 | <0.03 | 15.2 |
| | | 14-Oct-08 | N | 1892.81 | 1895 | 0.9F | 0.092 | <0.001 | <0.05 | 0.42 | 9.2 | 0.0163 | 37.7 | <0.03 | <2 | 0.0003F | 0.4D1 | <0.03 | 19 |
| | | 21-Oct-08 | N | 1892.81 | 1895 | 0.5F | 0.044 | <0.001 | <0.05 | 0.28 | 6.3 | 0.0129B7 | 21.9 | <0.03 | <2 | 0.0002F | 0.267D1 | <0.03 | 13.6 |
| | | 28-Oct-08 | N | 1892.81 | 1895 | 0.7F | 0.051 | <0.001 | <0.05 | 0.44 | 5.3 | 0.0226 | 22 | <0.03 | <2 | 0.0002F | 0.412D2 | <0.03 | 32.3 |
| | | 4-Nov-08 | N | 1892.81 | 1895 | 0.5F | 0.041 | <0.001 | <0.05 | 0.25 | 5.3 | 0.0213 | 32.5 | <0.03 | <2 | 0.0002F | 0.246D2 | <0.03 | 20 |
| | | 11-Nov-08 | N | 1892.81 | 1895 | 0.3F | 0.034 | <0.001 | 0.01F | 0.3 | 2.8 | 0.0238 | 23.2 | <0.03 | <2 | 0.0001F | 0.241D2 | <0.03 | 27.7 |
| | | 18-Nov-08 | N | 1892.81 | 1895 | <1 | 0.024F | <0.001 | 0.01F | 0.16 | 2.8 | 0.0162 | 25 | <0.03 | <2 | <0.0005 | 0.154 | <0.03 | 16 |
| | | 25-Nov-08 | N | 1892.81 | 1895 | 0.2F | 0.026F | <0.001 | <0.05 | 0.35 | 3 | 0.0265M1 | 24.9 | <0.03 | <2 | 0.0001F | 0.301D1 | <0.03 | 32.1 |
| | | 2-Dec-08 | N | 1892.81 | 1895 | <1 | 0.018F | <0.001 | <0.05 | 0.24 | 3.7 | 0.0163 | 21.7 | <0.03 | <2 | 0.0001F | 0.154 | <0.03 | 20.8 |
| | | 9-Dec-08 | N | 1892.81 | 1895 | <1 | 0.012F | <0.001 | <0.05 | 0.12 | 2.6 | 0.0118 | 21 | <0.03 | <2 | <0.0005 | 0.0959 | <0.03 | 10.7 |
| | | 16-Dec-08 | N | 1892.81 | 1895 | <1 | 0.012F | <0.001 | <0.05 | 0.12 | 2.9 | 0.0139 | 21.5 | <0.03 | <2 | <0.0005 | 0.0766 | <0.03 | 10.3 |
| | | 23-Dec-08 | N | 1892.81 | 1895 | <1 | 0.019F | -- | 0.02F | 0.15 | 2.6 | 0.0161 | 18.7 | -- | <2 | <0.0005 | 0.0747 | -- | 12.9 |
| | | 30-Dec-08 | N | 1892.81 | 1895 | <1 | 0.013F | -- | <0.05 | 0.32 | 2.4 | 0.0274 | 23.3 | -- | <2 | 0.0001F | 0.153 | -- | 31.2 |
| | | 6-Jan-09 | N | 1892.81 | 1895 | <1 | 0.014F | -- | 0.01F | 0.25 | 2.4 | 0.0218 | 14.6 | -- | <2 | <0.0005 | 0.108 | -- | 19.8 |
| | | 13-Jan-09 | N | 1892.81 | 1895 | <1 | 0.006F | <0.001 | <0.05 | 0.38 | 2.5 | 0.03 | 17.6 | <0.03 | <2 | <0.0005 | 0.206D1 | <0.03 | 44.1 |
| | | 20-Jan-09 | N | 1892.81 | 1895 | <1 | 0.011F | -- | <0.05 | 0.37 | 2.7 | 0.0235 | 15.8 | -- | <2 | 0.0001F | 0.164 | -- | 32.3 |
| | | 27-Jan-09 | N | 1892.81 | 1895 | <1 | 0.014F | -- | <0.05 | 0.35 | 2.5 | 0.0258 | 12.3M1 | -- | <2 | <0.0005 | 0.168 | -- | 26.8 |
| | | 3-Feb-09 | N | 1892.81 | 1895 | <1 | 0.028F | -- | <0.05 | 0.49 | 4.1 | 0.03 | 21.6 | -- | <2 | 0.0001F | 0.23D1 | -- | 41.5 |
| | | 10-Feb-09 | N | 1892.81 | 1895 | <1 | 0.01F | <0.001H3 | <0.05 | 0.5D2 | 2.7 | 0.04 | 16.7 | <0.03 | <2 | <0.0005 | 0.189 | <0.05D2 | 34.1 |
| | | 17-Feb-09 | N | 1892.81 | 1895 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 25 | 26-Aug-08 | N | 1917.29 | 1920.9 | 63.2 | 2.87 | <0.001 | <0.05 | 0.1 | 223 | 0.0347B7 | 41 | <0.03L1 | 61 | 0.0007 | 0.0005 | <0.03 | 0.58 |
| | | 2-Sep-08 | N | 1917.29 | 1920.9 | 1.1 | 0.084 | <0.001 | <0.05 | <0.05 | 20.9 | 0.0029 | 14.8 | <0.03 | 1.2F | <0.0005 | <0.0005 | <0.03 | 0.02F |
| | | 9-Sep-08 | N | 1917.29 | 1920.9 | 0.6 | 0.043 | <0.001 | <0.05 | 0.01 | 17.1 | 0.0022 | 17 | <0.03 | 0.7 | <0.0005 | <0.0005 | <0.03 | 0.02 |
| | | 16-Sep-08 | N | 1917.29 | 1920.9 | 3 | 0.224 | <0.001 | <0.05 | <0.05 | 23.2 | 0.012 | 12.5 | <0.03 | 0.7 | <0.0005 | <0.0005 | <0.03 | 0.1 |
| | | 23-Sep-08 | N | 1917.29 | 1920.9 | 4.1 | 0.301 | <0.001 | <0.05 | 0.02 | 21.6 | 0.0095 | 10.8 | <0.03 | 0.4 | <0.0005 | 0.0002 | <0.03 | 0.2 |
| | | 30-Sep-08 | N | 1917.29 | 1920.9 | 7.7 | 0.563 | <0.001 | <0.05 | 0.05 | 54.2 | 0.043 | 39.3 | <0.03 | 0.9 | 0.0002 | 0.0002 | <0.03 | 0.52 |
| | | 7-Oct-08 | N | 1917.29 | 1920.9 | 3.3 | 0.241 | <0.001 | <0.05 | 0.02F | 25.7 | 0.0082 | 19.5 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | 0.27 |
| | | 14-Oct-08 | N | 1917.29 | 1920.9 | 2.2 | 0.172 | <0.001 | <0.05 | <0.05 | 12.4 | 0.0044 | 8.7 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 0.22 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005I | TEST 25 | 21-Oct-08 | N | 1917.29 | 1920.9 | 3.8 | 0.274 | <0.001 | <0.05 | 0.04F | 22.5 | 0.0084B4 | 15.3 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 0.4 |
| | | 28-Oct-08 | N | 1917.29 | 1920.9 | 3 | 0.227 | <0.001 | <0.05 | 0.03F | 15.1 | 0.0075 | 11.5 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 0.4 |
| | | 4-Nov-08 | N | 1917.29 | 1920.9 | 3.9 | 0.275 | <0.001 | 0.01F | 0.03F | 28.6 | 0.0145 | 24.5 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.56 |
| | | 18-Nov-08 | N | 1917.29 | 1920.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 25S | 11-Nov-08 | N | 1917.29 | 1920.9 | 1.1 | 0.07 | <0.001 | 0.01F | 0.01F | 11.4 | 0.0041 | 4.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.17 |
| | | 18-Nov-08 | N | 1917.29 | 1920.9 | 0.6F | 0.042 | <0.001 | 0.02F | <0.05 | 5.8 | 0.0024 | 3.5 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 0.12 |
| | | 25-Nov-08 | N | 1917.29 | 1920.9 | 0.5F | 0.037 | <0.001 | <0.05 | <0.05 | 4.6 | 0.002 | 2.6 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.1 |
| | | 2-Dec-08 | N | 1917.29 | 1920.9 | 0.5F | 0.038 | <0.001 | <0.05 | <0.05 | 4.4 | 0.0016 | 1.9F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.13 |
| | | 9-Dec-08 | N | 1917.29 | 1920.9 | 0.6F | 0.044 | <0.001 | <0.05 | <0.05 | 4.7 | 0.0022 | 2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.16 |
| | | 16-Dec-08 | N | 1917.29 | 1920.9 | 0.6F | 0.05 | <0.001 | <0.05 | <0.05 | 4.4 | 0.0022 | 1.9F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.18 |
| | | 23-Dec-08 | N | 1917.29 | 1920.9 | 0.4F | 0.051 | -- | 0.02F | <0.05 | 4 | 0.0018 | 1.4F | -- | <2 | <0.0005 | 0.0001F | -- | 0.17 |
| | | 30-Dec-08 | N | 1917.29 | 1920.9 | 0.9F | 0.061 | -- | <0.05 | <0.05V1 | 4.7 | 0.0027 | 2.9 | -- | 0.3F | <0.0005 | 0.0002F | -- | 0.27 |
| | | 6-Jan-09 | N | 1917.29 | 1920.9 | 0.8F | 0.072 | -- | <0.05 | 0.02F | 5.6 | 0.0033 | 10.6 | -- | <2 | <0.0005 | <0.0005 | -- | 0.33 |
| | | 13-Jan-09 | N | 1917.29 | 1920.9 | 1.2 | 0.089 | <0.001 | <0.05 | <0.05 | 4.1 | 0.0039 | 1.9F | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 0.58 |
| | | 20-Jan-09 | N | 1917.29 | 1920.9 | 0.9F | 0.063 | -- | <0.05 | 0.02F | 4.1 | 0.0025 | 1.7F | -- | <2 | <0.0005 | 0.0002F | -- | 0.36 |
| | | 27-Jan-09 | N | 1917.29 | 1920.9 | 0.8F | 0.06 | -- | <0.05 | <0.05 | 3.9 | 0.0026 | 2.6 | -- | <2 | <0.0005 | 0.0001F | -- | 0.34 |
| | | 3-Feb-09 | N | 1917.29 | 1920.9 | 0.8F | 0.054 | -- | <0.05 | <0.05 | 3.2 | 0.0022 | 1.1F | -- | <2 | <0.0005 | 0.0001F | -- | 0.38 |
| | | 10-Feb-09 | N | 1917.29 | 1920.9 | 0.7F | 0.052 | <0.001H3 | <0.05 | 0.02F | 4 | 0.0033M1 | 1.9F | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 0.42 |
| | | 17-Feb-09 | N | 1917.29 | 1920.9 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-005J | TEST 26 | 26-Aug-08 | N | 1660.4 | 1686.47 | 1.9 | 0.141 | <0.001 | 1.37 | 0.01F | 26.1 | 0.0056B7 | 4.6 | <0.03L1 | 47.2 | 0.001 | <0.0005 | <0.03 | 0.02F |
| | | 2-Sep-08 | N | 1660.4 | 1686.47 | 1.4FD1 | 0.043 | <0.001 | 1.6 | <0.05 | 20.8 | 0.0043 | 4.4 | <0.03 | 25.8 | 0.0012 | <0.0005 | <0.05D1 | <0.1D1 |
| | | 9-Sep-08 | N | 1660.4 | 1686.47 | 1.2 | 0.027 | <0.001 | 1.24 | <0.05 | 16.4 | 0.0031 | 3.1 | <0.03 | 14.3 | 0.0009 | <0.0005 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1660.4 | 1686.47 | 0.8 | 0.019 | <0.001 | 0.62 | <0.05 | 10.9 | 0.0018 | 3 | <0.03 | 5.7 | 0.0008 | <0.0005 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 1660.4 | 1686.47 | 0.8 | 0.018 | <0.001 | 0.53 | <0.05 | 11.5 | 0.002 | 3.4 | <0.03 | 4.5 | 0.0011 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1660.4 | 1686.47 | 0.6 | 0.012 | <0.001 | 0.27 | <0.05 | 8.5 | 0.0016 | 2.1 | <0.03 | 2.2 | 0.0009 | <0.0005 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1660.4 | 1686.47 | 0.4F | 0.009F | <0.001 | 0.19 | <0.05 | 6.1 | 0.0015 | 1.9F | <0.03 | 1F | 0.0007 | <0.0005 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1660.4 | 1686.47 | 0.6F | 0.014F | <0.001 | 0.15 | <0.05 | 4.9 | 0.0011 | 2 | <0.03 | 0.6F | 0.0006 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1660.4 | 1686.47 | 0.4F | 0.008F | <0.001 | 0.1 | <0.05 | 3.9 | 0.001 | 1.9F | <0.03 | 0.3F | 0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1660.4 | 1686.47 | 0.5F | 0.01F | <0.001 | 0.09 | <0.05 | 2.9 | 0.001 | 1.6F | <0.03 | 0.4F | 0.0004F | <0.0005 | <0.03 | 0.01F |
| | | 4-Nov-08 | N | 1660.4 | 1686.47 | 0.5F | 0.012F | <0.001 | 0.09 | <0.05 | 2.7 | 0.0016 | 1.9F | <0.03 | <2 | 0.0005 | <0.0005 | <0.03 | 0.02F |
| | | 11-Nov-08 | N | 1660.4 | 1686.47 | 0.6F | 0.013F | <0.001 | 0.09 | <0.05 | 3.1 | 0.0018 | 2.3 | <0.03 | <2 | 0.0006 | <0.0005 | <0.03 | 0.02F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005J | TEST 26 | 18-Nov-08 | N | 1660.4 | 1686.47 | 0.4F | 0.011F | <0.001 | 0.07 | <0.05 | 2.1 | 0.001 | 1.9F | <0.03 | <2 | 0.0004F | <0.0005 | <0.03 | 0.03F |
| | | 25-Nov-08 | N | 1660.4 | 1686.47 | 0.3F | 0.01F | <0.001 | 0.04F | <0.05 | 1.7F | 0.0009 | 1.8F | <0.03 | <2 | 0.0004F | <0.0005 | <0.03 | 0.03F |
| | | 2-Dec-08 | N | 1660.4 | 1686.47 | 0.3F | 0.008F | <0.001 | 0.05 | <0.05 | 1.9F | 0.0007 | 1.4F | <0.03 | <2 | 0.0004F | <0.0005 | <0.03 | 0.05 |
| | | 9-Dec-08 | N | 1660.4 | 1686.47 | 0.3F | <0.03 | <0.001 | 0.04F | <0.05 | 1.9F | 0.0008 | 1.5F | <0.03 | <2 | 0.0003F | <0.0005 | <0.03 | 0.04F |
| | | 16-Dec-08 | N | 1660.4 | 1686.47 | <1 | <0.03 | <0.001 | 0.04F | <0.05 | 1.8F | 0.0007 | 1.3F | <0.03 | <2 | 0.0003F | <0.0005 | <0.03 | 0.04F |
| | | 23-Dec-08 | N | 1660.4 | 1686.47 | <1 | 0.011F | -- | 0.04F | <0.05 | 1.3F | 0.0003F | 1.1F | -- | <2 | 0.0003F | <0.0005 | -- | 0.04F |
| | | 30-Dec-08 | N | 1660.4 | 1686.47 | 0.2F | <0.03 | -- | 0.04F | <0.05V1 | <2 | 0.0005 | 1.2F | -- | <2 | 0.0003F | <0.0005 | -- | 0.06 |
| | | 6-Jan-09 | N | 1660.4 | 1686.47 | <1 | 0.007F | -- | 0.04F | <0.05 | 1F | 0.0006 | 1.1F | -- | <2 | 0.0003F | <0.0005 | -- | 0.07 |
| | | 13-Jan-09 | N | 1660.4 | 1686.47 | <1 | <0.03 | <0.001 | 0.02F | <0.05 | 0.7F | 0.0005 | 1.5F | <0.03 | <2 | 0.0003F | <0.0005 | <0.03 | 0.06 |
| | | 20-Jan-09 | N | 1660.4 | 1686.47 | <1 | 0.005F | -- | 0.01F | <0.05 | 0.9F | 0.0005 | 1.5F | -- | <2 | 0.0003F | <0.0005 | -- | 0.07 |
| | | 27-Jan-09 | N | 1660.4 | 1686.47 | <1 | 0.007F | -- | 0.02F | <0.05 | 0.8F | 0.0004F | 1.6F | -- | <2 | <0.0005 | <0.0005 | -- | 0.07 |
| | | 3-Feb-09 | N | 1660.4 | 1686.47 | <1 | <0.03 | -- | 0.02FM1 | <0.05 | 0.7F | 0.0004F | 1.9F | -- | <2 | 0.0002F | <0.0005 | -- | 0.08 |
| | | 10-Feb-09 | N | 1660.4 | 1686.47 | <1 | 0.005F | -- | 0.01F | <0.05 | 0.9F | 0.0027 | 1.9F | -- | <2 | <0.0005 | 0.0003F | -- | 0.08 |
| | | 17-Feb-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1660.4 | 1686.47 | <1 | 0.005F | <0.001 | 0.03F | <0.05 | 0.9F | 0.0004F | 1.5F | <0.03 | <2 | 0.0003F | <0.0005 | <0.03 | 0.14 |
| | | 17-Mar-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1660.4 | 1686.47 | <1 | <0.03 | <0.001 | 0.03F | <0.05 | 0.7F | 0.0011 | 1.9 | <0.03 | <2 | 0.0002F | <0.0005 | <0.03 | 0.16 |
| | | 14-Apr-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1660.4 | 1686.47 | <1 | <0.03 | <0.001 | 0.01F | <0.05 | 0.6F | 0.0003F | 1.6F | <0.03 | <2 | 0.0002F | <0.0005 | <0.03 | 0.2 |
| | | 12-May-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1660.4 | 1686.47 | <1 | 0.005F | <0.001 | 0.03F | <0.05 | 0.6F | 0.0004F | 2.1 | <0.03 | <2 | 0.0003F | <0.0005 | <0.03 | 0.22 |
| | | 9-Jun-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005J | TEST 26 | 23-Jun-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1660.4 | 1686.47 | <1 | 0.013F | <0.001 | 0.03F | <0.05 | 0.4F | 0.001 | 2.1 | 0.02F | <2 | 0.0004F | <0.0005 | <0.03 | 0.3 |
| | | 7-Jul-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1660.4 | 1686.47 | <1 | 0.03 | <0.001 | 0.04F | <0.05 | 0.7F | 0.0006 | 3.1 | <0.03 | <2 | 0.0004F | <0.0005 | <0.03 | 0.5 |
| | | 4-Aug-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1660.4 | 1686.47 | <1 | 0.044 | <0.001 | <0.05 | 0.02F | 0.8F | 0.0007 | 4.7 | <0.03 | <2V1 | 0.0005 | <0.0005 | <0.03 | 0.59 |
| | | 1-Sep-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Sep-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 1660.4 | 1686.47 | <1 | 0.055 | <0.001 | 0.03F | <0.05 | 0.5F | 0.0009 | 2.6 | <0.03 | <2 | 0.0004F | <0.0005 | <0.03 | 0.73 |
| | | 29-Sep-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 1660.4 | 1686.47 | <1 | 0.047 | <0.001 | <0.05 | 0.01F | 0.4F | 0.0007 | 2.8 | <0.03 | <2 | 0.0003F | <0.0005 | <0.03 | 0.83 |
| | | 27-Oct-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 1660.4 | 1686.47 | <1 | 0.036 | <0.001 | 0.02F | 0.02F | <2 | 0.0008 | 2.4 | <0.03 | <2 | 0.0003F | <0.0005 | <0.03 | 0.73 |
| | | 24-Nov-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 1-Dec-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Dec-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Dec-09 | N | 1660.4 | 1686.47 | <1 | 0.045 | <0.001 | 0.01F | 0.02F | 0.5F | 0.0011 | 3 | <0.03 | 0.4F | 0.0003F | <0.0005 | <0.03 | 0.99 |
| | | 22-Dec-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 29-Dec-09 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-Jan-10 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 12-Jan-10 | N | 1660.4 | 1686.47 | <1 | 0.033 | <0.001 | <0.05 | <0.05 | <2 | 0.0014 | 2.6 | <0.03 | <2 | 0.0003F | <0.0005 | <0.03 | 0.78 |
| | | 19-Jan-10 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-005J | TEST 26 | 26-Jan-10 | N | 1660.4 | 1686.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-006D | TEST 27 | 26-Aug-08 | N | 1750.4 | 1753.4 | 115 | 5.5 | <0.001 | 0.01F | 2 | 358 | 0.0434B7 | 91.7 | <0.05D1 | 39.3 | 0.0016 | 0.116 | 0.029F | 77.3 |
| | | 2-Sep-08 | N | 1750.4 | 1753.4 | 2.4 | 0.225 | <0.001 | <0.05 | 0.06 | 24.1 | 0.0162 | 19 | <0.03 | 0.6F | 0.0002F | 0.0017 | <0.03 | 11.9 |
| | | 9-Sep-08 | N | 1750.4 | 1753.4 | 1 | 0.117 | <0.001 | <0.05 | 0.04 | 8.4 | 0.0061 | 11.1 | <0.03 | <2 | <0.0005 | 0.0009 | <0.03 | 10.7 |
| | | 16-Sep-08 | N | 1750.4 | 1753.4 | 0.9 | 0.084 | <0.001 | <0.05 | 0.02 | 8.4 | 0.0051 | 11.9 | <0.03 | <2 | <0.0005 | 0.0013 | <0.03 | 15 |
| | | 23-Sep-08 | N | 1750.4 | 1753.4 | 0.9 | 0.095 | <0.001 | <0.05 | 0.03 | 8.6 | 0.0049 | 11.3 | <0.03 | <2 | 0.0001 | 0.002 | <0.03 | 17.1 |
| | | 30-Sep-08 | N | 1750.4 | 1753.4 | 0.9 | 0.072 | <0.001 | <0.05 | 0.02 | 7.9 | 0.0051 | 10.1 | <0.03 | <2 | 0.0001 | 0.0019 | <0.03 | 16.2 |
| | | 7-Oct-08 | N | 1750.4 | 1753.4 | 1.7 | 0.13 | <0.001 | <0.05 | 0.05 | 11.8 | 0.0109 | 10.7 | <0.03 | <2 | 0.0001F | 0.0032 | <0.03 | 26.2 |
| | | 14-Oct-08 | N | 1750.4 | 1753.4 | 1.5 | 0.11 | <0.001 | <0.05 | 0.04F | 8.8 | 0.0079 | 12.2 | <0.03 | 0.3F | <0.0005 | 0.0024 | <0.03 | 25.9 |
| | | 21-Oct-08 | N | 1750.4 | 1753.4 | 0.9F | 0.069 | <0.001 | 0.01F | 0.03F | 6 | 0.0043 | 10.5 | <0.03 | <2 | <0.0005 | 0.0016 | <0.03 | 17.1 |
| | | 28-Oct-08 | N | 1750.4 | 1753.4 | 1 | 0.061 | <0.001 | <0.05 | 0.03F | 4.6 | 0.0041 | 10.4 | <0.03 | 0.5F | <0.0005 | 0.0012 | 0.006F | 15.5 |
| | | 4-Nov-08 | N | 1750.4 | 1753.4 | 0.9F | 0.059 | <0.001 | <0.05 | 0.02F | 3.9 | 0.0044 | 11.6 | <0.03 | <2 | <0.0005 | 0.0012 | 0.006F | 16.2 |
| | | 11-Nov-08 | N | 1750.4 | 1753.4 | 3.6 | 0.242 | <0.001 | <0.05 | 0.1 | 14 | 0.0199 | 21.8 | <0.03 | 0.5F | 0.0002F | 0.0044 | <0.03 | 57.3 |
| | | 18-Nov-08 | N | 1750.4 | 1753.4 | 5.2 | 0.328 | <0.001 | <0.05 | 0.19 | 29 | 0.0797 | 52.8 | <0.03 | 0.6F | 0.0004F | 0.0161 | <0.03 | 145 |
| | | 25-Nov-08 | N | 1750.4 | 1753.4 | 0.8F | 0.071 | <0.001 | <0.05 | 0.03F | 6.3 | 0.0103B3 | 10 | <0.03 | <2 | 0.0001F | 0.0024 | <0.03 | 20 |
| | | 2-Dec-08 | N | 1750.4 | 1753.4 | 0.3F | 0.02F | <0.001 | <0.05 | <0.05 | 3.8 | 0.0043 | 15.5 | <0.03 | <2 | <0.0005 | 0.0009 | <0.03 | 7.79 |
| | | 9-Dec-08 | N | 1750.4 | 1753.4 | <1 | 0.005F | <0.001 | <0.05 | <0.05 | 3 | 0.0036 | 9.9 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | 5.99 |
| | | 16-Dec-08 | N | 1750.4 | 1753.4 | <1 | 0.006F | <0.001 | <0.05 | <0.05 | 2.4 | 0.0036 | 10 | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | 6.33 |
| | | 23-Dec-08 | N | 1750.4 | 1753.4 | <1 | 0.013F | -- | 0.02F | <0.05 | 2.3 | 0.003 | 6.9 | -- | <2 | <0.0005 | 0.0005 | -- | 5.2 |
| | | 30-Dec-08 | N | 1750.4 | 1753.4 | 0.3F | 0.008F | -- | 0.02F | <0.05V1 | 1.5F | 0.0034 | 12.5 | -- | <2 | <0.0005 | 0.0006 | -- | 6.54 |
| | | 6-Jan-09 | N | 1750.4 | 1753.4 | <1 | 0.014F | -- | <0.05 | <0.05 | 2.1 | 0.004 | 8.1 | -- | <2 | <0.0005 | 0.0005 | -- | 6.59 |
| | | 13-Jan-09 | N | 1750.4 | 1753.4 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.4F | 0.0031 | 7.2 | <0.03 | <2 | <0.0005 | 0.0005 | 0.013F | 6.13 |
| | | 20-Jan-09 | N | 1750.4 | 1753.4 | 0.9F | 0.031 | -- | <0.05 | 0.02F | 5.1 | 0.0101 | 22.3 | -- | <2 | <0.0005 | 0.0017 | -- | 22.4 |
| | | 27-Jan-09 | N | 1750.4 | 1753.4 | 0.6F | 0.019F | -- | <0.05 | <0.05 | 5.2 | 0.005 | 18.4 | -- | <2 | <0.0005 | 0.0008 | -- | 13.9 |
| | | 3-Feb-09 | N | 1750.4 | 1753.4 | 2 | 0.052 | -- | <0.05 | 0.07 | 13.3 | 0.0391 | 37.4 | -- | 0.4F | 0.0002F | 0.0063 | -- | 67.8 |
| | | 10-Feb-09 | N | 1750.4 | 1753.4 | 0.3F | 0.013F | <0.001H3 | 0.02F | 0.03FM1 | 1.8F | 0.0046 | 5.2M1 | <0.03M2 | <2 | <0.0005 | 0.0007 | <0.03 | 7.59M3 |
| | | 17-Feb-09 | N | 1750.4 | 1753.4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 28 | 26-Aug-08 | N | 1898.21 | 1901.09 | 50.5 | 5.02 | <0.001 | <0.1D1 | 0.85 | 618D1 | 0.0367B7 | 80 | <0.03L1 | 55.9 | 0.0028 | 0.0715 | 0.008F | 1.79 |
| | | 2-Sep-08 | N | 1898.21 | 1901.09 | 2.9 | 0.918 | <0.001 | <0.05 | 0.04F | 74.7 | 0.0056 | 72.7 | <0.03 | 3 | 0.0003F | 0.0032 | <0.03 | 0.07 |
| | | 9-Sep-08 | N | 1898.21 | 1901.09 | 0.3 | 0.066 | <0.001 | <0.05 | 0.02 | 4.4 | 0.0009 | 3.6 | <0.03 | <2 | <0.0005 | 0.0003 | <0.03 | 0.01 |
| | | 16-Sep-08 | N | 1898.21 | 1901.09 | 0.3 | 0.101 | <0.001 | <0.05 | <0.05 | 4.8 | 0.0018 | 3.9 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | 0.01 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-006D | TEST 28 | 23-Sep-08 | N | 1898.21 | 1901.09 | <1 | 0.047 | <0.001 | <0.05 | <0.05 | 3.7 | 0.0018 | 3.9 | <0.03 | <2 | <0.0005 | 0.0004 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1898.21 | 1901.09 | 0.4 | 0.086 | <0.001 | <0.05 | <0.05 | 7.9 | 0.0049 | 7.1 | <0.03 | <2 | <0.0005 | 0.0012 | <0.03 | 0.03 |
| | | 7-Oct-08 | N | 1898.21 | 1901.09 | 1.5 | 0.287 | <0.001 | <0.05 | 0.05 | 24.5 | 0.0116 | 26.9 | <0.03 | 0.5F | <0.0005 | 0.0038 | <0.03 | 0.09 |
| | | 14-Oct-08 | N | 1898.21 | 1901.09 | 0.6F | 0.105 | <0.001 | <0.05 | 0.02F | 8.9 | 0.0058 | 12.1 | <0.03 | <2 | <0.0005 | 0.0016 | <0.03 | 0.04F |
| | | 21-Oct-08 | N | 1898.21 | 1901.09 | 0.4F | 0.088 | <0.001 | <0.05 | 0.02F | 8.4 | 0.0063B4 | 10.2 | <0.03 | <2 | <0.0005 | 0.0018 | <0.03 | 0.03F |
| | | 28-Oct-08 | N | 1898.21 | 1901.09 | 0.7F | 0.101 | <0.001 | <0.05 | 0.02F | 9.4 | 0.0091 | 12.4 | <0.03 | <2 | <0.0005 | 0.0021 | <0.03 | 0.04F |
| | | 4-Nov-08 | N | 1898.21 | 1901.09 | 0.7F | 0.122 | <0.001 | <0.05 | 0.02F | 10 | 0.0134 | 17.6 | <0.03 | <2 | <0.0005 | 0.0027 | <0.03 | 0.07 |
| | | 11-Nov-08 | N | 1898.21 | 1901.09 | 0.9F | 0.144 | <0.001 | <0.05 | 0.03F | 11 | 0.0126 | 19.6 | <0.03 | <2 | <0.0005 | 0.0029 | <0.03 | 0.06 |
| | | 18-Nov-08 | N | 1898.21 | 1901.09 | 1.2 | 0.185 | <0.001 | 0.03F | 0.04F | 13.8 | 0.0154 | 28.1 | <0.03 | <2 | <0.0005 | 0.0037 | <0.03 | 0.12 |
| | | 25-Nov-08 | N | 1898.21 | 1901.09 | 0.9F | 0.146 | <0.001 | <0.05 | 0.04F | 10.6 | 0.0146B3 | 21 | <0.03 | <2 | <0.0005 | 0.0033 | <0.03 | 0.08 |
| | | 2-Dec-08 | N | 1898.21 | 1901.09 | 0.6F | 0.107 | <0.001 | <0.05 | 0.02F | 8.2 | 0.0091 | 20.2 | <0.03 | <2 | <0.0005 | 0.0021 | <0.03 | 0.05 |
| | | 9-Dec-08 | N | 1898.21 | 1901.09 | 0.4F | 0.078 | <0.001 | <0.05 | 0.02F | 7.4 | 0.0099 | 17.9 | <0.03 | <2 | <0.0005 | 0.0017 | <0.03 | 0.04F |
| | | 16-Dec-08 | N | 1898.21 | 1901.09 | 0.3F | 0.079 | <0.001 | <0.05 | 0.01F | 7.1 | 0.0044 | 16.5 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.03F |
| | | 23-Dec-08 | N | 1898.21 | 1901.09 | 0.4F | 0.111 | -- | 0.02F | 0.02F | 8.5 | 0.0123 | 18.9 | -- | <2 | <0.0005 | 0.0025 | -- | 0.06 |
| | | 30-Dec-08 | N | 1898.21 | 1901.09 | 0.3F | 0.054 | -- | <0.05 | <0.05 | 4.2 | 0.0079 | 14.6 | -- | <2 | <0.0005 | 0.0014 | -- | 0.04F |
| | | 6-Jan-09 | N | 1898.21 | 1901.09 | <1 | 0.061 | -- | <0.05 | 0.02F | 5.5 | 0.0095 | 12.1 | -- | <2 | <0.0005 | 0.0016 | -- | 0.05 |
| | | 13-Jan-09 | N | 1898.21 | 1901.09 | 0.5F | 0.1 | <0.001 | <0.05 | 0.02F | 7.5 | 0.0113 | 17.1 | <0.03 | <2 | <0.0005 | 0.0024 | <0.03 | 0.07 |
| | | 20-Jan-09 | N | 1898.21 | 1901.09 | 0.7F | 0.109 | -- | <0.05 | 0.04F | 8.5 | 0.0125 | 20.5 | -- | <2 | <0.0005 | 0.0032 | -- | 0.1 |
| | | 27-Jan-09 | N | 1898.21 | 1901.09 | 0.5F | 0.085 | -- | <0.05 | 0.02F | 7.7 | 0.0151 | 21.6 | -- | <2 | <0.0005 | 0.0028 | -- | 0.09 |
| | | 3-Feb-09 | N | 1898.21 | 1901.09 | 1 | 0.15 | -- | <0.05 | 0.08 | 16.2 | 0.019 | 48.1 | -- | <2 | <0.0005 | 0.0052 | -- | 0.18 |
| | | 10-Feb-09 | N | 1898.21 | 1901.09 | 0.7F | 0.11 | -- | <0.05 | 0.12 | 18.8 | 0.0032 | 62.3 | -- | <2 | <0.0005 | 0.0007 | -- | 0.22 |
| | | 17-Feb-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1898.21 | 1901.09 | <1 | 0.05 | <0.001 | <0.05 | 0.08 | 13.2 | 0.0452 | 73.2 | <0.05D2 | <2 | 0.0001F | 0.0105 | <0.03 | 0.32D2 |
| | | 17-Mar-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1898.21 | 1901.09 | <1 | 0.007F | <0.001 | <0.05 | 0.01F | 5.6 | 0.0247B7 | 77.8 | <0.03 | <2 | <0.0005 | 0.0041 | <0.03 | 0.03F |
| | | 14-Apr-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-006D | TEST 28 | 28-Apr-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1898.21 | 1901.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.4F | 0.0081 | 11.6 | <0.03 | <2 | <0.0005 | 0.0012 | <0.03 | <0.05 |
| | | 12-May-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1898.21 | 1901.09 | <1 | 0.031 | <0.001 | <0.05 | 0.06 | 8 | 0.103 | 130 | <0.03 | <2 | <0.0005 | 0.0185 | <0.05D1 | 0.15 |
| | | 9-Jun-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1898.21 | 1901.09 | <1 | 0.042 | <0.001 | <0.05 | 0.18 | 5.2 | 0.104B1 | 115D1 | <0.03 | <2 | 0.0001F | 0.0183 | <0.1D1 | 0.48D1 |
| | | 7-Jul-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1898.21 | 1901.09 | <1 | 0.027F | <0.001 | 0.02F | 0.08 | 3.1 | 0.0835 | 104 | <0.05D1 | <2 | <0.0005 | 0.0092 | <0.03 | 0.17 |
| | | 4-Aug-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1898.21 | 1901.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1898.21 | 1901.09 | <1 | 0.012F | <0.001 | <0.05 | 0.04F | 0.3F | 0.0186 | 30.8 | <0.03 | <2V1 | <0.0005 | 0.0023 | <0.03 | 0.05 |
| | TEST 29 | 26-Aug-08 | N | 1952.56 | 1954.83 | 4.6 | 1.35 | <0.001 | <0.05 | 0.06 | 76.3 | 0.0021 | 26.9 | <0.03L1 | 19.1 | 0.0002F | 0.0006 | <0.03 | 0.27 |
| | | 2-Sep-08 | N | 1952.56 | 1954.83 | 1.4 | 1.38 | <0.001 | <0.05 | 0.07 | 16.7 | 0.0034 | 33 | <0.03 | 0.9F | <0.0005 | 0.0003F | <0.03 | 0.04F |
| | | 9-Sep-08 | N | 1952.56 | 1954.83 | 0.5 | 0.611 | <0.001 | <0.05 | 0.03 | 4.6 | 0.0018 | 16.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.01 |
| | | 16-Sep-08 | N | 1952.56 | 1954.83 | 0.8 | 1.55 | <0.001 | <0.05 | 0.1 | 7.3 | 0.006 | 36 | <0.03 | <2 | <0.0005 | 0.0003 | <0.03 | 0.02 |
| | | 23-Sep-08 | N | 1952.56 | 1954.83 | 0.6 | 0.992 | <0.001 | 0.01 | 0.12 | 3.7 | 0.0114 | 18.5 | <0.03 | <2 | <0.0005 | 0.0008 | <0.03 | 0.03 |
| | | 30-Sep-08 | N | 1952.56 | 1954.83 | 0.4 | 0.308 | <0.001 | <0.05 | 0.07 | 6.8 | 0.0255 | 38.2 | <0.03 | <2 | <0.0005 | 0.0014 | <0.03 | 0.05 |
| | | 7-Oct-08 | N | 1952.56 | 1954.83 | <1 | 0.096 | <0.001 | <0.05 | 0.04F | 2.6 | 0.0229 | 25 | <0.03 | <2 | <0.0005 | 0.0011 | <0.03 | 0.02F |
| | | 14-Oct-08 | N | 1952.56 | 1954.83 | <1 | 0.076 | <0.001 | <0.05 | 0.03F | 2.8 | 0.0231 | 22.6 | <0.03 | <2 | <0.0005 | 0.0011 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1952.56 | 1954.83 | <1 | 0.061 | <0.001 | <0.05 | 0.04F | 1F | 0.0185B4 | 13.3 | <0.03 | <2 | <0.0005 | 0.0011 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1952.56 | 1954.83 | <1 | 0.059 | <0.001 | <0.05 | 0.04F | 1.8F | 0.0239 | 15 | <0.03 | <2 | <0.0005 | 0.0013 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 1952.56 | 1954.83 | <1 | 0.052 | <0.001 | 0.02F | 0.04F | 1.6F | 0.035 | 17.4 | <0.03 | <2 | <0.0005 | 0.0019 | <0.03 | 0.01F |
| | TEST 29S | 11-Nov-08 | N | 1952.56 | 1954.83 | <1 | 0.015F | <0.001 | <0.05 | <0.05 | 0.5F | 0.0091 | 4.2 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1952.56 | 1954.83 | <1 | 0.01F | <0.001 | <0.05 | <0.05 | 0.3F | 0.0048 | 2.9 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 0.01F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-006D | TEST 29S | 25-Nov-08 | N | 1952.56 | 1954.83 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0028 | 1.2F | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1952.56 | 1954.83 | <1 | 0.013F | <0.001 | <0.05 | <0.05 | 0.4F | 0.0037 | 2 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1952.56 | 1954.83 | <1 | 0.013F | <0.001 | <0.05 | <0.05 | 0.3F | 0.005 | 2.1 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1952.56 | 1954.83 | <1 | 0.018F | <0.001 | <0.05 | <0.05 | <2 | 0.0027 | 1F | <0.03 | <2 | <0.0005 | 0.0002F | 0.008F | <0.05 |
| | | 23-Dec-08 | N | 1952.56 | 1954.83 | <1 | 0.013F | -- | 0.01F | <0.05 | 0.4F | 0.0029 | 1.5F | -- | <2 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 30-Dec-08 | N | 1952.56 | 1954.83 | <1 | <0.03 | -- | <0.05 | <0.05V1 | <2 | 0.0029 | 1.8F | -- | <2 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 6-Jan-09 | N | 1952.56 | 1954.83 | <1 | 0.007F | -- | <0.05 | <0.05 | <2 | 0.0032 | 1.1F | -- | <2 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 13-Jan-09 | N | 1952.56 | 1954.83 | <1 | <0.03 | <0.001 | <0.05 | <0.1D1 | <2 | 0.0028 | 1.1F | <0.05D1 | <2 | <0.0005 | 0.0002F | <0.05D1 | <0.05 |
| | | 20-Jan-09 | N | 1952.56 | 1954.83 | <1 | 0.007F | -- | <0.05 | <0.05 | <2 | 0.0028 | 1.1F | -- | <2 | <0.0005 | 0.0003F | -- | <0.05 |
| | | 27-Jan-09 | N | 1952.56 | 1954.83 | <1 | 0.009F | -- | <0.05 | <0.05 | <2 | 0.0031 | 1.1F | -- | <2 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 3-Feb-09 | N | 1952.56 | 1954.83 | <1 | 0.009F | -- | <0.05 | <0.05 | <2 | 0.0033 | 1.2F | -- | <2 | <0.0005 | 0.0003F | -- | <0.05 |
| | | 10-Feb-09 | N | 1952.56 | 1954.83 | <1 | 0.008F | <0.001H3 | <0.05 | <0.05 | <2 | 0.0043 | 1.5F | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | 0.01F |
| | | 17-Feb-09 | N | 1952.56 | 1954.83 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 30 | 26-Aug-08 | N | 1954.83 | 1972 | 2.7 | 0.22 | <0.001 | 0.02F | 0.02F | 17.2 | 0.0035 | 3.2 | <0.03L1 | 23.4 | 0.0001F | <0.0005 | <0.03 | 0.03F |
| | | 2-Sep-08 | N | 1954.83 | 1972 | 2.6 | 0.258 | <0.001 | 0.01F | 0.01F | 14 | 0.0036 | 6.3 | <0.03 | 13.6 | 0.0001F | <0.0005 | <0.03 | 0.02F |
| | | 9-Sep-08 | N | 1954.83 | 1972 | 2.6 | 0.341 | <0.001 | <0.05 | 0.06 | 12.1 | 0.0031 | 6.3 | <0.03 | 7.4 | <0.0005 | <0.0005 | <0.03 | 0.04 |
| | | 16-Sep-08 | N | 1954.83 | 1972 | 2.3 | 0.308 | <0.001 | <0.05 | 0.04 | 9.6 | 0.0019 | 6.9 | <0.03 | 3.9 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | | 23-Sep-08 | N | 1954.83 | 1972 | 2.5 | 0.361 | <0.001 | <0.05 | 0.06 | 10 | 0.0018 | 8.5 | <0.03 | 2.8 | 0.0001 | 0.0002 | <0.03 | 0.07 |
| | | 30-Sep-08 | N | 1954.83 | 1972 | 2.1 | 0.331 | <0.001 | <0.05 | 0.06 | 8.3 | 0.0023 | 8 | <0.03 | 1.6 | 0.0001 | 0.0003 | <0.03 | 0.09 |
| | | 7-Oct-08 | N | 1954.83 | 1972 | 2.4 | 0.336 | <0.001 | <0.05 | 0.08 | 6.8 | 0.0031 | 8.1 | <0.03 | 1F | <0.0005 | 0.0004F | <0.03 | 0.1 |
| | | 14-Oct-08 | N | 1954.83 | 1972 | 2.2 | 0.262 | <0.001 | <0.05 | 0.05 | 4.3 | 0.0023 | 8.7 | <0.03 | 0.6F | <0.0005 | 0.0002F | <0.03 | 0.06 |
| | | 21-Oct-08 | N | 1954.83 | 1972 | 2.5 | 0.267 | <0.001 | <0.05 | 0.06 | 3.8 | 0.0026 | 7.7 | <0.03 | 0.5F | <0.0005 | 0.0003F | <0.03 | 0.02F |
| | | 28-Oct-08 | N | 1954.83 | 1972 | 2.5 | 0.243 | <0.001 | <0.05 | 0.04F | 3.1 | 0.0029 | 8.2 | <0.03 | 0.4F | <0.0005 | 0.0002F | <0.03 | 0.02F |
| | | 4-Nov-08 | N | 1954.83 | 1972 | 3.2 | 0.29 | <0.001 | 0.02F | 0.04F | 2.8 | 0.0051 | 10.1 | <0.03 | 0.5F | <0.0005 | 0.0004F | <0.03 | 0.08 |
| | | 11-Nov-08 | N | 1954.83 | 1972 | 2.9 | 0.25 | <0.001 | 0.02F | 0.04F | 2.2 | 0.0041 | 9 | <0.03 | 0.4F | <0.0005 | 0.0003F | <0.03 | 0.02F |
| | | 18-Nov-08 | N | 1954.83 | 1972 | 2.7 | 0.235 | <0.001 | 0.02F | 0.03F | 1.9F | 0.0045 | 8.8 | <0.03 | 0.4F | <0.0005 | 0.0003F | <0.03 | 0.07 |
| | | 25-Nov-08 | N | 1954.83 | 1972 | 3 | 0.253 | <0.001 | <0.05 | 0.03F | 1.7F | 0.0046 | 10.3 | <0.03 | 0.4F | <0.0005 | 0.0004F | <0.03 | 0.06 |
| | | 2-Dec-08 | N | 1954.83 | 1972 | 2.2 | 0.2 | <0.001 | <0.05 | 0.02F | 1.5F | 0.0036 | 6.9 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.03F |
| | | 9-Dec-08 | N | 1954.83 | 1972 | 2.3 | 0.193 | <0.001 | <0.05 | 0.03F | 1.4F | 0.0046 | 7.4 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.04F |
| | | 16-Dec-08 | N | 1954.83 | 1972 | 2.1 | 0.183 | <0.001 | <0.05 | 0.02F | 1.1F | 0.0095 | 7.8 | <0.03 | <2 | <0.0005 | 0.0019 | <0.03 | 0.04F |
| | | 23-Dec-08 | N | 1954.83 | 1972 | 2.1 | 0.191 | -- | <0.05 | 0.03F | 1.2F | 0.0051 | 7.5 | -- | 0.4F | <0.0005 | 0.0004F | -- | 0.06 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
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# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-006D | TEST 30 | 30-Dec-08 | N | 1954.83 | 1972 | 1.8 | 0.154 | -- | <0.05 | 0.03F | 1.1F | 0.0047 | 7.3 | -- | <2 | <0.0005 | 0.0004F | -- | 0.06 |
| | | 6-Jan-09 | N | 1954.83 | 1972 | 1.6 | 0.151 | -- | <0.05 | 0.02F | 1.1F | 0.0049 | 7.2 | -- | <2 | <0.0005 | 0.0004F | -- | 0.07 |
| | | 13-Jan-09 | N | 1954.83 | 1972 | 1.7 | 0.141 | <0.001 | <0.05 | 0.02F | 1F | 0.0056 | 7M1 | <0.03M2 | <2 | <0.0005 | 0.0005 | <0.03 | 0.05 |
| | | 20-Jan-09 | N | 1954.83 | 1972 | 1.6 | 0.135 | -- | <0.05L1M1 | 0.02F | 0.9F | 0.0054 | 7.8M1 | -- | <2 | <0.0005 | 0.0004F | -- | 0.06 |
| | | 27-Jan-09 | N | 1954.83 | 1972 | 1.4 | 0.124 | -- | <0.05L1M1 | 0.02F | 0.9F | 0.0059 | 9M1 | -- | <2 | 0.0002F | 0.0004F | -- | 0.07 |
| | | 3-Feb-09 | N | 1954.83 | 1972 | 1.6 | 0.13 | -- | <0.05 | 0.03F | 0.9F | 0.0066 | 7.2M1 | -- | <2 | <0.0005 | 0.0005 | -- | 0.08 |
| | | 10-Feb-09 | N | 1954.83 | 1972 | 1.4 | 0.122 | -- | <0.05M1 | 0.03F | 1.2F | 0.0042 | 7.8 | -- | <2 | <0.0005 | 0.0004F | -- | 0.08 |
| | | 17-Feb-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1954.83 | 1972 | 0.9F | 0.099 | <0.001 | <0.05 | 0.01F | 0.6F | 0.0072 | 6.8 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | 0.16 |
| | | 17-Mar-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1954.83 | 1972 | 0.7F | 0.073 | <0.001 | <0.05 | <0.05 | 0.6F | 0.0081B7 | 7.3 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | 0.05 |
| | | 14-Apr-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1954.83 | 1972 | 0.9F | 0.094 | <0.001 | <0.05 | 0.02F | 0.5F | 0.0123 | 8.2 | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | 0.08 |
| | | 12-May-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1954.83 | 1972 | 0.5F | 0.099 | <0.001 | <0.05 | 0.02F | 0.7F | 0.0205 | 8.4 | <0.03 | <2 | <0.0005 | 0.0012 | <0.05D1 | 0.06 |
| | | 9-Jun-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1954.83 | 1972 | 0.4F | 0.114 | <0.001 | 0.01F | 0.04F | 0.8F | 0.0252B1 | 8.1D1 | 0.02F | <2 | <0.0005 | 0.0021 | <0.05D1 | 0.22D1 |
| | | 7-Jul-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1954.83 | 1972 | 0.5F | 0.128 | <0.001 | <0.05 | 0.04F | 0.9F | 0.0375 | 8.7 | <0.05D1 | <2 | <0.0005 | 0.003 | <0.03 | 0.13 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-006D | TEST 30 | 4-Aug-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1954.83 | 1972 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1954.83 | 1972 | 0.5F | 0.09 | <0.001 | <0.05 | 0.05 | 0.7F | 0.0346 | 12.8 | <0.05D1 | <2V1 | <0.0005 | 0.0028 | <0.03 | 0.13D1 |
| | TEST 31 | 26-Aug-08 | N | 1980.6 | 1983.6 | 27.4 | 4.81 | <0.001 | <0.05 | 1.07 | 61.5 | 0.0281D1B7 | 71.7 | <0.05D1 | 20.1 | 0.0008 | 0.0656 | 0.106 | 19.7 |
| | | 2-Sep-08 | N | 1980.6 | 1983.6 | 0.7F | 0.262 | <0.001 | <0.05 | 0.02F | 11 | 0.0129 | 23.7 | <0.03 | <2 | <0.0005 | 0.0015 | <0.03 | 2.38 |
| | | 9-Sep-08 | N | 1980.6 | 1983.6 | 1 | 0.391 | <0.001 | <0.05 | 0.05 | 10.4 | 0.0213 | 41.5 | <0.03M2 | 0.4 | <0.0005 | 0.0021 | <0.03 | 7.53M3 |
| | | 16-Sep-08 | N | 1980.6 | 1983.6 | 0.5 | 0.192 | <0.001 | <0.05 | 0.02 | 7.4 | 0.0161 | 31.6 | <0.03M2 | <2 | <0.0005 | 0.0021 | <0.03 | 6.44M3 |
| | | 23-Sep-08 | N | 1980.6 | 1983.6 | 0.4 | 0.15 | <0.001 | <0.05 | 0.06 | 3.1 | 0.0241 | 18.5 | <0.03M2 | <2 | <0.0005 | 0.0054 | <0.03 | 16.2M3 |
| | | 30-Sep-08 | N | 1980.6 | 1983.6 | 0.8 | 0.218 | <0.001 | <0.05 | 0.09 | 6.8 | 0.0427 | 38.9 | <0.03M2 | <2 | <0.0005 | 0.0084 | <0.03 | 27M3 |
| | | 7-Oct-08 | N | 1980.6 | 1983.6 | 0.3F | 0.077 | <0.001 | <0.05 | 0.13 | 5.9 | 0.0546 | 34.2 | <0.03M2 | <2 | <0.0005 | 0.0067 | <0.03 | 28.4M3 |
| | | 14-Oct-08 | N | 1980.6 | 1983.6 | <1 | 0.022F | <0.001 | <0.05 | 0.02F | 2.8 | 0.0186 | 25.8 | <0.03M2 | <2 | <0.0005 | 0.0019 | <0.03 | 8.94M3 |
| | | 21-Oct-08 | N | 1980.6 | 1983.6 | <1 | 0.022F | <0.001 | <0.05 | 0.05 | 2.1 | 0.0242B7 | 21.4 | <0.03M2 | <2 | <0.0005 | 0.0023 | <0.03 | 12.1M3 |
| | | 28-Oct-08 | N | 1980.6 | 1983.6 | 0.3FM1 | 0.023F | <0.001 | <0.05M1 | 0.04F | 1.6FM1 | 0.0267 | 18.7 | <0.03M2 | <2M1 | <0.0005 | 0.0037 | <0.03M1 | 15.3M3 |
| | | 4-Nov-08 | N | 1980.6 | 1983.6 | <1 | 0.009F | <0.001 | 0.02F | 0.02F | <2 | 0.0063 | 3.2M1 | <0.03M2 | <2 | <0.0005 | 0.001 | <0.03 | 4.63 |
| | TEST 31S | 11-Nov-08 | N | 1980.6 | 1983.6 | 0.2F | 0.021F | <0.001 | 0.01F | 0.04F | 1.5F | 0.0283 | 15.9 | <0.03 | <2 | <0.0005 | 0.0115 | <0.03 | 22.2 |
| | | 18-Nov-08 | N | 1980.6 | 1983.6 | <1 | 0.005F | <0.001 | 0.02F | <0.05 | 0.4F | 0.0059 | 6.8 | <0.03M2 | <2 | <0.0005 | 0.002 | <0.03 | 6.17M3 |
| | | 25-Nov-08 | N | 1980.6 | 1983.6 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0031 | 3.7 | <0.03M2 | <2 | <0.0005 | 0.0013 | <0.03 | 3.82M3 |
| | | 2-Dec-08 | N | 1980.6 | 1983.6 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0027 | 3.9 | <0.03M2 | <2 | <0.0005 | 0.0014 | <0.03 | 4.99M3 |
| | | 9-Dec-08 | N | 1980.6 | 1983.6 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0023 | 2.9 | <0.03M2 | <2 | <0.0005 | 0.0008 | <0.03 | 3.66M3 |
| | | 16-Dec-08 | N | 1980.6 | 1983.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1980.6 | 1983.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 32 | 26-Aug-08 | N | 2091.13 | 2094.13 | 376M3 | 1.72 | <0.001 | 0.03F | 0.07 | 238 | 0.225B7 | 24.7 | <0.03L1 | 214M2 | 0.0004F | 0.0024 | 0.007F | 0.05 |
| | | 2-Sep-08 | N | 2091.13 | 2094.13 | 9.6 | 0.026F | <0.001 | 0.02F | <0.05 | 20.7 | 0.0079 | 5.3 | <0.03M2 | 2.7 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 2091.13 | 2094.13 | 4.3 | 0.016 | <0.001 | <0.05 | <0.05 | 9.8 | 0.0035 | 2.7 | <0.03 | 1.4 | <0.0005 | 0.0001 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 2091.13 | 2094.13 | 2.1 | <0.03 | <0.001 | <0.05 | <0.05 | 8.4 | 0.0031 | 2.1 | <0.03 | 0.9 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 2091.13 | 2094.13 | 16.9 | 0.072 | <0.001 | 0.05 | <0.05 | 20.8 | 0.0215 | 3.8 | <0.03 | 3.3 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 2091.13 | 2094.13 | 14 | 0.07 | <0.001 | 0.01 | <0.05 | 14.2 | 0.0238 | 1.7 | <0.03 | 1.1 | <0.0005 | <0.0005 | <0.03 | 0.01 |
| | | 7-Oct-08 | N | 2091.13 | 2094.13 | 17.8 | 0.108 | <0.001 | 0.01F | <0.05 | 17.9 | 0.0311 | 2.6 | <0.03 | 1.7F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 2091.13 | 2094.13 | 16.9 | 0.116 | <0.001 | 0.01F | <0.05 | 17.8 | 0.0275 | 2.7 | <0.03 | 1.2F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 2091.13 | 2094.13 | 8.6 | 0.043 | <0.001 | 0.01F | <0.05 | 17.6 | 0.0148 | 3.5 | <0.03 | 0.4F | <0.0005 | <0.0005 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-006D | TEST 32 | 28-Oct-08 | N | 2091.13 | 2094.13 | 10.1 | 0.062 | <0.001 | 0.01F | <0.05 | 18.6 | 0.0221 | 3.7 | <0.03 | 0.5F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 2091.13 | 2094.13 | 16.8 | 0.143 | <0.001 | 0.02F | <0.05 | 21 | 0.039 | 5.4 | <0.03 | 0.5F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | TEST 32S | 11-Nov-08 | N | 2091.13 | 2094.13 | 32.2 | 0.288 | <0.001 | 0.03F | <0.05 | 33.2 | 0.0537 | 4.4 | <0.03 | 0.6F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 2091.13 | 2094.13 | 6.1 | 0.069 | <0.001 | 0.02F | <0.05 | 7.2 | 0.0095 | 1F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 2091.13 | 2094.13 | 5.1 | 0.054 | <0.001 | <0.05 | <0.05 | 5.1 | 0.0074B3 | 0.5F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 2091.13 | 2094.13 | 5.2 | 0.052 | <0.001 | <0.05 | <0.05 | 5.1 | 0.0055 | 0.5F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 2091.13 | 2094.13 | 6.3 | 0.06 | <0.001 | <0.05 | <0.05 | 5.3 | 0.0078 | 0.4F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 2091.13 | 2094.13 | 7.9 | 0.087 | <0.001 | <0.05 | <0.05 | 4.2D1 | 0.0083 | 0.5F | <0.03 | 0.4F | <0.0005 | <0.0005 | <0.03 | <0.1D1 |
| | | 23-Dec-08 | N | 2091.13 | 2094.13 | 7.6 | 0.091 | -- | <0.05 | <0.05 | 5 | 0.0082 | 0.5F | -- | 0.4F | <0.0005 | <0.0005 | -- | <0.05 |
| | | 30-Dec-08 | N | 2091.13 | 2094.13 | 7.4 | 0.088 | -- | <0.05 | <0.05 | 4.7 | 0.0079 | 0.5F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 6-Jan-09 | N | 2091.13 | 2094.13 | 10.4 | 0.124 | -- | <0.05 | <0.05 | 6.1 | 0.0099 | 0.6F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 13-Jan-09 | N | 2091.13 | 2094.13 | 10.3 | 0.13 | <0.001 | <0.05 | <0.05 | 5.4 | 0.0112 | 0.7F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 2091.13 | 2094.13 | 12.2 | 0.166 | -- | <0.05L1 | <0.05 | 5.6 | 0.0109 | 0.7F | -- | <2 | <0.0005 | <0.0005 | -- | 0.01F |
| | | 27-Jan-09 | N | 2091.13 | 2094.13 | 10.9 | 0.147 | -- | <0.05 | <0.05 | 5.5 | 0.01 | 0.7F | -- | <2 | 0.0002F | <0.0005 | -- | 0.01F |
| | | 3-Feb-09 | N | 2091.13 | 2094.13 | 12.1 | 0.162 | -- | <0.05 | <0.05 | 5.5 | 0.0108 | 0.7F | -- | <2 | <0.0005 | <0.0005 | -- | 0.01F |
| | | 10-Feb-09 | N | 2091.13 | 2094.13 | 11.6 | 0.163 | <0.001H3 | <0.05 | <0.05 | 5.2 | 0.0121 | 0.6F | <0.03M2 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 17-Feb-09 | N | 2091.13 | 2094.13 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-008A | TEST 33 | 26-Aug-08 | N | 1597 | 1600 | 0.9F | 0.023F | <0.001M2 | <0.05 | <0.05 | 7.1 | 0.0003F | 20.9 | <0.03L1M2 | 25.6 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 2-Sep-08 | N | 1597 | 1600 | 0.4F | 0.022F | <0.001 | <0.05 | 0.02F | 3.8 | 0.0002F | 20.2 | <0.03 | 17.9 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1597 | 1600 | 0.4 | 0.017 | <0.001 | <0.05 | <0.05 | 3.3 | <0.0005 | 21.3 | <0.03 | 13.6 | <0.0005 | 0.0003 | 0.006 | <0.05 |
| | | 16-Sep-08 | N | 1597 | 1600 | 0.3 | 0.021 | <0.001 | <0.05 | <0.05 | 2.9 | 0.0002 | 21.7 | <0.03 | 10.9 | <0.0005 | 0.0004 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 1597 | 1600 | <1 | 0.017 | <0.001 | <0.05 | <0.05 | 2.8 | 0.0002 | 18.4 | <0.03 | 8.7 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1597 | 1600 | 0.2 | 0.017 | <0.001 | <0.05 | <0.05 | 3.3 | 0.0001 | 21.2 | <0.03 | 8 | <0.0005 | 0.0003 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1597 | 1600 | <1 | 0.021F | <0.001 | <0.05 | <0.05 | 2.7 | 0.0003F | 18.8 | <0.03 | 6.4 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1597 | 1600 | 0.3F | 0.028F | <0.001 | <0.05 | <0.05 | 2.7 | <0.0005 | 20.4 | <0.03 | 5.9 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1597 | 1600 | 0.2F | 0.04 | <0.001 | <0.05 | <0.05 | 2.3 | 0.0002F | 17.8 | <0.03 | 4.9 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1597 | 1600 | 0.5F | 0.034 | <0.001 | <0.05 | <0.05 | 2.4 | <0.0005 | 20 | <0.03 | 4.6 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 1597 | 1600 | 0.4F | 0.035 | <0.001 | 0.01F | 0.02F | 2.3 | 0.0002F | 22.7 | <0.03 | 3.5 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1597 | 1600 | 0.4F | 0.029F | <0.001 | <0.05 | <0.05 | 2 | <0.0005 | 18.9 | <0.03 | 3 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1597 | 1600 | 0.4F | 0.033 | <0.001 | <0.05 | <0.05 | 2.2 | 0.0002FM1 | 22.4 | <0.03 | 2.8 | <0.0005 | <0.0005 | 0.005F | <0.05 |
| | | 25-Nov-08 | N | 1597 | 1600 | 0.3F | 0.035 | <0.001 | <0.05 | <0.05 | 1.7F | 0.0001F | 16.6 | <0.03 | 2 | <0.0005 | <0.0005 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-008A | TEST 33 | 2-Dec-08 | N | 1597 | 1600 | 0.3F | 0.037 | <0.001 | <0.05 | <0.05 | 2.1 | <0.0005 | 16.7 | <0.03 | 1.9F | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1597 | 1600 | 0.3F | 0.028F | <0.001 | <0.05 | <0.05 | 2 | <0.0005 | 16.9 | <0.03 | 1.5F | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1597 | 1600 | 0.2F | 0.039 | <0.001 | <0.05 | <0.05 | 1.7F | <0.0005 | 13.4 | <0.03 | 1.2F | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1597 | 1600 | <1 | 0.039 | -- | <0.05 | <0.05 | 1.6F | <0.0005 | 14.4 | -- | 1F | <0.0005 | 0.0002F | -- | <0.05 |
| | | 30-Dec-08 | N | 1597 | 1600 | 0.3F | 0.037 | -- | <0.05 | <0.05 | 1.7F | <0.0005 | 17.2 | -- | 1.1F | <0.0005 | 0.0002F | -- | <0.05 |
| | | 6-Jan-09 | N | 1597 | 1600 | <1 | 0.043 | -- | 0.01F | <0.05 | 1.6F | <0.0005 | 15.7 | -- | 0.9F | <0.0005 | 0.0002F | -- | <0.05 |
| | | 13-Jan-09 | N | 1597 | 1600 | 0.4F | 0.047 | <0.001 | <0.05 | <0.05 | 1.7F | 0.0001F | 19 | <0.03 | 0.9F | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1597 | 1600 | 0.5F | 0.062 | -- | <0.05L1 | <0.05 | 1.6F | <0.0005 | 18.8 | -- | 0.7F | <0.0005 | 0.0002F | -- | <0.05 |
| | | 27-Jan-09 | N | 1597 | 1600 | 0.4F | 0.045 | -- | <0.05 | 0.01F | 1.4F | <0.0005 | 14.2 | -- | 0.5F | 0.0002F | 0.0001F | -- | <0.05 |
| | | 3-Feb-09 | N | 1597 | 1600 | 0.5F | 0.035 | -- | 0.01F | <0.05 | 1.6F | <0.0005 | 19.4 | -- | 0.6F | <0.0005 | 0.0002F | -- | <0.05 |
| | | 10-Feb-09 | N | 1597 | 1600 | 0.4F | 0.049 | <0.001H3 | <0.05 | <0.05 | 1.4F | <0.0005 | 16.3 | <0.03 | 0.5F | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 17-Feb-09 | N | 1597 | 1600 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 34 | 26-Aug-08 | N | 1717 | 1720 | 4.4 | 0.58 | <0.001 | <0.05 | <0.05 | 19.4 | 0.0029 | 4.3 | <0.03L1 | 26.4 | <0.0005 | 0.0009 | <0.03 | <0.05 |
| | | 2-Sep-08 | N | 1717 | 1720 | 2.5 | 0.145 | <0.001 | <0.05 | <0.05 | 10.9 | 0.003 | 4 | <0.03 | 18.1 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1717 | 1720 | 2.1 | 0.152 | <0.001 | <0.05 | 0.01 | 8.8 | 0.0017 | 4.5 | <0.03 | 12.1 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1717 | 1720 | 2.1 | 0.165 | <0.001 | <0.05 | <0.05 | 8.7 | 0.0013 | 4.6 | <0.03 | 9.9 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 1717 | 1720 | 1.2 | 0.11 | <0.001 | <0.05 | <0.05 | 6.7 | 0.0008 | 3.6 | <0.03 | 5.4 | <0.0005 | 0.0001 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1717 | 1720 | 1 | 0.108 | <0.001 | <0.05 | <0.05 | 6.3 | 0.0008 | 3.5 | <0.03 | 3.9 | <0.0005 | 0.0001 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1717 | 1720 | 1 | 0.106 | <0.001 | <0.05 | <0.05 | 6.3 | 0.0008 | 3.9 | <0.03 | 3.3 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1717 | 1720 | 1 | 0.109 | <0.001 | <0.05 | <0.05 | 5 | 0.0005 | 3.3 | <0.03 | 2.4 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1717 | 1720 | 0.6F | 0.09 | <0.001 | <0.05 | <0.05 | 4.5 | 0.0005 | 4.1 | <0.03 | 1.6F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1717 | 1720 | 0.7F | 0.088 | <0.001 | <0.05 | <0.05 | 3.9 | 0.0004F | 3.1 | <0.03 | 1.2F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 1717 | 1720 | 0.8F | 0.094 | <0.001 | <0.05 | <0.05 | 4.2 | 0.0007 | 3.9 | <0.03 | 1.1F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1717 | 1720 | 0.6F | 0.091 | <0.001 | <0.05 | <0.05 | 3 | 0.0005 | 3.1 | <0.03 | 0.7F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1717 | 1720 | 0.5F | 0.089 | <0.001 | <0.05 | <0.05 | 3.2 | 0.0004F | 3.4 | <0.03 | 0.6F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1717 | 1720 | 0.5F | 0.076 | <0.001 | <0.05 | <0.05 | 2.7 | 0.0003F | 2.8 | <0.03 | 0.4F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1717 | 1720 | 0.5F | 0.105 | <0.001 | <0.05 | <0.05 | 3.2 | 0.0003F | 2.7 | <0.03 | 0.5F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1717 | 1720 | 0.4F | 0.083 | <0.001 | <0.05 | <0.05 | 2.8 | 0.0003F | 2.4 | <0.03 | 0.3F | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1717 | 1720 | 0.4F | 0.103 | <0.001 | <0.05 | <0.05 | 2.4 | 0.0002F | 2.2 | <0.03 | 0.3F | <0.0005 | <0.0005 | 0.005F | <0.05 |
| | | 23-Dec-08 | N | 1717 | 1720 | 0.3F | 0.099 | -- | <0.05 | <0.05 | 2.5 | 0.0002F | 2.3 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 30-Dec-08 | N | 1717 | 1720 | 0.3F | 0.09 | -- | <0.05 | <0.05 | 2.2 | 0.0002F | 2.2 | -- | 0.5F | <0.0005 | <0.0005 | -- | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-008A | TEST 34 | 6-Jan-09 | N | 1717 | 1720 | <1 | 0.086 | -- | <0.05 | <0.05 | 2.4 | 0.0002F | 2.4 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 13-Jan-09 | N | 1717 | 1720 | 0.4F | 0.079 | <0.001 | <0.05 | <0.05 | 2.2 | 0.0003F | 3.2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1717 | 1720 | 0.4F | 0.081 | -- | <0.05L1 | <0.05 | 2.4 | 0.0002F | 4.1 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 27-Jan-09 | N | 1717 | 1720 | 0.4F | 0.089 | -- | <0.05 | <0.05 | 2.2 | 0.0001F | 2.9 | -- | <2 | 0.0003F | <0.0005 | -- | <0.05 |
| | | 3-Feb-09 | N | 1717 | 1720 | 0.4F | 0.08 | -- | <0.05 | <0.05 | 2.2 | 0.0002F | 3.5 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 10-Feb-09 | N | 1717 | 1720 | 2.1 | 0.096 | -- | 0.02F | <0.05 | 5.5 | <0.001D1 | 3.4 | -- | 3.3 | <0.0005 | <0.0005 | -- | 0.02F |
| | | 17-Feb-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1717 | 1720 | <1 | 0.082 | <0.001 | <0.05 | <0.05 | 2.1 | 0.0002F | 3.2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05L1 |
| | | 17-Mar-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1717 | 1720 | 0.3F | 0.085 | <0.001 | <0.05 | <0.05 | 1.6F | <0.0005 | 2.8 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 14-Apr-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1717 | 1720 | 0.3F | 0.098 | <0.001 | <0.05 | <0.05 | 1.6F | 0.0001F | 2.9 | <0.03M2 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 12-May-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1717 | 1720 | 0.2F | 0.117 | <0.001 | <0.05 | <0.05 | 2.2 | 0.0003F | 3.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Jun-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1717 | 1720 | 0.3F | 0.171 | <0.001 | <0.05 | <0.05 | 2.4 | 0.0004F | 4 | 0.01F | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 7-Jul-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1717 | 1720 | 0.5F | 0.231 | <0.001 | <0.05 | <0.05 | 2.3 | 0.0004F | 4.2 | <0.05D1 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Aug-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-008A | TEST 34 | 11-Aug-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1717 | 1720 | 0.7F | 0.312 | <0.001 | <0.05 | 0.01F | 2.4 | 0.0003F | 4.6 | <0.03 | <2V1 | <0.0005 | <0.0005 | <0.03 | 0.02F |
| | | 1-Sep-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Sep-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 1717 | 1720 | 0.5F | 0.303 | <0.001 | 0.01F | <0.05 | 1.7F | 0.0003F | 3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | | 29-Sep-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 1717 | 1720 | 0.4F | 0.223 | <0.001 | <0.05 | <0.05 | 1.3F | 0.0002F | 2.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | | 27-Oct-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 1717 | 1720 | <1 | 0.218 | <0.001 | <0.05 | <0.05 | 0.9F | 0.0002F | 2.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.05 |
| | | 24-Nov-09 | N | 1717 | 1720 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 35 | 26-Aug-08 | N | 1844.1 | 1846.6 | 25.5 | 3.14 | <0.001 | <0.05 | <0.05 | 15.2 | 0.0173B7 | 6.4 | <0.03L1 | 36.5 | 0.0001F | 0.0028 | <0.03 | 0.23 |
| | | 2-Sep-08 | N | 1844.1 | 1846.6 | 11.5 | 0.546 | <0.001 | <0.05 | <0.05 | 8.7 | 0.0166 | 6 | <0.03 | 19.4 | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1844.1 | 1846.6 | 9 | 0.545 | <0.001 | <0.05 | <0.05 | 6.7 | 0.0101 | 6 | <0.03 | 11.3 | <0.0005 | 0.0005 | <0.03 | 0.01 |
| | | 16-Sep-08 | N | 1844.1 | 1846.6 | 8 | 0.539 | <0.001 | <0.05 | <0.05 | 5.5 | 0.0063 | 6 | <0.03 | 7.1 | <0.0005 | 0.0004 | <0.03 | 0.01 |
| | | 23-Sep-08 | N | 1844.1 | 1846.6 | 6.7 | 0.425 | <0.001 | <0.05 | <0.05 | 4.6 | 0.004 | 4.5 | <0.03 | 4.3 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1844.1 | 1846.6 | 5.9 | 0.385 | <0.001 | <0.05 | <0.05 | 4.8 | 0.0041 | 4.8 | <0.03 | 2.9 | <0.0005 | 0.0003 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1844.1 | 1846.6 | 5.1 | 0.3 | <0.001 | <0.05 | <0.05 | 3.5 | 0.0032 | 3.7 | <0.03 | 1.9F | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1844.1 | 1846.6 | 5.6 | 0.399 | <0.001 | <0.05 | <0.05 | 3.6 | 0.0025 | 4.3 | <0.03 | 1.5F | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1844.1 | 1846.6 | 4.6 | 0.351 | <0.001 | <0.05 | <0.05 | 2.8 | 0.0021 | 4 | <0.03 | 0.9F | <0.0005 | 0.0002F | 0.005F | <0.05 |
| | | 28-Oct-08 | N | 1844.1 | 1846.6 | 4.4 | 0.395 | <0.001 | <0.05 | <0.05 | 2.8 | 0.0024 | 4 | <0.03 | 0.7F | <0.0005 | 0.0001F | <0.03 | 0.01F |
| | | 4-Nov-08 | N | 1844.1 | 1846.6 | 3.7 | 0.283 | <0.001 | 0.01F | <0.05 | 2.3 | 0.003M1 | 4.4 | <0.03 | 0.4F | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1844.1 | 1846.6 | 4.2 | 0.334 | <0.001 | <0.05 | <0.05 | 2.2 | 0.0024 | 3.4 | <0.03 | 0.4F | <0.0005 | 0.0002F | 0.006F | <0.05 |
| | | 18-Nov-08 | N | 1844.1 | 1846.6 | 3.2 | 0.317 | <0.001 | <0.05 | <0.05 | 2 | 0.0021 | 4.2 | <0.03 | <2 | <0.0005 | 0.0001F | 0.005F | <0.05 |
| | | 25-Nov-08 | N | 1844.1 | 1846.6 | 3 | 0.332 | <0.001 | <0.05 | <0.05 | 1.8F | 0.0018 | 3.3 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1844.1 | 1846.6 | 2.9 | 0.351 | <0.001 | <0.05 | <0.05 | 2.1 | 0.0014 | 3.3 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 0.01F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-008A | TEST 35 | 9-Dec-08 | N | 1844.1 | 1846.6 | 2.5 | 0.301 | <0.001 | <0.05 | <0.05 | 1.8F | 0.0015 | 3.2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1844.1 | 1846.6 | 2.2 | 0.29 | <0.001 | <0.05 | <0.05 | 1.5F | 0.0012 | 2.7 | <0.03 | <2 | <0.0005 | <0.0005 | 0.006F | <0.05 |
| | | 23-Dec-08 | N | 1844.1 | 1846.6 | 2 | 0.295 | -- | <0.05 | <0.05 | 1.5F | 0.0012 | 2.7 | -- | <2 | <0.0005 | 0.0001F | -- | <0.05 |
| | | 30-Dec-08 | N | 1844.1 | 1846.6 | 2.8 | 0.412 | -- | <0.05 | <0.05 | 1.8F | 0.0014 | 4.1 | -- | 0.8F | <0.0005 | 0.0001F | -- | <0.05 |
| | | 6-Jan-09 | N | 1844.1 | 1846.6 | 2 | 0.306 | -- | <0.05 | <0.05 | 1.5F | 0.0011 | 3.3 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 13-Jan-09 | N | 1844.1 | 1846.6 | 1.8 | 0.233 | <0.001 | <0.05 | <0.05 | 1.2F | 0.0012 | 3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1844.1 | 1846.6 | 1.9 | 0.241 | -- | <0.05L1 | <0.05 | 1.3F | 0.0011 | 3.3 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 27-Jan-09 | N | 1844.1 | 1846.6 | 1.8 | 0.244 | -- | <0.05 | <0.05 | 1.2F | 0.001 | 2.6 | -- | <2 | 0.0001F | <0.0005 | -- | <0.05 |
| | | 3-Feb-09 | N | 1844.1 | 1846.6 | 1.9 | 0.237 | -- | <0.05 | <0.05 | 1.3F | 0.0013 | 3.6 | -- | <2 | <0.0005 | 0.0001F | -- | <0.05 |
| | | 10-Feb-09 | N | 1844.1 | 1846.6 | 2.4 | 0.201 | -- | 0.02F | <0.05 | 3.1 | 0.0005FD1 | 2.8 | -- | 1.9F | <0.0005 | <0.0005 | -- | 0.01F |
| | | 17-Feb-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1844.1 | 1846.6 | 1.4 | 0.246 | <0.001 | <0.05 | <0.05 | 1F | 0.0013 | 3 | <0.03M2 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05L1M1 |
| | | 17-Mar-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1844.1 | 1846.6 | 1.2 | 0.233 | <0.001 | 0.01F | <0.05 | 1F | 0.0007 | 2.9 | <0.03M2 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 14-Apr-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1844.1 | 1846.6 | 1.1 | 0.216 | <0.001 | <0.05 | <0.05 | 1F | 0.0008 | 2.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 12-May-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1844.1 | 1846.6 | 1.1 | 0.204 | <0.001 | <0.05 | <0.05 | 1F | 0.0014 | 3.1 | <0.03M2 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Jun-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1844.1 | 1846.6 | 1.2 | 0.217 | <0.001 | <0.05 | <0.05 | 1.3F | 0.0015 | 3.7M1 | <0.03M2 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 7-Jul-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-008A | TEST 35 | 14-Jul-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1844.1 | 1846.6 | 1.9M1 | 0.319 | <0.001 | <0.05 | <0.05 | 1.4F | 0.0019 | 3.6M1 | <0.03M2 | <2 | <0.0005 | <0.0005 | <0.03M1 | <0.05M1 |
| | | 4-Aug-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1844.1 | 1846.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1844.1 | 1846.6 | 1.9 | 0.356 | <0.001 | <0.05 | <0.05 | 1.4F | 0.0017 | 4.9M1 | 0.01F | <2V1M1 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | TEST 36 | 26-Aug-08 | N | 1979.95 | 1982.94 | 27.9 | 5.26 | <0.001 | <0.05 | 0.04F | 9.4 | 0.0756B7 | 2.6 | <0.03L1 | 18.6 | 0.0001F | 0.0112 | <0.03 | 0.13 |
| | | 2-Sep-08 | N | 1979.95 | 1982.94 | 19.7 | 2.27 | <0.001 | <0.05 | <0.05 | 6.7 | 0.0831 | 3.2 | <0.03 | 13.7 | <0.0005 | 0.0057 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1979.95 | 1982.94 | 14.3 | 2.32 | <0.001 | <0.05 | 0.02 | 4.9 | 0.0544 | 2.7 | <0.03 | 7.6 | <0.0005 | 0.003 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1979.95 | 1982.94 | 11.9 | 2.08 | <0.001 | <0.05 | <0.05 | 3.7 | 0.0335 | 2.1 | <0.03 | 4.9 | <0.0005 | 0.0017 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 1979.95 | 1982.94 | 9 | 1.82 | <0.001 | 0.01 | <0.05 | 3 | 0.0163 | 2 | <0.03 | 2.2 | <0.0005 | 0.0021 | 0.007 | <0.05 |
| | | 30-Sep-08 | N | 1979.95 | 1982.94 | 9.3 | 2.22 | <0.001 | <0.05 | <0.05 | 3.5 | 0.0154 | 2.2 | <0.03 | 1.5 | <0.0005 | 0.0031 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1979.95 | 1982.94 | 8.9 | 2.32 | <0.001 | <0.05 | <0.05 | 2.7 | 0.0124 | 2 | <0.03 | 0.8F | <0.0005 | 0.0022 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1979.95 | 1982.94 | 7.4 | 2.48 | <0.001 | <0.05 | <0.05 | 2.3 | 0.0075 | 2 | <0.03 | 0.4F | <0.0005 | 0.0022 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1979.95 | 1982.94 | 6.1 | 2.26 | <0.001 | <0.05 | <0.05 | 1.9F | 0.0064 | 1.8F | <0.03 | <2 | <0.0005 | 0.0013 | 0.008F | <0.05 |
| | | 28-Oct-08 | N | 1979.95 | 1982.94 | 5.3 | 2.27 | <0.001 | <0.05 | 0.01F | 1.9F | 0.0059 | 1.6F | <0.03 | <2 | <0.0005 | 0.0017 | 0.007F | <0.05 |
| | | 4-Nov-08 | N | 1979.95 | 1982.94 | 4.4 | 2.43 | <0.001 | <0.05 | <0.05 | 1.9F | 0.0068 | 2.5 | <0.03 | <2 | <0.0005 | 0.0024 | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1979.95 | 1982.94 | 2.9 | 1.87 | <0.001 | <0.05 | <0.05 | 1.4F | 0.0042 | 2.1 | <0.03 | <2 | <0.0005 | 0.0021 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1979.95 | 1982.94 | 2.9 | 2 | <0.001 | <0.05 | <0.05 | 1.5F | 0.0046 | 2.2 | <0.03 | <2 | <0.0005 | 0.0023 | 0.006F | <0.05 |
| | | 25-Nov-08 | N | 1979.95 | 1982.94 | 2.8 | 2.18 | <0.001 | <0.05 | <0.05 | 1.2F | 0.0046B3 | 1.7F | <0.03 | <2 | <0.0005 | 0.0019 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1979.95 | 1982.94 | 2.2 | 2.16 | <0.001 | <0.05 | <0.05 | 1.3F | 0.003 | 1.9F | <0.03 | <2 | <0.0005 | 0.002 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1979.95 | 1982.94 | 1.7 | 1.8 | <0.001 | <0.05 | <0.05 | 1.1F | 0.0033 | 1.3F | <0.03 | <2 | <0.0005 | 0.0011 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1979.95 | 1982.94 | 1.2 | 1.7 | <0.001 | <0.05 | <0.05 | 0.8F | 0.002 | 1.5F | <0.03 | <2 | <0.0005 | 0.0011 | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1979.95 | 1982.94 | 1 | 1.72 | -- | <0.05 | <0.05 | 0.8F | 0.0022 | 1.2F | -- | <2 | <0.0005 | 0.0015 | -- | <0.05 |
| | | 30-Dec-08 | N | 1979.95 | 1982.94 | 1.3 | 2.02 | -- | <0.05 | <0.05 | 1F | 0.002 | 1.6F | -- | <2 | <0.0005 | 0.0015 | -- | <0.05 |
| | | 6-Jan-09 | N | 1979.95 | 1982.94 | 0.9F | 1.57 | -- | <0.05 | <0.05 | 0.9F | 0.0026 | 1.3F | -- | <2 | <0.0005 | 0.0012 | -- | <0.05 |
| | | 13-Jan-09 | N | 1979.95 | 1982.94 | 0.9F | 1.51 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0024 | 1.4F | <0.03 | <2 | <0.0005 | 0.0012 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1979.95 | 1982.94 | 0.8F | 1.48 | -- | <0.05L1 | <0.05 | 0.7F | 0.0025 | 1.4F | -- | <2 | <0.0005 | 0.0008 | -- | <0.05 |
| | | 27-Jan-09 | N | 1979.95 | 1982.94 | 0.8F | 1.66 | -- | <0.05 | <0.05 | 0.8F | 0.0022 | 1.3F | -- | <2 | 0.0002F | 0.001 | -- | <0.05 |
| | | 3-Feb-09 | N | 1979.95 | 1982.94 | 0.7F | 1.47 | -- | <0.05 | <0.05 | 0.8F | 0.0021 | 1.4F | -- | <2 | <0.0005 | 0.0008 | -- | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-008A | TEST 36 | 10-Feb-09 | N | 1979.95 | 1982.94 | 0.6F | 1.61 | -- | 0.01F | <0.05 | 1F | <0.0005 | 1.6F | -- | <2 | <0.0005 | 0.0007 | -- | <0.05 |
| | | 17-Feb-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1979.95 | 1982.94 | 0.5F | 1.48 | <0.001 | <0.05 | <0.05 | 1F | 0.0017 | 1.3F | <0.03 | 0.3F | <0.0005 | 0.0009 | <0.03 | <0.05L1 |
| | | 17-Mar-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1979.95 | 1982.94 | 0.5F | 1.19 | <0.001 | 0.01FM1 | <0.05 | 0.5F | 0.0017 | 1.4 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 14-Apr-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1979.95 | 1982.94 | 0.5F | 1.4 | <0.001 | <0.05 | <0.05 | 0.7F | 0.002 | 1.2F | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 12-May-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1979.95 | 1982.94 | 0.4F | 1.38 | <0.001 | <0.05 | <0.05 | 0.9F | 0.0026 | 1.4F | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 9-Jun-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1979.95 | 1982.94 | 0.4F | 1.32 | <0.001 | <0.05 | <0.05 | 1F | 0.0026 | 2.1 | 0.02FM2 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 7-Jul-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1979.95 | 1982.94 | 0.8F | 1.51 | <0.001 | <0.05 | <0.05 | 0.9F | 0.0031 | 1.6F | <0.03 | <2 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 4-Aug-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1979.95 | 1982.94 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1979.95 | 1982.94 | 1 | 1.91 | <0.001 | <0.05 | 0.02FM1 | 0.9F | 0.0029 | 2.2 | <0.03M2 | <2V1 | <0.0005 | 0.0003F | <0.03 | 0.02F |
| | TEST 37 | 26-Aug-08 | N | 2053.81 | 2056.81 | 62.2 | 4.12 | <0.001 | <0.05 | 0.03F | 20.6 | 0.0072B7 | 2.1 | <0.03L1 | 8.8 | 0.0001F | 0.0009 | 0.005F | <0.05 |
| | | 2-Sep-08 | N | 2053.81 | 2056.81 | 54.9 | 1.26 | <0.001 | <0.05 | <0.05 | 17.8 | 0.0147 | 2.9 | <0.03 | 8.1 | <0.0005 | 0.0005 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-008A | TEST 37 | 9-Sep-08 | N | 2053.81 | 2056.81 | 30.6 | 1.39 | <0.001 | <0.05 | 0.04 | 13.5 | 0.0088 | 3.9 | <0.03 | 3.5 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 2053.81 | 2056.81 | 8.6 | 0.534 | <0.001 | <0.05 | 0.05 | 5.5 | 0.0036 | 2.8 | <0.03 | 0.7 | <0.0005 | 0.0001 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 2053.81 | 2056.81 | 10.1 | 0.807 | <0.001 | 0.02 | <0.05 | 8.5 | 0.0044 | 4.5 | <0.03 | 0.6 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 2053.81 | 2056.81 | 4 | 0.423 | <0.001 | <0.05 | <0.05 | 4.9 | 0.0027 | 3.5 | <0.03 | <2 | <0.0005 | 0.0002 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 2053.81 | 2056.81 | 2.5 | 0.323 | <0.001 | <0.05 | <0.05 | 3.2 | 0.0021 | 3.1 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 2053.81 | 2056.81 | 2.2 | 0.329 | <0.001 | <0.05 | <0.05 | 2.5 | 0.0019 | 2.5 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 2053.81 | 2056.81 | 2 | 0.404 | <0.001 | <0.05 | <0.05 | 2.5 | 0.0019 | 3.4 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 2053.81 | 2056.81 | 1.8 | 0.292 | <0.001 | <0.05 | 0.01F | 2.2 | 0.0014 | 2.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 2053.81 | 2056.81 | 1.4 | 0.329 | <0.001 | 0.01F | <0.05 | 1.9F | 0.002 | 2.9 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 2053.81 | 2056.81 | 1.3 | 0.307 | <0.001 | 0.01F | <0.05 | 1.7F | 0.0018 | 2.5 | <0.03 | <2 | <0.0005 | <0.0005 | 0.007F | <0.05 |
| | | 18-Nov-08 | N | 2053.81 | 2056.81 | 1.3 | 0.424 | <0.001 | 0.02F | <0.05 | 1.9F | 0.0017 | 3.4 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 2053.81 | 2056.81 | 0.9F | 0.305 | <0.001 | <0.05 | <0.05 | 1.2F | 0.001 | 2.2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 2053.81 | 2056.81 | 0.8F | 0.368 | <0.001 | <0.05 | <0.05 | 1.7F | 0.001 | 2.5 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 2053.81 | 2056.81 | 0.8F | 0.421 | <0.001 | <0.05 | <0.05 | 1.8F | 0.0013 | 2.7 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 2053.81 | 2056.81 | 0.5F | 0.305 | <0.001 | <0.05 | <0.05 | 0.9F | 0.0007 | 2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 2053.81 | 2056.81 | 0.5F | 0.373 | -- | <0.05 | <0.05 | 1.1F | 0.0009 | 2.1 | -- | <2 | <0.0005 | 0.0001F | -- | <0.05 |
| | | 30-Dec-08 | N | 2053.81 | 2056.81 | 0.5F | 0.391 | -- | <0.05 | <0.05 | 1.1F | 0.0008 | 2.4 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 6-Jan-09 | N | 2053.81 | 2056.81 | 0.3F | 0.387 | -- | <0.05 | <0.05 | 1.1F | 0.0008 | 2.4 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 13-Jan-09 | N | 2053.81 | 2056.81 | 0.4F | 0.263 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0006 | 1.8F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 2053.81 | 2056.81 | 0.5F | 0.339 | -- | <0.05L1 | <0.05 | 0.8F | 0.0008 | 2.3 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 27-Jan-09 | N | 2053.81 | 2056.81 | 0.4F | 0.294 | -- | <0.05 | <0.05 | 0.7F | 0.0006 | 1.6F | -- | <2 | 0.0002F | <0.0005 | -- | <0.05 |
| | | 3-Feb-09 | N | 2053.81 | 2056.81 | 0.4F | 0.306 | -- | <0.05 | <0.05 | 0.8F | 0.0007 | 2.2 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 10-Feb-09 | N | 2053.81 | 2056.81 | 0.3F | 0.294 | -- | <0.05 | <0.05 | 0.9F | <0.001D1 | 1.8F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 17-Feb-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 2053.81 | 2056.81 | 0.2F | 0.369 | <0.001 | <0.05 | <0.05 | 1.1F | 0.0006 | 1.7F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05L1 |
| | | 17-Mar-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 2053.81 | 2056.81 | 0.4F | 0.358 | <0.001 | 0.01F | <0.05 | 0.7F | 0.0006 | 1.9 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-008A | TEST 37 | 14-Apr-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 2053.81 | 2056.81 | 0.3F | 0.328 | <0.001 | <0.05 | <0.05 | 0.6F | 0.0007 | 1.8F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 12-May-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 2053.81 | 2056.81 | 0.4F | 0.45 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0014 | 2.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Jun-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 2053.81 | 2056.81 | 0.3F | 0.589 | <0.001 | <0.05 | <0.05 | 0.8F | 0.0014 | 2.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 7-Jul-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 2053.81 | 2056.81 | 1.2 | 0.891 | <0.001 | <0.05 | <0.05 | 1.3F | 0.0032 | 3.7 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 4-Aug-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 2053.81 | 2056.81 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 2053.81 | 2056.81 | 1.4 | 1.1 | <0.001 | <0.05 | 0.03F | 0.8F | 0.0034 | 3 | <0.03 | <2V1 | <0.0005 | <0.0005 | <0.03 | 0.02F |
| RES-009 | TEST 38 | 26-Aug-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | 0.01F | 1.4F | 0.0002F | 21.7 | <0.03L1 | 27.1 | <0.0005 | 0.002 | 0.007F | <0.05 |
| | | 2-Sep-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.5F | <0.0005 | 17.3 | <0.03 | 21.8 | <0.0005 | 0.0031 | 0.006F | <0.05 |
| | | 9-Sep-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | 0.01 | 0.8 | <0.0005 | 15.1 | <0.03 | 18.6 | <0.0005 | 0.0036 | 0.016 | <0.05 |
| | | 16-Sep-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.4 | 0.0002 | 13.7 | <0.03 | 16.1 | <0.0005 | 0.0037 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.3 | 0.0002 | 11.7 | <0.03 | 14.5 | <0.0005 | 0.0034 | 0.007 | <0.05 |
| | | 30-Sep-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.9 | <0.0005 | 15.7 | <0.03 | 15.7 | <0.0005 | 0.0031 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.3F | 0.0001F | 14 | <0.03 | 14.6 | <0.0005 | 0.0031 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.4F | 0.0002F | 12.8 | <0.03 | 13.3 | <0.0005 | 0.0032 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0003F | 12.8 | <0.03 | 13.5 | <0.0005 | 0.0031 | 0.007F | <0.05 |
| | | 28-Oct-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | 0.01F | <2 | <0.0005 | 11.9 | <0.03 | 14.5 | <0.0005 | 0.0028 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | 0.01F | <0.05 | 0.3F | <0.0005 | 13.8 | <0.03 | 12.4 | <0.0005 | 0.0026 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009 | TEST 38 | 11-Nov-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | 0.01F | <0.05 | 0.4F | <0.0005 | 12.4 | <0.03 | 11.3 | <0.0005 | 0.0031 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.4F | <0.0005 | 12.1 | <0.03 | 10.3 | <0.0005 | 0.0028 | <0.03 | 0.01F |
| | | 25-Nov-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | <0.0005 | 9.6 | <0.03 | 8.9 | <0.0005 | 0.0033 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.5F | <0.0005 | 8.9 | <0.03 | 8.9 | <0.0005 | 0.0027 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 278.9 | 281.09 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.3F | <0.0005 | 8.5 | <0.03 | 8 | <0.0005 | 0.0018 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 278.9 | 281.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 278.9 | 281.09 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 39 | 26-Aug-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | 0.02F | <0.05 | 1.6F | 0.138B7 | 9.9 | <0.03L1 | 66.4 | <0.0005 | 0.0009 | 0.061 | <0.05 |
| | | 2-Sep-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | 0.02F | <0.05 | 0.9F | 0.0881 | 8.3 | <0.03 | 54.6 | <0.0005 | 0.0011 | 0.048 | <0.05 |
| | | 9-Sep-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.2 | 0.0563 | 6.7 | <0.03 | 47.2 | <0.0005 | 0.0013 | 0.044 | <0.05 |
| | | 16-Sep-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | 0.01 | <0.05 | 0.8 | 0.0484 | 6.5 | <0.03 | 44.8 | <0.0005 | 0.0012 | 0.029 | <0.05 |
| | | 23-Sep-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | 0.02 | <0.05 | 1 | 0.0354 | 6.7 | <0.03 | 44.4 | <0.0005 | 0.0013 | 0.029 | <0.05 |
| | | 30-Sep-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.1 | 0.014 | 7 | <0.03 | 39.8 | <0.0005 | 0.0014 | 0.029 | <0.05 |
| | | 7-Oct-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.7F | 0.007 | 6.6 | <0.03 | 37.3 | <0.0005 | 0.0014 | 0.023F | <0.05 |
| | | 14-Oct-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.8F | 0.0044 | 6.1 | <0.03 | 35.5 | <0.0005 | 0.0012 | 0.024F | <0.05 |
| | | 21-Oct-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0029 | 5.8 | <0.03 | 31.5 | <0.0005 | 0.0009 | 0.024F | <0.05 |
| | | 28-Oct-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0027 | 4 | <0.03 | 30.7 | <0.0005 | 0.0009 | 0.005F | <0.05 |
| | | 4-Nov-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.8F | 0.0024 | 5.7 | <0.03 | 28.5 | <0.0005 | 0.001 | 0.016F | <0.05 |
| | | 11-Nov-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | 0.01F | <0.05 | 0.7F | 0.0027 | 5.4 | <0.03 | 25.9 | <0.0005 | 0.001 | 0.017F | <0.05 |
| | | 18-Nov-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.9F | 0.0023 | 5.4 | <0.03 | 24.4 | <0.0005 | 0.0009 | 0.015F | 0.01F |
| | | 25-Nov-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0019 | 4.1 | <0.03 | 21.8 | <0.0005 | 0.001 | 0.009F | <0.05 |
| | | 2-Dec-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.9F | 0.0015 | 4 | <0.03 | 23.4 | <0.0005 | 0.001 | 0.009F | <0.05 |
| | | 9-Dec-08 | N | 645.59 | 647.52 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0018 | 5 | <0.03 | 23.8 | <0.0005 | 0.0007 | 0.013F | <0.05 |
| | | 16-Dec-08 | N | 645.59 | 647.52 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 645.59 | 647.52 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 40 | 26-Aug-08 | N | 804.84 | 807 | 1.1 | <0.03 | <0.001 | 0.02F | <0.05 | 2.9 | 0.101B7 | 6.7 | <0.03M2 | 212 | <0.0005 | 0.0007 | 0.017F | <0.05 |
| | | 2-Sep-08 | N | 804.84 | 807 | 2.4 | <0.03 | <0.001 | 0.03F | <0.05 | 3.7 | 0.0979 | 7.6 | <0.03 | 294 | <0.0005 | 0.0006 | 0.019F | <0.05 |
| | | 9-Sep-08 | N | 804.84 | 807 | 2.7 | 0.01 | <0.001 | <0.05 | 0.01 | 4.2 | 0.0454 | 7.2 | <0.03 | 271 | <0.0005 | 0.0005 | 0.012 | <0.05 |
| | | 16-Sep-08 | N | 804.84 | 807 | 1.6 | 0.007 | <0.001 | <0.05 | <0.05 | 2.7 | 0.0081 | 6.7 | <0.03 | 150 | <0.0005 | 0.0003 | 0.014 | <0.05 |
| | | 23-Sep-08 | N | 804.84 | 807 | 3.2 | 0.007 | <0.001 | 0.02 | <0.05 | 5.4 | 0.0098 | 7.7 | <0.03 | 209 | <0.0005 | 0.0006 | 0.015 | <0.05 |
| | | 30-Sep-08 | N | 804.84 | 807 | 2.4 | 0.01 | <0.001 | <0.05 | <0.05 | 4.6 | 0.0036 | 7.7 | <0.03 | 148 | <0.0005 | 0.0006 | 0.01 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009 | TEST 40 | 7-Oct-08 | N | 804.84 | 807 | 2.8 | 0.006F | <0.001 | 0.02F | <0.05 | 7.5 | 0.0029 | 7 | <0.03 | 136 | <0.0005 | 0.0005 | 0.007F | <0.05 |
| | | 14-Oct-08 | N | 804.84 | 807 | 2.7 | 0.01F | <0.001 | <0.05 | <0.05 | 3.7 | 0.002 | 6.3 | <0.03 | 102 | <0.0005 | 0.0003F | 0.007F | <0.05 |
| | | 21-Oct-08 | N | 804.84 | 807 | 2.5 | 0.006F | <0.001 | <0.05 | <0.05 | 3.4 | 0.0015 | 6.9 | <0.03 | 76.9 | <0.0005 | 0.0003F | 0.012F | <0.05 |
| | | 28-Oct-08 | N | 804.84 | 807 | 2.8 | 0.009F | <0.001 | <0.05 | 0.01F | 3.2 | 0.0014 | 4.6 | <0.03 | 71.7 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 804.84 | 807 | 2.8 | 0.009F | <0.001 | 0.01F | <0.05 | 3.2 | 0.0014 | 6 | <0.03 | 59.9 | <0.0005 | 0.0002F | 0.015F | <0.05 |
| | | 11-Nov-08 | N | 804.84 | 807 | 2.8 | 0.011F | <0.001 | 0.01F | <0.05 | 3 | 0.0016 | 5.8 | <0.03 | 53.8 | <0.0005 | 0.0003F | 0.009F | <0.05 |
| | | 18-Nov-08 | N | 804.84 | 807 | 3.3 | 0.012F | <0.001 | <0.05 | <0.05 | 3.4 | 0.0014 | 7.7 | <0.03 | 53.9 | <0.0005 | 0.0003F | 0.012F | <0.05 |
| | | 25-Nov-08 | N | 804.84 | 807 | 2.9 | 0.011F | <0.001 | <0.05 | <0.05 | 2.7 | 0.0011M1 | 5.4 | <0.03 | 35.1 | <0.0005 | 0.0002F | 0.005F | <0.05 |
| | | 2-Dec-08 | N | 804.84 | 807 | 2.4 | 0.01F | <0.001 | <0.05 | <0.05 | 2.4 | 0.0008 | 4.9 | <0.03 | 22.9 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 804.84 | 807 | 4.2 | 0.009F | <0.001 | <0.05 | <0.05 | 4 | <0.0005 | 8.6 | <0.03 | 43.4 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 804.84 | 807 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 804.84 | 807 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 41 | 26-Aug-08 | FD | 804.84 | 807 | 1.2 | <0.03 | <0.001 | 0.02F | <0.05 | 3.5 | 0.119B7 | 7.7 | <0.03 | 238 | <0.0005 | 0.0008 | 0.022F | <0.05 |
| | | 2-Sep-08 | FD | 804.84 | 807 | 2.6 | <0.03 | <0.001 | 0.02F | <0.05 | 3.9 | 0.0985B7 | 7.9 | <0.03 | 312 | <0.0005 | 0.0007 | 0.015F | <0.05 |
| | | 9-Sep-08 | FD | 804.84 | 807 | 2.6 | 0.01 | <0.001 | <0.05 | <0.05 | 3.9 | 0.0294 | 7.8 | <0.03M2 | 274M2 | <0.0005 | 0.0006 | 0.02 | <0.05 |
| | | 16-Sep-08 | FD | 804.84 | 807 | 1.8 | 0.009 | <0.001 | <0.05 | <0.05 | 3 | 0.0061 | 7.4 | <0.03M2 | 169 | <0.0005 | 0.0004 | 0.018 | <0.05 |
| | | 23-Sep-08 | FD | 804.84 | 807 | 2.4 | <0.03 | <0.001 | <0.05 | <0.05 | 4.7 | 0.0048 | 7.8 | <0.03 | 186 | <0.0005 | 0.0005 | 0.014 | <0.05 |
| | | 30-Sep-08 | FD | 804.84 | 807 | 2.2 | <0.03 | <0.001 | <0.05 | <0.05 | 4.1 | 0.0029 | 8.3 | <0.03M2 | 138 | 0.0001 | 0.0005 | 0.01 | <0.05 |
| | | 7-Oct-08 | FD | 804.84 | 807 | 2.1 | <0.03 | <0.001 | <0.05 | <0.05 | 4.2 | 0.0023 | 7.2 | <0.03M2 | 112 | <0.0005 | 0.0004F | 0.011F | <0.05 |
| | | 14-Oct-08 | FD | 804.84 | 807 | 0.7F | <0.03 | <0.001 | <0.05 | <0.05 | 3.1 | 0.0013 | 2.6 | <0.03M2 | 89.9 | <0.0005 | 0.0002F | 0.006F | <0.05 |
| | | 21-Oct-08 | FD | 804.84 | 807 | 2 | <0.03M2 | <0.001 | <0.05 | <0.05 | 3.4 | 0.0013 | 6.2 | <0.03M2 | 67.6 | <0.0005 | 0.0003F | 0.007F | <0.05 |
| | | 28-Oct-08 | FD | 804.84 | 807 | 2.4 | 0.009F | <0.001 | <0.05 | <0.05 | 2.7 | 0.0012 | 6.1 | <0.03M2 | 56.1 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 4-Nov-08 | FD | 804.84 | 807 | 2.3 | <0.03M1 | <0.001 | <0.05 | <0.05 | 2.9 | 0.0012 | 6.3 | <0.03M2 | 52.3 | <0.0005 | 0.0002F | 0.01F | <0.05 |
| | | 11-Nov-08 | FD | 804.84 | 807 | 2.5 | 0.011F | <0.001 | <0.05 | <0.05 | 3.1 | 0.0012 | 5.2 | <0.03 | 42.4 | 0.0002F | 0.0001F | 0.007F | <0.05 |
| | | 18-Nov-08 | FD | 804.84 | 807 | 2.7 | 0.01F | <0.001 | <0.05 | <0.05 | 3 | 0.0012 | 7.4M1 | <0.03M2 | 37.9 | <0.0005 | 0.0002F | 0.012F | 0.02F |
| | | 25-Nov-08 | FD | 804.84 | 807 | 2.6 | 0.014F | <0.001 | <0.05 | <0.05 | 2.6 | 0.0008 | 5.9M1 | <0.03M2 | 26.6 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 2-Dec-08 | FD | 804.84 | 807 | 1.9 | <0.03 | <0.001 | <0.05 | <0.05 | 2.1 | 0.001 | 4.6 | <0.03M2 | 19.2 | 0.0001F | 0.0002F | <0.03 | <0.05 |
| | | 9-Dec-08 | FD | 804.84 | 807 | 2.4 | <0.03 | <0.001 | <0.05 | <0.05 | 2.8 | 0.0008 | 5.3 | <0.03M2 | 20.4 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 16-Dec-08 | FD | 804.84 | 807 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | FD | 804.84 | 807 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 42 | 26-Aug-08 | N | 994.67 | 997.67 | 10.7 | 0.283 | <0.001 | 1.31 | <0.05 | 30.9 | 0.0029 | 16.2 | <0.03 | 857D1B7M2 | 0.0002F | 0.0285 | <0.1D1 | 0.01F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009 | TEST 42 | 2-Sep-08 | N | 994.67 | 997.67 | 1.2 | 0.018F | <0.001 | 1 | 0.01F | 7.5 | 0.0004F | 9 | <0.03 | 148 | <0.0005 | 0.0069 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 994.67 | 997.67 | 0.3 | 0.01 | <0.001 | 1.17 | <0.05 | 6.3 | 0.0005 | 15 | <0.03 | 90.2 | <0.0005 | 0.0045 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 994.67 | 997.67 | <1 | 0.014 | <0.001 | 0.2 | <0.05 | 2.5 | 0.0001 | 6.3 | <0.03 | 16 | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 994.67 | 997.67 | <1 | <0.03 | <0.001 | 0.13 | <0.05 | 2.8 | 0.0002 | 5.1 | <0.03 | 15 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 994.67 | 997.67 | <1 | <0.03 | <0.001 | 0.08 | <0.05 | 3.1 | 0.0001 | 5 | <0.03 | 9.4 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 994.67 | 997.67 | <1 | <0.03 | <0.001 | 0.04F | <0.05 | 2 | 0.0001F | 3.8 | <0.03 | 7.7 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 994.67 | 997.67 | <1 | <0.03 | <0.001 | 0.06 | <0.05 | 2 | <0.0005 | 4.4 | <0.03 | 7.2 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 994.67 | 997.67 | <1 | <0.03 | <0.001 | 0.08 | <0.05 | 3.1 | 0.0001F | 6 | <0.03 | 10 | <0.0005 | 0.0007 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 994.67 | 997.67 | <1 | 0.007F | <0.001 | 0.07 | <0.05 | 2.3 | <0.0005 | 5.5 | <0.03 | 8.2 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 994.67 | 997.67 | <1 | <0.03 | <0.001 | 0.07 | <0.05 | 2.8 | <0.0005 | 5.8 | <0.03 | 8.8 | <0.0005 | 0.0007 | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 994.67 | 997.67 | <1 | 0.006F | <0.001 | 0.03F | <0.05 | 2.6 | <0.0005 | 3.9 | <0.03 | 5.4 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 994.67 | 997.67 | <1 | 0.02F | <0.001 | 0.14 | <0.05 | 1.9F | 0.0001F | 5.6 | <0.03 | 10.1 | <0.0005 | 0.0011 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 994.67 | 997.67 | 0.3F | 0.024F | <0.001 | 0.45 | <0.05 | 3.3 | 0.0001F | 11.9 | <0.03 | 30.1 | <0.0005 | 0.003 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 994.67 | 997.67 | <1 | <0.03 | <0.001 | 0.05 | <0.05 | 2.9 | <0.0005 | 6.4 | <0.03 | 8 | <0.0005 | 0.0009 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 994.67 | 997.67 | <1 | <0.03 | <0.001 | 0.03F | <0.05 | 3.2 | <0.0005 | 5.1 | <0.03 | 5.5 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 994.67 | 997.67 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 994.67 | 997.67 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| RES-009E | TEST 43 | 26-Aug-08 | N | 1351.03 | 1354.03 | 60.8 | 3.27 | <0.001 | <0.05 | 0.39 | 714 | 0.0409 | 70.8 | <0.03 | 71.3 | 0.0036 | 0.0044 | <0.05D1 | 0.51 |
| | | 2-Sep-08 | N | 1351.03 | 1354.03 | 2.3 | 0.232 | <0.001 | <0.05 | 0.05 | 83.6 | 0.0019 | 45.5 | <0.03 | 3.4 | 0.0005 | 0.0004F | <0.03 | 0.02F |
| | | 9-Sep-08 | N | 1351.03 | 1354.03 | 1.5 | 0.161 | <0.001 | <0.05 | <0.05 | 42.5 | 0.0029 | 27.6 | <0.03 | 1.3 | 0.0003 | 0.0005 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1351.03 | 1354.03 | 1.6 | 0.163 | <0.001 | <0.05 | <0.05 | 32.1 | 0.0022 | 30.4 | <0.03 | 0.6 | 0.0002 | 0.0004 | <0.03 | 0.02 |
| | | 23-Sep-08 | N | 1351.03 | 1354.03 | 1.1 | 0.113 | <0.001 | <0.05 | 0.03 | 17.2 | 0.0027 | 12.9 | <0.03 | 0.5 | 0.0001 | 0.0006 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1351.03 | 1354.03 | 1 | 0.106 | <0.001 | <0.05 | <0.05 | 14.8 | 0.0024 | 11.5 | <0.03 | 0.4 | 0.0001 | 0.0007 | <0.03 | 0.02 |
| | | 7-Oct-08 | N | 1351.03 | 1354.03 | 0.8F | 0.097 | <0.001 | <0.05 | 0.02F | 12.4 | 0.0022 | 8.8 | <0.03 | 0.4F | 0.0001F | 0.0007 | <0.03 | 0.03F |
| | | 14-Oct-08 | N | 1351.03 | 1354.03 | 1 | 0.134 | <0.001 | <0.05 | 0.02F | 12.5 | 0.0021 | 9.3 | <0.03 | <2 | 0.0001F | 0.0006 | <0.03 | 0.01F |
| | | 21-Oct-08 | N | 1351.03 | 1354.03 | 0.9F | 0.112 | <0.001 | <0.05 | 0.02F | 13.7 | 0.0024 | 8.6 | <0.03 | <2 | 0.0001F | 0.0006 | <0.03 | 0.02F |
| | | 28-Oct-08 | N | 1351.03 | 1354.03 | 1 | 0.107 | <0.001 | <0.05 | <0.05 | 11.8 | 0.0024 | 9.5 | <0.03 | <2 | 0.0002F | 0.0006 | <0.03 | 0.02F |
| | | 4-Nov-08 | N | 1351.03 | 1354.03 | 0.9F | 0.111 | <0.001 | <0.05 | <0.05 | 12.8 | 0.003 | 9.3 | <0.03 | <2 | 0.0001F | 0.0007 | <0.03 | 0.01F |
| | | 11-Nov-08 | N | 1351.03 | 1354.03 | 0.8F | 0.104 | <0.001 | <0.05 | 0.01F | 12.7 | 0.0029 | 9.3 | <0.03 | <2 | 0.0001F | 0.0006 | <0.03 | 0.02F |
| | | 18-Nov-08 | N | 1351.03 | 1354.03 | 0.9F | 0.095 | <0.001 | <0.05 | <0.05 | 10.4 | 0.0039M1 | 8.3 | <0.03 | <2 | 0.0001F | 0.0006 | <0.03 | 0.02F |
| | | 25-Nov-08 | N | 1351.03 | 1354.03 | 1 | 0.096 | <0.001 | <0.05 | 0.01F | 9.2 | 0.0023 | 6.7 | <0.03 | <2 | 0.0001F | 0.0005 | <0.03 | 0.03F |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 43 | 2-Dec-08 | N | 1351.03 | 1354.03 | 0.9F | 0.095 | <0.001 | <0.05 | <0.05 | 10.5 | 0.0039 | 4.8 | <0.03 | <2 | 0.0002F | 0.0007 | <0.03 | 0.01F |
| | | 9-Dec-08 | N | 1351.03 | 1354.03 | 1.1 | 0.131 | <0.001 | <0.05 | <0.05 | 11.1 | 0.0035 | 5.1 | <0.03 | 0.3F | 0.0001F | 0.0008 | <0.03 | 0.02F |
| | | 16-Dec-08 | N | 1351.03 | 1354.03 | 0.9F | 0.119 | <0.001 | <0.05 | <0.05 | 10.3 | 0.0032 | 8.6 | <0.03 | <2 | 0.0001F | 0.0006 | <0.03 | 0.04F |
| | | 23-Dec-08 | N | 1351.03 | 1354.03 | 0.6F | 0.081 | -- | <0.05 | 0.01F | 8.3 | 0.003 | 4.8 | -- | <2 | <0.0005 | 0.0005 | -- | 0.03F |
| | | 30-Dec-08 | N | 1351.03 | 1354.03 | 0.8F | 0.073 | -- | <0.05 | 0.01F | 8.2 | 0.0028 | 9.4 | -- | <2V1 | <0.0005 | 0.0005 | -- | 0.03F |
| | | 6-Jan-09 | N | 1351.03 | 1354.03 | 0.5F | 0.072 | -- | <0.05 | 0.02F | 9.8 | 0.0031 | 9.1 | -- | <2 | 0.0001F | 0.0006 | -- | 0.03F |
| | | 13-Jan-09 | N | 1351.03 | 1354.03 | 0.6F | 0.053 | <0.001 | <0.05 | 0.02F | 7.5 | 0.003 | 8.3 | <0.03 | <2 | 0.0001F | 0.0005 | <0.03 | 0.02F |
| | | 20-Jan-09 | N | 1351.03 | 1354.03 | 0.6F | 0.051 | -- | <0.05L1 | 0.01F | 7.5 | 0.0026 | 8 | -- | <2 | <0.0005 | 0.0005 | -- | 0.03F |
| | | 27-Jan-09 | N | 1351.03 | 1354.03 | 0.7F | 0.062 | -- | <0.05 | <0.05 | 8.2 | 0.003 | 8.3 | -- | <2 | 0.0002F | 0.0006 | -- | 0.04F |
| | | 3-Feb-09 | N | 1351.03 | 1354.03 | 0.8F | 0.073 | -- | <0.05 | 0.01F | 8.9 | 0.0035 | 10 | -- | <2 | 0.0001F | 0.0007 | -- | 0.05 |
| | | 10-Feb-09 | N | 1351.03 | 1354.03 | 0.5F | 0.056 | -- | <0.05 | 0.03F | 8 | 0.0006 | 10.5 | -- | <2 | 0.0001F | 0.0005 | -- | 0.04F |
| | | 17-Feb-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1351.03 | 1354.03 | 0.4F | 0.054 | <0.001 | <0.05 | <0.05 | 6.5 | 0.0023 | 6.8 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | 0.07 |
| | | 17-Mar-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1351.03 | 1354.03 | 0.4F | 0.033 | <0.001 | <0.05 | <0.05 | 4.4 | 0.002 | 6.8 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | 0.02F |
| | | 14-Apr-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1351.03 | 1354.03 | 0.4F | 0.049 | <0.001 | <0.05 | <0.05 | 4.6 | 0.0032 | 5 | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | 0.03F |
| | | 12-May-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1351.03 | 1354.03 | <1 | 0.023F | <0.001 | <0.05 | <0.05 | 4.3 | 0.003 | 7.3 | <0.03 | <2 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 9-Jun-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1351.03 | 1354.03 | <1 | 0.032 | <0.001 | <0.05 | 0.02F | 4.9 | 0.0038B1 | 10 | <0.03 | <2 | 0.0003F | 0.0012 | <0.03 | 0.07 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 43 | 7-Jul-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1351.03 | 1354.03 | 0.2F | 0.032 | <0.001 | <0.05 | 0.01F | 3.9 | 0.0041 | 8.3 | <0.03 | <2 | 0.0001F | 0.0015 | <0.03 | 0.04F |
| | | 4-Aug-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1351.03 | 1354.03 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1351.03 | 1354.03 | 0.6F | 0.021F | <0.001 | <0.05 | 0.03F | 3.7 | 0.0026 | 12.2 | <0.03 | 0.4F | <0.0005 | 0.0013 | <0.03 | 0.04F |
| | TEST 44 | 26-Aug-08 | N | 1510.74 | 1527.19 | 10.9 | 0.927 | <0.001 | <0.05 | 0.58 | 50.6 | 0.0406 | 5.8 | <0.03M2 | 50.2 | 0.0013 | 0.0016 | <0.03 | 0.26 |
| | | 2-Sep-08 | N | 1510.74 | 1527.19 | 10.6 | 0.666 | <0.001 | <0.05 | 0.74 | 38.2D1 | 0.0565B7 | 20.2 | <0.05D1 | 29.2D1 | 0.001 | 0.0017 | <0.03 | 0.33 |
| | | 9-Sep-08 | N | 1510.74 | 1527.19 | 7.3 | 0.43D2 | <0.001 | <0.05 | 0.51 | 25.7 | 0.0447 | 19.1 | <0.03 | 14 | 0.0008 | 0.0024 | <0.05D2 | 0.37 |
| | | 16-Sep-08 | N | 1510.74 | 1527.19 | 4.4 | 0.285 | <0.001 | <0.1D1 | 0.35D1 | 14.4 | 0.0313 | 18.9 | <0.03 | 5.8 | 0.0006 | 0.0026 | <0.05D1 | 0.43D1 |
| | | 23-Sep-08 | N | 1510.74 | 1527.19 | 2.8 | 0.201 | <0.001 | <0.05 | 0.31 | 7.9D2 | 0.0273 | 16.8 | <0.03 | 2.5 | 0.0004 | 0.0033 | <0.03 | 0.52 |
| | | 30-Sep-08 | N | 1510.74 | 1527.19 | 2 | 0.163 | <0.001 | <0.05 | 0.22 | 5.1 | 0.0268 | 17 | <0.03 | 1.2 | 0.0003 | 0.0047 | <0.03 | 0.71 |
| | | 7-Oct-08 | N | 1510.74 | 1527.19 | 1.3 | 0.125 | <0.001 | <0.05 | 0.23 | 2.7FD1 | 0.0251 | 17 | <0.03 | 0.7F | 0.0002F | 0.0051 | <0.03 | 0.87 |
| | | 14-Oct-08 | N | 1510.74 | 1527.19 | 0.8F | 0.074 | <0.001 | <0.05 | 0.15 | 1.3FD1 | 0.0184 | 14.4 | <0.03 | <3D1 | <0.0005 | 0.0035 | <0.03 | 0.63 |
| | | 21-Oct-08 | N | 1510.74 | 1527.19 | 0.5F | 0.059 | <0.001 | <0.1D1 | 0.14 | 1.4FD1 | 0.0231 | 15.5 | <0.05D1 | <3D1 | 0.0001F | 0.0047 | <0.03 | 0.78 |
| | | 28-Oct-08 | N | 1510.74 | 1527.19 | 0.4F | 0.042 | <0.001 | 0.03F | 0.06 | 0.9F | 0.0189 | 14D2 | <0.03 | <3D2 | <0.0005 | 0.0035 | <0.03 | 0.54 |
| | | 4-Nov-08 | N | 1510.74 | 1527.19 | <1 | 0.033 | <0.001 | <0.05 | 0.06 | 0.9F | 0.0222 | 11.9 | <0.05D2 | <3D2 | 0.0001F | 0.0044 | <0.03 | 0.52 |
| | | 11-Nov-08 | N | 1510.74 | 1527.19 | <1 | 0.032 | <0.001 | <0.05 | 0.06 | 0.7F | 0.0218 | 10.9 | <0.05D2 | <3D2 | <0.0005 | 0.0041 | <0.03 | 0.46D2 |
| | | 18-Nov-08 | N | 1510.74 | 1527.19 | 0.2F | 0.027F | <0.001 | 0.03F | 0.05FD2 | 0.4F | 0.0255 | 10.8 | <0.03 | <2 | <0.0005 | 0.004 | <0.03 | 0.4D2 |
| | | 25-Nov-08 | N | 1510.74 | 1527.19 | 0.2F | 0.029F | <0.001 | 0.03F | 0.05 | 0.5F | 0.0222 | 11.9 | <0.03 | <2 | <0.0005 | 0.0039 | <0.03 | 0.44 |
| | | 2-Dec-08 | N | 1510.74 | 1527.19 | <1 | 0.018F | <0.001 | <0.05 | 0.02F | 0.3F | 0.0231 | 7.7 | <0.05D1 | <2 | 0.0001F | 0.0037 | <0.03 | 0.32 |
| | | 9-Dec-08 | N | 1510.74 | 1527.19 | <1 | 0.014F | <0.001 | <0.05 | 0.02F | 0.4F | 0.02 | 9.5 | <0.03 | <2 | <0.0005 | 0.0033 | <0.03 | 0.31 |
| | | 16-Dec-08 | N | 1510.74 | 1527.19 | <1 | 0.017F | <0.001 | 0.02F | 0.03F | <3D1 | 0.0191 | 7.8 | <0.03 | <2 | <0.0005 | 0.0032 | 0.007F | 0.28D1 |
| | | 23-Dec-08 | N | 1510.74 | 1527.19 | <1 | 0.005F | -- | <0.05 | 0.04FD1 | <2 | 0.0214 | 8.1 | -- | 0.4F | <0.0005 | 0.0034 | -- | 0.27 |
| | | 30-Dec-08 | N | 1510.74 | 1527.19 | <1V1 | 0.013F | -- | 0.01F | 0.05 | <2 | 0.0217 | 10.3 | -- | <2V1 | <0.0005 | 0.0033 | -- | 0.35 |
| | | 6-Jan-09 | N | 1510.74 | 1527.19 | <1 | 0.009F | -- | 0.04F | 0.05FD1 | <3D1 | 0.0193 | 7.4 | -- | <2 | <0.0005 | 0.0034 | -- | 0.27 |
| | | 13-Jan-09 | N | 1510.74 | 1527.19 | <1 | 0.01F | <0.001 | 0.03FD1 | 0.05 | <2 | 0.02 | 7.4 | <0.03 | <2 | <0.0005 | 0.0033 | <0.03 | 0.22D1 |
| | | 20-Jan-09 | N | 1510.74 | 1527.19 | <1 | 0.01F | -- | <0.05M1 | 0.03F | <2 | 0.0206 | 8.4 | -- | <2 | <0.0005 | 0.0035 | -- | 0.25 |
| | | 27-Jan-09 | N | 1510.74 | 1527.19 | <1 | 0.01F | -- | <0.05 | 0.03F | <2 | 0.0183 | 6.8D1 | -- | <2 | 0.0002F | 0.0035 | -- | 0.23 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 44 | 3-Feb-09 | N | 1510.74 | 1527.19 | <1 | 0.008F | -- | <0.05 | 0.02F | <2 | 0.0169 | 8 | -- | <2 | <0.0005 | 0.0034 | -- | 0.22 |
| | | 10-Feb-09 | N | 1510.74 | 1527.19 | <1 | 0.015F | -- | <0.1D2 | 0.04F | 0.5F | 0.0156 | 7.9D2 | -- | <2 | <0.0005 | 0.0041 | -- | 0.28 |
| | | 17-Feb-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1510.74 | 1527.19 | <1 | 0.018F | <0.001 | <0.05 | 0.02F | 0.4F | 0.0136 | 7.6 | <0.05D2 | <2 | <0.0005 | 0.006 | <0.03 | 0.4D2 |
| | | 17-Mar-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1510.74 | 1527.19 | 0.2F | 0.006F | <0.001 | 0.02FD1 | 0.02FD1 | <2 | 0.0118B7 | 8.4 | <0.03 | <2 | <0.0005 | 0.0069 | <0.05D1 | 0.18 |
| | | 14-Apr-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1510.74 | 1527.19 | 0.2F | 0.023F | <0.001 | <0.05 | 0.03F | <2 | 0.0085 | 7.5 | <0.03 | <2 | <0.0005 | 0.0056 | <0.03 | 0.19 |
| | | 12-May-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1510.74 | 1527.19 | <1 | 0.019F | <0.001 | <0.05 | 0.03F | <2 | 0.0087 | 8.6 | <0.03 | <2 | <0.0005 | 0.0057 | <0.03 | 0.11 |
| | | 9-Jun-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1510.74 | 1527.19 | <1 | 0.029F | 0.0002F | <0.05 | 0.06 | <2 | 0.0123B1 | 11.3D1 | <0.05D1 | <2 | <0.0005 | 0.0081 | <0.05D1 | 0.2D1 |
| | | 7-Jul-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1510.74 | 1527.19 | 0.4F | 0.035 | <0.001 | 0.01F | 0.06 | <2 | 0.0102 | 10.9 | <0.03 | <2 | <0.0005 | 0.008 | 0.01F | 0.13 |
| | | 4-Aug-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1510.74 | 1527.19 | 0.3F | 0.01F | <0.001 | 0.02F | 0.04F | <2 | 0.0077 | 12 | 0.02F | <2V1 | <0.0005 | 0.0056 | 0.018F | 0.07 |
| | | 1-Sep-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 44 | 8-Sep-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 1510.74 | 1527.19 | <1 | <0.03 | <0.001 | <0.05 | 0.04F | <2 | 0.0076 | 6.9 | <0.03 | <2 | <0.0005 | 0.0042 | 0.011F | 0.06 |
| | | 29-Sep-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 1510.74 | 1527.19 | <1 | <0.05D1 | <0.001 | <0.1D1 | <0.1D1 | <2 | 0.0045 | 3.3 | <0.03 | <2 | <0.0005 | 0.0018 | <0.05D1 | 0.04F |
| | | 27-Oct-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 1510.74 | 1527.19 | <1 | <0.03 | <0.001 | <0.05 | 0.03F | <2 | 0.0051 | 2.8 | <0.03 | <2 | <0.0005 | 0.002 | <0.03 | 0.02F |
| | | 24-Nov-09 | N | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 45 | 26-Aug-08 | FD | 1510.74 | 1527.19 | 6.8 | 0.546 | <0.001 | <0.05 | 0.38 | 32.2 | 0.0272 | 4.4 | <0.03 | 31.3 | 0.0009 | 0.001 | <0.03 | 0.17 |
| | | 2-Sep-08 | FD | 1510.74 | 1527.19 | 6.4 | 0.516 | <0.001 | <0.05 | 0.46 | 23.6 | 0.0351B7 | 12.7 | <0.03M2 | 17.5 | 0.0006 | 0.0012 | <0.03 | 0.24 |
| | | 9-Sep-08 | FD | 1510.74 | 1527.19 | 4.2 | 0.269 | <0.001 | <0.05 | 0.29D2 | 14.7 | 0.03 | 6.4 | <0.03 | 6.2 | 0.0004 | 0.0018 | <0.03 | 0.25 |
| | | 16-Sep-08 | FD | 1510.74 | 1527.19 | 1.7 | 0.14 | <0.001 | <0.05 | 0.16 | 5.9 | 0.0161 | 13.7 | <0.03 | 1.1 | <0.0005 | 0.0012 | <0.03 | 0.23 |
| | | 23-Sep-08 | FD | 1510.74 | 1527.19 | 1.1 | 0.096 | <0.001 | <0.05 | 0.14 | 3.6 | 0.0153 | 3.9 | <0.03 | 0.6 | 0.0002 | 0.0019 | <0.03 | 0.25 |
| | | 30-Sep-08 | FD | 1510.74 | 1527.19 | 0.9 | 0.091 | <0.001 | <0.05 | 0.11 | 2.4 | 0.0172 | 3.6 | <0.03 | <2 | 0.0001 | 0.0027 | <0.03 | 0.36 |
| | | 7-Oct-08 | FD | 1510.74 | 1527.19 | 0.5F | 0.068 | <0.001 | <0.05 | 0.1 | 1.1F | 0.014 | 3.6 | <0.03 | <2 | <0.0005 | 0.0025 | <0.03 | 0.38 |
| | | 14-Oct-08 | FD | 1510.74 | 1527.19 | 0.4F | 0.053 | <0.001 | <0.05 | 0.09 | 0.8F | 0.013 | 3.4 | <0.03 | <2 | <0.0005 | 0.0023 | <0.03 | 0.35 |
| | | 21-Oct-08 | FD | 1510.74 | 1527.19 | <1 | 0.045 | <0.001 | <0.05 | 0.06 | 0.9F | 0.0127 | 7.2 | <0.03 | <2 | <0.0005 | 0.0022 | <0.03 | 0.33 |
| | | 28-Oct-08 | FD | 1510.74 | 1527.19 | <1 | 0.04 | <0.001 | 0.02F | 0.03F | 0.5F | 0.0106 | 6 | <0.03 | <2 | <0.0005 | 0.0017 | <0.03 | 0.26 |
| | | 4-Nov-08 | FD | 1510.74 | 1527.19 | <1 | 0.039 | <0.001 | <0.05 | 0.04F | 0.5F | 0.015 | 4.6 | <0.03 | <2 | <0.0005 | 0.0027 | <0.03 | 0.32 |
| | | 11-Nov-08 | FD | 1510.74 | 1527.19 | <1 | 0.027F | <0.001 | <0.05 | 0.04F | 0.4F | 0.0131 | 3 | <0.03 | <2 | <0.0005 | 0.0022 | <0.03 | 0.27 |
| | | 18-Nov-08 | FD | 1510.74 | 1527.19 | <1 | 0.022F | <0.001 | 0.01F | 0.03F | <2 | 0.0161 | 4 | <0.03 | <2 | <0.0005 | 0.0021 | <0.03 | 0.23 |
| | | 25-Nov-08 | FD | 1510.74 | 1527.19 | <1 | 0.023F | <0.001 | 0.02F | 0.02F | 0.3F | 0.011 | 3.8 | <0.03 | <2 | <0.0005 | 0.0017 | <0.03 | 0.21 |
| | | 2-Dec-08 | FD | 1510.74 | 1527.19 | <1 | 0.01F | <0.001 | <0.05 | <0.05 | 0.3F | 0.0141 | 3.5 | <0.03 | <2 | <0.0005 | 0.0021 | <0.03 | 0.17 |
| | | 9-Dec-08 | FD | 1510.74 | 1527.19 | <1 | 0.007F | <0.001 | <0.05 | <0.05 | 0.4F | 0.0107 | 3.5 | <0.03 | <2 | <0.0005 | 0.0014 | <0.03 | 0.13 |
| | | 16-Dec-08 | FD | 1510.74 | 1527.19 | <1 | 0.011F | <0.001 | <0.05 | <0.05 | <3D1 | 0.0092 | 3.8 | <0.03 | <2 | <0.0005 | 0.0012 | 0.008F | 0.11D1 |
| | | 23-Dec-08 | FD | 1510.74 | 1527.19 | <1 | 0.011FM1 | -- | <0.05 | <0.05 | <2 | 0.0107 | 3.3 | -- | <2 | <0.0005 | 0.0014 | -- | 0.14M1 |
| | | 30-Dec-08 | FD | 1510.74 | 1527.19 | <1V1 | 0.011F | -- | <0.05 | 0.03F | <2 | 0.0113 | 3.7 | -- | <2V1 | <0.0005 | 0.0015 | -- | 0.38 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 45 | 6-Jan-09 | FD | 1510.74 | 1527.19 | <1 | 0.005F | -- | <0.05 | 0.02F | <2 | 0.01 | 1.8F | -- | <2 | <0.0005 | 0.0019 | -- | 0.56 |
| | | 13-Jan-09 | FD | 1510.74 | 1527.19 | <1 | 0.01F | <0.001 | <0.05 | 0.03F | <2 | 0.0102 | 4.4 | <0.03 | <2 | <0.0005 | 0.0014 | <0.03 | 0.15 |
| | | 20-Jan-09 | FD | 1510.74 | 1527.19 | <1 | 0.008F | -- | <0.05L1 | 0.02F | <2 | 0.012 | 2.2 | -- | <2 | <0.0005 | 0.0018 | -- | 0.14 |
| | | 27-Jan-09 | FD | 1510.74 | 1527.19 | <1 | 0.008F | -- | <0.05 | <0.05 | <2 | 0.0093 | 2.2 | -- | <2 | 0.0001F | 0.0013 | -- | 0.12 |
| | | 3-Feb-09 | FD | 1510.74 | 1527.19 | <1 | 0.02F | -- | <0.05 | 0.02F | <2 | 0.0154 | 2.6 | -- | <2 | <0.0005 | 0.0025 | -- | 0.23 |
| | | 10-Feb-09 | FD | 1510.74 | 1527.19 | <1 | <0.05D2 | <0.001H3 | 0.02F | <0.1D2 | <2 | 0.0118M1 | 2.3 | <0.03 | <2 | <0.0005 | 0.0015 | <0.05D1 | 0.1D2 |
| | | 17-Feb-09 | FD | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 46 | 26-Aug-08 | FD | 1510.74 | 1527.19 | 3.3 | 0.339 | <0.001 | <0.05 | 0.17 | 17.7 | 0.0149 | 3.3 | <0.03 | 15.2 | 0.0004F | 0.0005 | <0.03 | 0.1 |
| | | 2-Sep-08 | FD | 1510.74 | 1527.19 | 2.7 | 0.276 | <0.001 | <0.05 | 0.18 | 9.9 | 0.0143B7 | 5.1 | <0.03 | 5.6 | 0.0002F | 0.0005 | <0.03 | 0.12 |
| | | 9-Sep-08 | FD | 1510.74 | 1527.19 | 1.6 | 0.15 | <0.001 | <0.05 | 0.11 | 6 | 0.012 | 5.6 | <0.03 | 2 | 0.0002 | 0.0007 | <0.03 | 0.11 |
| | | 30-Sep-08 | FD | 1510.74 | 1527.19 | 0.3 | 0.05 | <0.001 | <0.05 | 0.04 | 1.7 | 0.0091 | 3.1 | <0.03 | <2 | <0.0005 | 0.0013 | <0.03 | 0.21 |
| | | 7-Oct-08 | FD | 1510.74 | 1527.19 | <1 | 0.038 | <0.001 | <0.05 | 0.06 | 0.8F | 0.0077 | 2.9 | <0.03 | <2 | <0.0005 | 0.0013 | <0.03 | 0.23 |
| | | 14-Oct-08 | FD | 1510.74 | 1527.19 | <1 | 0.018F | <0.001 | <0.05 | 0.04F | 0.5F | 0.0051 | 3.4 | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | 0.13 |
| | | 21-Oct-08 | FD | 1510.74 | 1527.19 | <1 | 0.018F | <0.001 | <0.05 | 0.03F | 0.7F | 0.0065B7 | 3.3 | <0.03 | <2 | <0.0005 | 0.001 | <0.03 | 0.14 |
| | | 28-Oct-08 | FD | 1510.74 | 1527.19 | <1 | 0.011F | <0.001 | 0.02F | <0.05 | 0.4F | 0.0041 | 4.3 | <0.03 | <2 | <0.0005 | 0.0006 | <0.03 | 0.09 |
| | | 4-Nov-08 | FD | 1510.74 | 1527.19 | <1 | 0.01F | <0.001 | <0.05 | <0.05 | 0.5F | 0.0053M1 | 3.2 | <0.03 | <2 | <0.0005 | 0.0008 | <0.03 | 0.07 |
| | | 11-Nov-08 | FD | 1510.74 | 1527.19 | <1 | 0.013F | <0.001 | <0.05 | 0.02F | 0.5F | 0.0068 | 2.8 | <0.03 | <2 | <0.0005 | 0.001 | <0.03 | 0.11 |
| | | 18-Nov-08 | FD | 1510.74 | 1527.19 | <1 | 0.009F | <0.001 | <0.05 | 0.01F | 0.3F | 0.007 | 4.5 | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | 0.07 |
| | | 25-Nov-08 | FD | 1510.74 | 1527.19 | <1 | 0.01F | <0.001 | <0.05 | 0.01F | 0.4F | 0.0042 | 4.4 | <0.03 | <2 | <0.0005 | 0.0006 | <0.03 | 0.06 |
| | | 2-Dec-08 | FD | 1510.74 | 1527.19 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.4F | 0.0047 | 3.2 | <0.03 | <2 | <0.0005 | 0.0006 | <0.03 | 0.05 |
| | | 9-Dec-08 | FD | 1510.74 | 1527.19 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.4F | 0.0042 | 4.4 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | 0.02F |
| | | 16-Dec-08 | FD | 1510.74 | 1527.19 | <1 | 0.005FM1 | <0.001 | <0.05 | 0.01F | <2 | 0.0044 | 2.4M1 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | 0.04F |
| | | 23-Dec-08 | FD | 1510.74 | 1527.19 | <1 | <0.03 | -- | <0.05 | <0.05 | <2 | 0.0042 | 2.2 | -- | 0.4F | <0.0005 | 0.0005 | -- | 0.03F |
| | | 30-Dec-08 | FD | 1510.74 | 1527.19 | <1M1 | <0.03M1 | -- | <0.05M1 | <0.05M1 | <2M1 | 0.0039 | 2.5M1 | -- | <2V1M1 | <0.0005 | 0.0004F | -- | 0.03FM1 |
| | | 6-Jan-09 | FD | 1510.74 | 1527.19 | <1 | <0.03 | -- | <0.05 | <0.05 | <2 | 0.0031 | 1.7FM1 | -- | <2 | <0.0005 | 0.0004F | -- | 0.02F |
| | | 13-Jan-09 | FD | 1510.74 | 1527.19 | <1 | <0.03 | <0.001 | <0.05 | 0.01F | <2 | 0.0036 | 2M1 | <0.03M2 | <2 | <0.0005 | 0.0004F | <0.03 | 0.02F |
| | | 20-Jan-09 | FD | 1510.74 | 1527.19 | <1 | <0.03 | -- | <0.05L1M1 | <0.05 | <2 | 0.0032 | 1.9FM1 | -- | <2 | <0.0005 | 0.0003F | -- | 0.02F |
| | | 27-Jan-09 | FD | 1510.74 | 1527.19 | <1 | <0.03 | -- | <0.05M1 | <0.05 | <2 | 0.0037 | 1.8FM1 | -- | <2 | 0.0001F | 0.0004F | -- | 0.03F |
| | | 3-Feb-09 | FD | 1510.74 | 1527.19 | <1 | <0.03 | -- | <0.05 | <0.05 | <2 | 0.0038 | 2M1 | -- | <2 | <0.0005 | 0.0004F | -- | 0.03F |
| | | 10-Feb-09 | FD | 1510.74 | 1527.19 | <1 | <0.03 | <0.001H3 | <0.05 | <0.05 | <2 | 0.006 | 1.3F | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | 0.03F |
| | | 23-Sep-08 | FD | 1510.74 | 1527.19 | 0.7 | 0.078 | <0.001 | <0.05 | 0.1 | 2.6 | 0.0106 | 2.6 | <0.03 | <2 | <0.0005 | 0.0013 | <0.03 | 0.19 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 46 | 17-Feb-09 | FD | 1510.74 | 1527.19 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 47 | 26-Aug-08 | N | 1597.32 | 1599.88 | 16.4 | 2.3 | <0.001 | <0.05 | 0.79 | 2.4 | 0.0193 | 96.5 | <0.1D1V1 | 7.3 | 0.0001F | 0.0866 | <0.1D1 | 156 |
| | | 2-Sep-08 | N | 1597.32 | 1599.88 | 0.4F | 0.238 | <0.001 | <0.05 | 0.08 | 2.3 | 0.0047B7 | 32.5 | <0.03 | 0.6F | <0.0005 | 0.0019 | <0.03 | 36.2 |
| | | 9-Sep-08 | N | 1597.32 | 1599.88 | <1 | 0.107 | <0.001 | <0.05 | 0.01 | 1.2 | 0.0033 | 26.4 | <0.03 | <2 | <0.0005 | 0.0018 | 0.006 | 33.9 |
| | | 16-Sep-08 | N | 1597.32 | 1599.88 | 0.7 | 0.321 | <0.001 | 0.01 | 0.08 | 3.9 | 0.0103 | 86.7 | <0.03 | 0.7 | <0.0005 | 0.0043 | <0.03 | 85.8 |
| | | 23-Sep-08 | N | 1597.32 | 1599.88 | <1 | 0.082 | <0.001 | <0.05 | 0.08 | 2.3 | 0.0058 | 52.1 | <0.03 | <2 | <0.0005 | 0.0018 | <0.03 | 44.8 |
| | | 30-Sep-08 | N | 1597.32 | 1599.88 | <1 | 0.044 | <0.001 | <0.05 | 0.01 | 3.1 | 0.0053 | 43 | <0.03 | 0.3 | <0.0005 | 0.0013 | <0.03 | 28.8 |
| | | 7-Oct-08 | N | 1597.32 | 1599.88 | <1 | 0.115 | <0.001 | 0.04F | 0.31 | <8D1 | 0.045 | 74.5 | <0.03 | <2 | <0.0005 | 0.0178 | <0.03 | 335D1M3 |
| | | 14-Oct-08 | N | 1597.32 | 1599.88 | <1 | 0.026F | <0.001 | <0.05 | 0.04F | 0.5F | 0.0122 | 30.1 | <0.03 | <2 | <0.0005 | 0.0022 | <0.03 | 33 |
| | | 21-Oct-08 | N | 1597.32 | 1599.88 | <1 | 0.036 | <0.001 | <0.05 | 0.03F | <2 | 0.0067B7 | 13.4 | <0.03 | <2 | <0.0005 | 0.0021 | <0.03 | 37.2 |
| | | 28-Oct-08 | N | 1597.32 | 1599.88 | <1 | 0.087 | <0.001 | 0.01F | <0.05 | 0.4F | 0.0046 | 58.3 | <0.03 | 0.3F | <0.0005 | 0.0021 | <0.03 | 59.7 |
| | | 4-Nov-08 | N | 1597.32 | 1599.88 | <1 | 0.027F | <0.001 | <0.05 | 0.03F | 0.6F | 0.0113 | 27.4 | <0.03 | <2 | <0.0005 | 0.0018 | 0.007F | 36.8 |
| | TEST 47S | 11-Nov-08 | N | 1597.32 | 1599.88 | <1 | 0.047 | <0.001 | <0.05 | 0.03F | 0.3F | 0.0139 | 20.7 | <0.03 | <2 | <0.0005 | 0.0039 | <0.03 | 69.6 |
| | | 18-Nov-08 | N | 1597.32 | 1599.88 | <1 | 0.009F | <0.001 | <0.05 | <0.05 | <2 | 0.002 | 10.3 | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | 20 |
| | | 25-Nov-08 | N | 1597.32 | 1599.88 | <1 | 0.011F | <0.001 | 0.01F | <0.05 | <2 | 0.0008 | 7.1 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | 15.5 |
| | | 2-Dec-08 | N | 1597.32 | 1599.88 | <1 | 0.005F | <0.001 | <0.05 | <0.05 | <2 | 0.0007 | 6.6 | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | 15.6 |
| | | 9-Dec-08 | N | 1597.32 | 1599.88 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0009 | 5.2 | <0.03 | <2 | <0.0005 | 0.0006 | <0.03 | 16.6 |
| | | 16-Dec-08 | N | 1597.32 | 1599.88 | <1 | 0.009F | <0.001 | 0.02F | <0.05 | <3D1 | 0.0009 | 5.9 | <0.03 | <2 | <0.0005 | 0.0007 | 0.009F | 9.2D1 |
| | | 23-Dec-08 | N | 1597.32 | 1599.88 | <1 | <0.03 | -- | <0.05 | <0.05 | <2 | 0.001 | 5.1 | -- | <2 | <0.0005 | 0.0006 | -- | 15M3 |
| | | 30-Dec-08 | N | 1597.32 | 1599.88 | <1V1 | 0.011F | -- | <0.05 | <0.05 | 0.3F | 0.001 | 7.2 | -- | 0.3F | <0.0005 | 0.0006 | -- | 18.8 |
| | | 6-Jan-09 | N | 1597.32 | 1599.88 | <1 | 0.005F | -- | <0.05 | <0.05 | <2 | 0.0009 | 6.4 | -- | <2 | <0.0005 | 0.0006 | -- | 16.2 |
| | | 13-Jan-09 | N | 1597.32 | 1599.88 | <1 | 0.01F | <0.001 | <0.05 | <0.05 | <2 | 0.0009 | 5.3 | <0.03 | <2 | <0.0005 | 0.0006 | <0.03 | 13.1 |
| | | 20-Jan-09 | N | 1597.32 | 1599.88 | <1 | 0.011F | -- | <0.05L1 | <0.05 | <2 | 0.001 | 4.9 | -- | <2 | <0.0005 | 0.0006 | -- | 14.4 |
| | | 27-Jan-09 | N | 1597.32 | 1599.88 | <1 | 0.011F | -- | <0.05 | <0.05 | <2 | 0.0009 | 3.9 | -- | <2 | 0.0002F | 0.0007 | -- | 15 |
| | | 3-Feb-09 | N | 1597.32 | 1599.88 | <1 | 0.012F | -- | <0.05 | 0.01F | <2 | 0.0011 | 4.7 | -- | <2 | <0.0005 | 0.0007 | -- | 15.3 |
| | | 10-Feb-09 | N | 1597.32 | 1599.88 | <1 | 0.012F | <0.001H3 | <0.05 | <0.05 | <2 | 0.0013 | 3.9 | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | 15.2M3 |
| | | 17-Feb-09 | N | 1597.32 | 1599.88 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 48 | 26-Aug-08 | N | 1634.46 | 1637.47 | 54.2 | 1.77 | <0.001 | <0.05 | 1.16 | 423 | 0.0318 | 70.8 | <0.03 | 66.9 | 0.0044 | 0.0198 | <0.1D1 | 22.9 |
| | | 2-Sep-08 | N | 1634.46 | 1637.47 | 4.2 | 0.293 | <0.001 | <0.05 | 0.12 | 66.4 | 0.0066B7 | 48.5 | <0.03 | 2.3 | 0.0006 | 0.0018 | <0.03 | 2.17 |
| | | 9-Sep-08 | N | 1634.46 | 1637.47 | 0.8 | 0.046 | <0.001 | <0.05 | <0.05V1 | 9.6 | 0.0018 | 9.5 | <0.03 | <2 | 0.0001 | 0.0006 | <0.03 | 0.95 |
| | | 16-Sep-08 | N | 1634.46 | 1637.47 | 1.9 | 0.095 | <0.001 | <0.05 | 0.03 | 17.4 | 0.0025 | 22.9 | <0.03 | 0.5 | 0.0002 | 0.0011 | <0.03 | 1.78 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 48 | 23-Sep-08 | N | 1634.46 | 1637.47 | 1.5 | 0.083 | <0.001 | <0.05 | 0.04 | 16.9 | 0.0039 | 20.7 | <0.03 | 0.5 | 0.0002 | 0.0011 | <0.03 | 1.72 |
| | | 30-Sep-08 | N | 1634.46 | 1637.47 | 5.4 | 0.239 | <0.001 | <0.05 | 0.05 | 43.1 | 0.0106 | 45.7 | <0.03 | 0.8 | 0.0005 | 0.0033 | <0.03 | 6.18 |
| | | 7-Oct-08 | N | 1634.46 | 1637.47 | 3.1 | 0.15 | <0.001 | <0.05 | 0.12 | 18.4D1 | 0.0117 | 24.5 | <0.03 | 0.4F | 0.0002F | 0.0049 | <0.03 | 9.54 |
| | | 14-Oct-08 | N | 1634.46 | 1637.47 | 2.4 | 0.105 | <0.001 | <0.05 | 0.09 | 14.9D1 | 0.004 | 20.6 | 0.02F | <3D1 | 0.0002F | 0.0032 | <0.03 | 7.33 |
| | | 21-Oct-08 | N | 1634.46 | 1637.47 | 0.5F | 0.04 | <0.001 | <0.05 | 0.03F | 6.4 | 0.0028 | 7.7 | <0.03 | <2 | <0.0005 | 0.0011 | <0.03 | 2.4 |
| | | 28-Oct-08 | N | 1634.46 | 1637.47 | 1.1 | 0.046 | <0.001 | 0.01F | <0.3D2 | 23.1 | 0.0037 | 33D2 | <0.03 | <3D2 | 0.0003F | 0.0023 | <0.03 | 5.75 |
| | | 4-Nov-08 | N | 1634.46 | 1637.47 | 0.3F | 0.026F | <0.001 | <0.05 | 0.06FD2 | 10.3 | 0.0118 | 19 | <0.05D2 | <3D2 | 0.0002F | 0.0042 | <0.03 | 8 |
| | TEST 48S | 11-Nov-08 | N | 1634.46 | 1637.47 | 0.3F | 0.032 | <0.001 | <0.05 | 0.05 | 15.5 | 0.0132 | 21.5 | <0.1D2 | <8D2 | 0.0002F | 0.0034 | 0.005F | 10D2 |
| | | 18-Nov-08 | N | 1634.46 | 1637.47 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0009 | 6.9 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1634.46 | 1637.47 | <1 | 0.011F | <0.001 | <0.05 | 0.01F | 2.7 | 0.002 | 7.8 | <0.03 | <2 | <0.0005 | 0.0008 | <0.03 | 2.39 |
| | | 2-Dec-08 | N | 1634.46 | 1637.47 | <1 | 0.005F | <0.001 | <0.05 | <0.05 | 2.1 | 0.0029 | 5.9 | <0.03 | <2 | <0.0005 | 0.001 | <0.03 | 2.75 |
| | | 9-Dec-08 | N | 1634.46 | 1637.47 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 2 | 0.0024 | 6 | <0.03 | <2 | <0.0005 | 0.0009 | <0.03 | 2.67 |
| | | 16-Dec-08 | N | 1634.46 | 1637.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Dec-08 | N | 1634.46 | 1637.47 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 49 | 26-Aug-08 | N | 1739.63 | 1742.63 | 6 | 4.28 | <0.001 | <0.05 | 0.35 | 1.8F | 0.0046 | 64.9 | <0.03 | 4.7 | 0.0005 | 0.0071 | <0.05D1 | 0.61 |
| | | 2-Sep-08 | N | 1739.63 | 1742.63 | 0.5F | 1.65 | <0.001 | <0.05 | 0.06 | 0.9F | 0.0006 | 49.7 | <0.03 | 3.4 | 0.0001F | 0.0006 | <0.03 | 0.05 |
| | | 9-Sep-08 | N | 1739.63 | 1742.63 | <1 | 0.422 | <0.001 | <0.05 | <0.05V1 | 0.4 | 0.0004 | 21.9 | <0.03 | 1 | <0.0005 | 0.0003 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1739.63 | 1742.63 | 0.2 | 1.2 | <0.001 | <0.05 | 0.09 | 1.1 | 0.0012 | 45.9 | <0.03 | 1.6 | 0.0001 | 0.0006 | <0.03 | 0.05 |
| | | 23-Sep-08 | N | 1739.63 | 1742.63 | <1 | 0.417 | <0.001 | <0.05 | 0.05 | 0.8 | 0.0007 | 30.6 | <0.03 | <2 | <0.0005 | 0.0004 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 1739.63 | 1742.63 | <1 | 0.585 | <0.001 | <0.05 | 0.05 | 1.4 | 0.0025 | 51 | <0.03 | 0.5 | 0.0002 | 0.0008 | <0.03 | 0.03 |
| | | 7-Oct-08 | N | 1739.63 | 1742.63 | <1 | 0.628 | <0.001 | <0.05 | 0.17 | 1.1FD1 | 0.0042 | 58.8 | <0.03 | 0.3F | 0.0002F | 0.0014 | <0.03 | 0.06 |
| | | 14-Oct-08 | N | 1739.63 | 1742.63 | <1 | 0.134 | <0.001 | <0.05 | 0.08 | 0.6F | 0.0017 | 58.8 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 21-Oct-08 | N | 1739.63 | 1742.63 | <1 | 0.039 | <0.001 | <0.05 | 0.03F | 0.5F | 0.0019 | 26.3 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1739.63 | 1742.63 | <1 | 0.043 | <0.001 | 0.02F | <0.3D2 | 0.5F | 0.0022 | 33 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 4-Nov-08 | N | 1739.63 | 1742.63 | <1 | 0.166 | <0.001 | <0.05 | 0.12 | 1.2F | 0.0099 | 63.8 | <0.1D2 | <8D2 | 0.0003F | 0.003 | <0.03 | <0.05 |
| | TEST 49S | 11-Nov-08 | N | 1739.63 | 1742.63 | <1 | 0.017F | <0.001 | <0.05 | 0.02F | <2 | 0.0032 | 22.7 | <0.03 | <2 | <0.01D2 | <0.01D2 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1739.63 | 1742.63 | <1 | 0.01F | <0.001 | 0.02F | 0.01F | 4.5 | 0.0041 | 12.4 | <0.03 | <2 | <0.0005 | 0.0012 | <0.03 | 3.06 |
| | | 25-Nov-08 | N | 1739.63 | 1742.63 | <1 | 0.006F | <0.001 | <0.05 | <0.05 | <2 | 0.0006 | 4.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1739.63 | 1742.63 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0009 | 2.9 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1739.63 | 1742.63 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0008 | 2.7 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1739.63 | 1742.63 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0009 | 4.1 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 49S | 23-Dec-08 | N | 1739.63 | 1742.63 | <1 | <0.03 | -- | <0.05 | <0.05 | <2 | 0.0012 | 4.2 | -- | <2 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 30-Dec-08 | N | 1739.63 | 1742.63 | <1V1 | <0.03 | -- | <0.05 | <0.05 | <2 | 0.001 | 4.7 | -- | <2V1 | <0.0005 | 0.0001F | -- | <0.05 |
| | | 6-Jan-09 | N | 1739.63 | 1742.63 | <1 | <0.03 | -- | <0.05 | 0.01F | <2 | 0.0011 | 4.4 | -- | <2 | <0.0005 | 0.0001F | -- | <0.05 |
| | | 13-Jan-09 | N | 1739.63 | 1742.63 | <1 | 0.005F | <0.001 | <0.05 | 0.02F | <2 | 0.0014 | 4.4 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1739.63 | 1742.63 | <1 | 0.005F | -- | <0.05 | <0.05 | <2 | 0.0014 | 3.5 | -- | <2 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 27-Jan-09 | N | 1739.63 | 1742.63 | <1 | <0.03 | -- | <0.05 | <0.05 | <2 | 0.0014 | 3.6 | -- | <2 | 0.0001F | 0.0002F | -- | <0.05 |
| | | 3-Feb-09 | N | 1739.63 | 1742.63 | <1 | 0.007F | -- | <0.05 | <0.05 | <2 | 0.0017 | 3.9 | -- | <2 | <0.0005 | 0.0002F | -- | 0.01F |
| | | 10-Feb-09 | N | 1739.63 | 1742.63 | <1 | 0.005F | <0.001H3 | <0.05 | <0.05 | <2 | 0.002 | 3.9 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 17-Feb-09 | N | 1739.63 | 1742.63 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 50 | 26-Aug-08 | N | 1829.95 | 1832.48 | 415 | 25.4M3 | <0.001 | <0.05 | 0.28 | 61.7 | 0.0783 | 74.1 | <0.03M2 | 199 | 0.0003F | 0.0963 | 0.005F | 7.21M3 |
| | | 2-Sep-08 | N | 1829.95 | 1832.48 | 42.3 | 4.49 | <0.001 | <0.05 | 0.26 | 35.3 | 0.111B7 | 79 | <0.03 | 9.6 | 0.0002F | 0.165 | <0.03 | 15.7 |
| | | 9-Sep-08 | N | 1829.95 | 1832.48 | 47.8D2 | 3.9D2 | <0.001 | <0.05 | 0.18 | 26.8 | 0.116 | 57 | <0.03 | 2 | 0.0002 | 0.238D2 | <0.05D2 | 16.9 |
| | | 16-Sep-08 | N | 1829.95 | 1832.48 | 37.4 | 2.3 | <0.001 | <0.1D1 | 0.13D1 | 21.8 | 0.0978 | 49.9 | <0.03 | 1.4 | 0.0001 | 0.247D1 | <0.03 | 14.2D1 |
| | | 23-Sep-08 | N | 1829.95 | 1832.48 | 42.3 | 2.18 | <0.001 | <0.05 | 0.22 | 22D2 | 0.132D2B7 | 62.1 | <0.03 | 0.9 | 0.0002 | 0.552D2 | <0.03 | 17.6 |
| | | 30-Sep-08 | N | 1829.95 | 1832.48 | 35.7 | 1.7 | <0.001 | <0.05 | 0.09 | 15.7 | 0.135 | 52.3 | <0.03 | 1.4 | 0.0001 | 0.403D1 | <0.03 | 12.3 |
| | | 7-Oct-08 | N | 1829.95 | 1832.48 | 32.4 | 1.49 | <0.001 | <0.05 | 0.14 | 12.1D1 | 0.117 | 44.7 | <0.03 | 1.2F | <0.0005 | 0.358D1 | <0.03 | 9.43 |
| | | 14-Oct-08 | N | 1829.95 | 1832.48 | 27.2 | 1.25 | <0.001 | <0.05 | 0.11 | 11D1 | 0.0817 | 40.2 | <0.03 | 1FD1 | <0.0005 | 0.337D1 | <0.03 | 6.49 |
| | | 21-Oct-08 | N | 1829.95 | 1832.48 | 23 | 1.04 | <0.001 | <0.1D1 | 0.09 | 11D1 | 0.0723B7 | 44.5 | <0.05D1 | 0.9FD1 | <0.0005 | 0.347D1 | <0.03 | 4.84 |
| | | 28-Oct-08 | N | 1829.95 | 1832.48 | 19.9 | 0.918 | <0.001 | 0.01F | <0.3D2 | 6.3 | 0.0578 | 28.5D2 | <0.03 | 0.8FD2 | <0.0005 | 0.3D2 | <0.03 | 4.26 |
| | | 4-Nov-08 | N | 1829.95 | 1832.48 | 19.1 | 0.865 | <0.001 | <0.05 | 0.03F | 7 | 0.0546 | 31 | <0.03 | 0.8F | <0.0005 | 0.235 | <0.03 | 3 |
| | | 11-Nov-08 | N | 1829.95 | 1832.48 | 31.4 | 1.4 | <0.001 | <0.05 | 0.07 | 9.5 | 0.0847 | 26.2 | <0.05D2 | 0.8FD2 | <0.0005 | 0.256D2 | 0.006F | 4.3D2 |
| | | 18-Nov-08 | N | 1829.95 | 1832.48 | 28 | 1.25 | <0.001 | <0.05 | 0.07FD2 | 9.4 | 0.0845 | 30.1 | <0.03 | 0.4F | <0.0005 | 0.362D2 | <0.03 | 4.45D2 |
| | | 25-Nov-08 | N | 1829.95 | 1832.48 | 25.6 | 1.14 | <0.001 | <0.05 | 0.07 | 8.2 | 0.0764D1B3 | 34.8 | <0.03 | 0.5F | <0.0005 | 0.474D1 | <0.1D1 | 4.97 |
| | | 2-Dec-08 | N | 1829.95 | 1832.48 | 17.1 | 0.749 | <0.001 | <0.05 | 0.03F | 7 | 0.0741 | 20.4 | <0.05D1 | <2 | 0.0001F | 0.347D1 | <0.03 | 3.4 |
| | | 9-Dec-08 | N | 1829.95 | 1832.48 | 16.8 | 0.741 | <0.001 | <0.05 | 0.04F | 6.7 | 0.0718 | 23.1 | <0.03 | 0.3F | <0.0005 | 0.314D1 | <0.03 | 3.84 |
| | | 16-Dec-08 | N | 1829.95 | 1832.48 | 16.2 | 0.713 | <0.001 | 0.01F | 0.05 | 5.4D1 | 0.0656 | 21.9 | <0.03 | <2 | <0.0005 | 0.295D1 | 0.007F | 2.71D1 |
| | | 23-Dec-08 | N | 1829.95 | 1832.48 | 13.7 | 0.605 | -- | <0.05 | <0.3D1 | 6.3 | 0.0809 | 24 | -- | 0.5F | <0.0005 | 0.236D1 | -- | 3.03 |
| | | 30-Dec-08 | N | 1829.95 | 1832.48 | 15D1 | 0.64 | -- | <0.05 | 0.06 | 6.6 | 0.0697 | 26.2 | -- | <8D1 | <0.0005 | 0.196 | -- | 3.21 |
| | | 6-Jan-09 | N | 1829.95 | 1832.48 | 12.7 | 0.571 | -- | <0.05 | 0.06FD1 | 5.1D1 | 0.0625 | 20.5 | -- | <2 | <0.0005 | 0.145 | -- | 2.81 |
| | | 13-Jan-09 | N | 1829.95 | 1832.48 | 13.5 | 0.604 | <0.001 | <0.3D1 | 0.08 | 5.3 | 0.0769 | 19.1 | <0.03 | <2 | 0.0001F | 0.135 | <0.1D1 | 3.07D1 |
| | | 20-Jan-09 | N | 1829.95 | 1832.48 | 14.1 | 0.632 | -- | <0.05L1V1 | 0.04F | 5.6 | 0.0761 | 19.3 | -- | <2 | <0.0005 | 0.131 | -- | 2.85 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 50 | 27-Jan-09 | N | 1829.95 | 1832.48 | 13.9 | 0.613 | -- | <0.05 | 0.06 | 6 | 0.0695 | 19D1 | -- | <2 | 0.0002F | 0.102 | -- | 2.46 |
| | | 3-Feb-09 | N | 1829.95 | 1832.48 | 14.8 | 0.644 | -- | <0.05 | 0.05 | 6.3 | 0.0749 | 17.8 | -- | <2 | <0.0005 | 0.0904 | -- | 2.49 |
| | | 10-Feb-09 | N | 1829.95 | 1832.48 | 14.9 | 0.69D2 | <0.001H3 | 0.01F | <0.3D2 | 5.4 | 0.0885 | 20.5 | <0.03 | <2 | <0.0005 | 0.0901 | <0.1D2 | 2.59D2 |
| | | 17-Feb-09 | N | 1829.95 | 1832.48 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 51 | 26-Aug-08 | N | 1867.87 | 1844.35 | 16.9 | 0.15 | <0.001 | 0.05 | <0.05 | 12.6 | 0.0446 | 4.7 | <0.03 | 85.5 | <0.0005 | 0.0041 | <0.03 | <0.05 |
| | | 2-Sep-08 | N | 1867.87 | 1844.35 | 16 | 0.094 | <0.001 | 0.06 | <0.05 | 10.8 | 0.0341B7 | 5.1 | <0.03 | 63.2 | <0.0005 | 0.0031 | 0.005F | <0.05 |
| | | 9-Sep-08 | N | 1867.87 | 1844.35 | 22.9 | 0.127 | <0.001 | 0.06 | <0.05V1 | 11 | 0.0345 | 4.3M1 | <0.03M2 | 65.9 | <0.0005 | 0.0059 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1867.87 | 1844.35 | 14.3 | 0.081 | <0.001 | 0.04 | <0.05 | 7.9 | 0.0145 | 4.9 | <0.03M2 | 31.9 | <0.0005 | 0.0026 | 0.016 | <0.05 |
| | | 23-Sep-08 | N | 1867.87 | 1844.35 | 22.5 | 0.141 | <0.001 | 0.04 | <0.05 | 10.3 | 0.0166 | 4.7 | <0.03 | 36.4 | <0.0005 | 0.0032 | 0.005 | <0.05 |
| | | 30-Sep-08 | N | 1867.87 | 1844.35 | 17.4 | 0.114 | <0.001 | 0.03 | <0.05 | 8.4 | 0.0125 | 4.5 | <0.03M2 | 22.9 | <0.0005 | 0.0019 | <0.03 | <0.05 |
| | | 7-Oct-08 | N | 1867.87 | 1844.35 | 17.6 | 0.139 | <0.001 | 0.03F | <0.05 | 6.9 | 0.0098 | 4.2 | <0.03M2 | 15.9 | <0.0005 | 0.0014 | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1867.87 | 1844.35 | 17.7 | 0.181 | <0.001 | 0.02F | <0.05 | 6.2 | 0.0075 | 3.8 | <0.03M2 | 12.4 | <0.0005 | 0.0013 | 0.008F | <0.05 |
| | | 21-Oct-08 | N | 1867.87 | 1844.35 | 14.7 | 0.152 | <0.001 | 0.02F | <0.05 | 5.9 | 0.0065B7 | 3.5 | <0.03M2 | 9.5 | <0.0005 | 0.0011 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1867.87 | 1844.35 | 23.5 | 0.281 | <0.001 | 0.04F | <0.3D2 | 7.3M1 | 0.0082 | 4M1 | <0.03M2 | 11.9 | <0.0005 | 0.0018 | 0.006F | 0.01F |
| | | 4-Nov-08 | N | 1867.87 | 1844.35 | 21.6 | 0.276 | <0.001 | 0.03F | <0.05 | 7.6 | 0.0075 | 4.1 | <0.03 | 6.4 | <0.0005 | 0.0016 | <0.03 | <0.05 |
| | | 11-Nov-08 | N | 1867.87 | 1844.35 | 11.2 | 0.148M1 | <0.001 | <0.05 | <0.05 | 4.3 | 0.0041 | 3.1 | <0.03M2 | 1.6F | <0.0005 | 0.0007 | 0.005F | <0.05 |
| | | 18-Nov-08 | N | 1867.87 | 1844.35 | 12.8 | 0.189 | <0.001 | 0.03F | <0.05 | 4.3 | 0.0051 | 3.7M1 | <0.03M2 | 1.2F | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1867.87 | 1844.35 | 13.8 | 0.227M1 | <0.001 | 0.03F | <0.05 | 4.6 | 0.0043 | 3.8M1 | <0.03M2 | 0.9F | <0.0005 | 0.0007 | <0.03 | 0.02F |
| | | 2-Dec-08 | N | 1867.87 | 1844.35 | 14.1 | 0.244 | <0.001 | <0.05 | <0.05 | 4.7 | 0.0049 | 3 | <0.03M2 | 0.5F | <0.0005 | 0.0011 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1867.87 | 1844.35 | 13.2 | 0.228 | <0.001 | 0.02F | <0.05 | 4.5 | 0.0042 | 3.4 | <0.03M2 | 0.4F | <0.0005 | 0.0008 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1867.87 | 1844.35 | 8.2 | 0.154 | <0.001 | 0.01F | <0.05 | 3.1 | 0.0029 | 2.8 | <0.03 | <2 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 23-Dec-08 | N | 1867.87 | 1844.35 | 9.5 | 0.188 | -- | <0.05 | <0.05 | 2.9 | 0.0038 | 2.9 | -- | 0.3F | <0.0005 | 0.0005 | -- | <0.05 |
| | | 30-Dec-08 | N | 1867.87 | 1844.35 | 10.3 | 0.237 | -- | 0.02F | <0.05 | 3.4 | 0.0037 | 3.4 | -- | <2V1 | <0.0005 | 0.0005 | -- | <0.05 |
| | | 6-Jan-09 | N | 1867.87 | 1844.35 | 9.6 | 0.239 | -- | <0.05 | <0.05 | 3.6 | 0.0033 | 2.4 | -- | <2 | <0.0005 | 0.0005 | -- | <0.05 |
| | | 13-Jan-09 | N | 1867.87 | 1844.35 | 7.1 | 0.176 | <0.001 | <0.05 | <0.05 | 2.6 | 0.0031 | 2.8 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1867.87 | 1844.35 | 9.7 | 0.273 | -- | <0.05 | <0.05 | 3.4 | 0.0035 | 3.1 | -- | <2 | <0.0005 | 0.0005 | -- | 0.02F |
| | | 27-Jan-09 | N | 1867.87 | 1844.35 | 6.6 | 0.179 | -- | <0.05 | <0.05 | 2.5 | 0.0027 | 2.4 | -- | <2 | 0.0001F | 0.0004F | -- | <0.05 |
| | | 3-Feb-09 | N | 1867.87 | 1844.35 | 9.7 | 0.305 | -- | 0.01F | <0.05 | 3.5 | 0.0034 | 3.5 | -- | <2 | <0.0005 | 0.0005 | -- | 0.02F |
| | | 10-Feb-09 | N | 1867.87 | 1844.35 | 5.6 | 0.163 | -- | 0.02F | <0.05 | 2.6 | <0.0005 | 3.1 | -- | <2 | <0.0005 | 0.0002F | -- | <0.05 |
| | | 17-Feb-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 51 | 3-Mar-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 1867.87 | 1844.35 | 6.9 | 0.309 | <0.001 | 0.01F | <0.05 | 3.5 | 0.0032 | 3.1 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.02F |
| | | 17-Mar-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 1867.87 | 1844.35 | 4.9 | 0.251 | <0.001 | 0.02F | <0.05 | 2.4 | 0.0026 | 3 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.02F |
| | | 14-Apr-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 1867.87 | 1844.35 | 4.4 | 0.287 | <0.001 | 0.01F | <0.05 | 2.3 | 0.0024 | 2.4 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 0.03F |
| | | 12-May-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 1867.87 | 1844.35 | 4.2 | 0.256 | <0.001 | 0.01F | <0.05 | 2.6 | 0.0032 | 3.1 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 9-Jun-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 1867.87 | 1844.35 | 2.9 | 0.214 | <0.001 | 0.01F | <0.05 | 2.2 | 0.0029B1 | 2.4 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 0.01F |
| | | 7-Jul-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-Jul-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 1867.87 | 1844.35 | 3.8 | 0.25 | <0.001 | 0.03F | <0.05 | 2.2 | 0.0036 | 2.7 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | <0.05 |
| | | 4-Aug-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 1867.87 | 1844.35 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 1867.87 | 1844.35 | 4.8 | 0.339 | <0.001 | <0.05 | <0.05 | 2.9 | 0.0041 | 3.2 | <0.03 | <2V1 | <0.0005 | 0.0003F | <0.03 | 0.02F |
| | TEST 52 | 26-Aug-08 | N | 1899 | 1901.88 | 148 | 1.87 | <0.001 | 0.05 | <0.05 | 113 | 0.142 | 14.8 | <0.03 | 129 | <0.0005 | 0.0126 | 0.006F | <0.05 |
| | | 2-Sep-08 | N | 1899 | 1901.88 | 8.8 | 0.538 | <0.001 | 0.13 | <0.05 | 23.9 | 0.0229B7 | 10.1 | <0.03 | 2.9 | <0.0005 | 0.0072 | <0.03 | <0.05 |
| | | 9-Sep-08 | N | 1899 | 1901.88 | 3.2 | 0.426 | <0.001 | 0.08 | <0.05V1 | 11.9 | 0.0119 | 6.6 | 0.02 | 0.9 | <0.0005 | 0.001 | <0.03 | <0.05 |
| | | 16-Sep-08 | N | 1899 | 1901.88 | 9.1 | 1.44 | <0.001 | 0.02 | <0.05 | 9.4 | 0.0131 | 4.1 | <0.03 | <2 | <0.0005 | 0.0018 | <0.03 | 0.01 |
| | | 23-Sep-08 | N | 1899 | 1901.88 | 5.7 | 1.07 | <0.001 | <0.05 | <0.05 | 6.7 | 0.0207 | 2.6 | <0.03 | 0.3 | <0.0005 | 0.0009 | <0.03 | <0.05 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 52 | 30-Sep-08 | N | 1899 | 1901.88 | 9.3 | 1.78 | <0.001 | 0.01 | <0.05 | 11.1 | 0.0251 | 5.2 | <0.03 | 0.4 | <0.0005 | 0.0014 | <0.03 | 0.02 |
| | | 7-Oct-08 | N | 1899 | 1901.88 | 5.3 | 1.02 | <0.001 | 0.01F | <0.05 | 8 | 0.0151 | 4.3 | <0.03 | 0.5F | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | | 14-Oct-08 | N | 1899 | 1901.88 | 5.5 | 1.79 | <0.001 | <0.05 | <0.05 | 7.9 | 0.0092 | 4.3 | <0.03 | <2 | <0.0005 | 0.0003F | 0.01F | <0.05 |
| | | 21-Oct-08 | N | 1899 | 1901.88 | 7.2 | 3.65 | <0.001 | 0.02F | <0.05 | 11.6 | 0.0039 | 4.8 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 | <0.05 |
| | | 28-Oct-08 | N | 1899 | 1901.88 | 6.4 | 6.07 | <0.001 | 0.03F | <0.3D2 | 10.8 | 0.0026 | 7 | <0.03 | <2 | 0.0001F | 0.0006 | <0.03 | 0.06 |
| | | 4-Nov-08 | N | 1899 | 1901.88 | 2.1 | 2.33 | <0.001 | 0.02F | <0.05 | 6.8 | 0.0039 | 4.2 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | <0.05 |
| | TEST 52S | 11-Nov-08 | N | 1899 | 1901.88 | 0.7F | 0.878 | <0.001 | <0.05 | <0.05 | 3.7 | 0.0018 | 1.3F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 18-Nov-08 | N | 1899 | 1901.88 | 0.4F | 0.561 | <0.001 | <0.05 | <0.05 | 1.2F | 0.0013 | 0.7F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 25-Nov-08 | N | 1899 | 1901.88 | 0.5F | 0.668 | <0.001 | <0.05 | <0.05 | 1.5F | 0.0009 | 0.7F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 2-Dec-08 | N | 1899 | 1901.88 | <1 | 0.521 | <0.001 | <0.05 | <0.05 | 1.2F | 0.0011 | <2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 9-Dec-08 | N | 1899 | 1901.88 | 0.3F | 0.519 | <0.001 | <0.05 | <0.05 | 1.6F | 0.0008 | <2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 16-Dec-08 | N | 1899 | 1901.88 | <1 | 0.522 | <0.001 | <0.05 | <0.05 | 0.8F | 0.0007 | <2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.02F |
| | | 23-Dec-08 | N | 1899 | 1901.88 | <1 | 0.496 | -- | <0.05 | <0.1D1 | 0.4F | 0.0008 | <2 | -- | <2 | <0.0005 | <0.0005 | -- | <0.1D1 |
| | | 30-Dec-08 | N | 1899 | 1901.88 | 0.5F | 0.606 | -- | <0.05V1 | <0.05 | 1F | 0.001 | <2V1 | -- | 1.2F | <0.0005 | <0.0005 | -- | <0.05 |
| | | 6-Jan-09 | N | 1899 | 1901.88 | <1 | 0.454 | -- | <0.05 | <0.05 | 0.8F | 0.0008 | <2 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 13-Jan-09 | N | 1899 | 1901.88 | 0.4F | 0.423 | <0.001 | 0.01F | <0.05 | 0.6F | 0.001 | <2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 20-Jan-09 | N | 1899 | 1901.88 | 0.6F | 0.619 | -- | <0.05L1V1 | <0.05 | 1F | 0.0013 | 0.5F | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 27-Jan-09 | N | 1899 | 1901.88 | 0.5F | 0.493 | -- | <0.05 | <0.05 | 0.7F | 0.0012 | <2 | -- | <2 | 0.0001F | <0.0005 | -- | <0.05 |
| | | 3-Feb-09 | N | 1899 | 1901.88 | 0.5F | 0.486 | -- | <0.05 | <0.05 | 0.9F | 0.0016 | <2 | -- | <2 | <0.0005 | <0.0005 | -- | <0.05 |
| | | 10-Feb-09 | N | 1899 | 1901.88 | 0.4F | 0.431 | <0.001H3 | <0.05 | <0.05 | 0.7F | 0.0016 | 0.5F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | <0.05 |
| | | 17-Feb-09 | N | 1899 | 1901.88 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 53 | 26-Aug-08 | N | 1984.74 | 1987.74 | 3.2 | 4.97 | <0.001 | <0.05 | 0.26 | 4.9 | 0.0009 | 25.6 | <0.03 | 13.9 | <0.0005 | 0.0005 | 0.02FD1 | 4.87 |
| | | 2-Sep-08 | N | 1984.74 | 1987.74 | 0.4F | 5.25 | <0.001 | <0.05 | 0.28 | 1.4F | 0.0007 | 22.9 | <0.03 | 0.9F | <0.0005 | 0.0004F | <0.03 | 1.42 |
| | | 9-Sep-08 | N | 1984.74 | 1987.74 | <1 | 1.13D2 | <0.001 | <0.05 | 0.23 | 0.8 | 0.0006 | 21.9 | <0.03 | 0.4 | <0.0005 | 0.0004 | <0.05D2 | 3.36 |
| | | 16-Sep-08 | N | 1984.74 | 1987.74 | <1 | 0.221 | <0.001 | <0.1D1 | 0.07D1 | 0.3 | 0.0012 | 17.8 | <0.03 | <2 | <0.0005 | 0.0003 | <0.03 | 3.66D1 |
| | | 23-Sep-08 | N | 1984.74 | 1987.74 | <1 | 0.208 | <0.001 | <0.05 | 0.12 | <8D2 | 0.001 | 22.9 | <0.03 | <2 | 0.0001 | 0.0005 | 0.006 | 4.89 |
| | | 30-Sep-08 | N | 1984.74 | 1987.74 | <1 | 0.128 | <0.001 | <0.05 | 0.02 | 1.3 | 0.0004 | 18.9 | <0.03 | <2 | <0.0005 | 0.0002 | <0.03 | 0.77 |
| | | 7-Oct-08 | N | 1984.74 | 1987.74 | <1 | 0.043 | <0.001 | <0.05 | 0.08 | <3D1 | 0.001 | 16.7 | 0.01F | <2 | <0.0005 | 0.0003F | <0.03 | 2.81 |
| | | 14-Oct-08 | N | 1984.74 | 1987.74 | <1 | 0.029F | <0.001 | 0.01F | 0.05 | <3D1 | 0.001 | 15 | 0.02F | <3D1 | <0.0005 | 0.0001F | 0.007F | 2.32 |
| | | 21-Oct-08 | N | 1984.74 | 1987.74 | <1 | 0.022F | <0.001 | 0.01F | 0.04F | 0.5F | 0.0003F | 12.6 | <0.03 | <2 | <0.0005 | 0.0002F | 0.008F | 1.8 |
| | | 28-Oct-08 | N | 1984.74 | 1987.74 | <2D2 | 0.01FD2 | <0.001 | <0.1D2 | <0.3D2 | <3D2 | 0.0007 | 15.8D2 | <0.05D2 | <3D2 | <0.0005 | 0.0002F | <0.05D2 | 3.58 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 53 | 4-Nov-08 | N | 1984.74 | 1987.74 | <1 | 0.019F | <0.001 | <0.05 | 0.01F | <2 | 0.0004F | 14.8 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 1.58 |
| | | 11-Nov-08 | N | 1984.74 | 1987.74 | <1 | 0.011F | <0.001 | <0.05 | 0.02F | 0.6F | 0.0006 | 11 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 1.5 |
| | | 18-Nov-08 | N | 1984.74 | 1987.74 | <1 | 0.011F | <0.001 | 0.02F | 0.02F | <2 | 0.0002F | 14.2 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 1.94 |
| | | 25-Nov-08 | N | 1984.74 | 1987.74 | <1 | 0.017F | <0.001 | <0.05 | <0.05 | <2 | 0.0002F | 11.9 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 | 0.59 |
| | | 2-Dec-08 | N | 1984.74 | 1987.74 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0003F | 9.3 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 1.94 |
| | | 9-Dec-08 | N | 1984.74 | 1987.74 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.7F | 0.0003F | 9.3 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 2.42 |
| | | 16-Dec-08 | N | 1984.74 | 1987.74 | <1 | 0.006F | <0.001 | 0.01F | <0.05 | <2 | 0.0002F | 8.4 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 2.25 |
| | | 23-Dec-08 | N | 1984.74 | 1987.74 | <1 | <0.03 | -- | <0.05 | 0.01F | <2 | 0.0003F | 8.5 | -- | <2 | <0.0005 | 0.0001F | -- | 2.62 |
| | | 30-Dec-08 | N | 1984.74 | 1987.74 | <1V1 | <0.03 | -- | <0.05V1 | <0.05 | <2 | 0.0003F | 8.7 | -- | <2V1 | <0.0005 | <0.0005 | -- | 2.03 |
| | | 6-Jan-09 | N | 1984.74 | 1987.74 | <1 | <0.03 | -- | <0.05 | 0.02F | <2 | 0.0002F | 6.2 | -- | <2 | <0.0005 | 0.0001F | -- | 2.27 |
| | | 13-Jan-09 | N | 1984.74 | 1987.74 | <1 | <0.03 | <0.001 | <0.05 | 0.03F | <2 | 0.0002F | 6.2 | <0.03 | <2 | <0.0005 | 0.0001F | <0.03 | 2.49 |
| | | 20-Jan-09 | N | 1984.74 | 1987.74 | <1 | <0.03 | -- | <0.05 | 0.02F | <2 | 0.0003F | 7.8 | -- | <2 | <0.0005 | <0.0005 | -- | 2.26 |
| | | 27-Jan-09 | N | 1984.74 | 1987.74 | <1 | <0.03 | -- | <0.05 | <0.05 | <2 | 0.0002F | 4.8 | -- | <2 | 0.0002F | <0.0005 | -- | 2.71 |
| | | 3-Feb-09 | N | 1984.74 | 1987.74 | <1 | <0.03 | -- | <0.05 | 0.02F | <2 | 0.0003F | 5.5 | -- | <2 | <0.0005 | 0.0001F | -- | 3.27 |
| | | 10-Feb-09 | N | 1984.74 | 1987.74 | <1 | <0.03 | <0.001H3 | 0.02F | <0.05 | <2 | 0.0003F | 5.8 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 3.54 |
| | | 17-Feb-09 | N | 1984.74 | 1987.74 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | TEST 54 | 26-Aug-08 | N | 2056.38 | 2075 | 44 | 0.3 | <0.001 | 0.02F | 0.07 | 60 | 0.0351 | 4.3 | <0.03 | 28.5 | 0.0002F | 0.0048 | 0.006F | 0.03F |
| | | 2-Sep-08 | N | 2056.38 | 2075 | 36.1D1 | 0.14D1 | <0.001 | 0.02FD1 | <0.1D1 | 37.4D1 | 0.0282 | 4.2D1 | <0.05D1 | 15.6D1 | 0.0001F | 0.0014 | <0.05D1 | <0.1D1 |
| | | 9-Sep-08 | N | 2056.38 | 2075 | 33.3V1 | 0.15 | <0.001 | 0.02 | <0.05V1 | 30.5 | 0.0184 | 3.9 | <0.03 | 8.9 | <0.0005 | 0.0014 | 0.007 | <0.05 |
| | | 16-Sep-08 | N | 2056.38 | 2075 | 26.1 | 0.157 | <0.001 | 0.02 | <0.05 | 21.6 | 0.0135 | 3.7 | <0.03 | 4.4 | <0.0005 | 0.0006 | <0.03 | <0.05 |
| | | 23-Sep-08 | N | 2056.38 | 2075 | 24.8 | 0.178 | <0.001 | <0.05 | <0.05 | 18.8 | 0.0131 | 3.2 | <0.03 | 2.8 | <0.0005 | 0.0004 | <0.03 | <0.05 |
| | | 30-Sep-08 | N | 2056.38 | 2075 | 27.4 | 0.237 | <0.001 | <0.05 | <0.05 | 18 | 0.0119 | 4 | <0.03 | 1.5 | <0.0005 | 0.0003 | <0.03 | 0.02 |
| | | 7-Oct-08 | N | 2056.38 | 2075 | 19.1 | 0.214 | <0.001 | <0.05 | 0.01F | 11.2 | 0.0101 | 3 | <0.03 | 0.6F | <0.0005 | 0.0002F | <0.03 | 0.02F |
| | | 14-Oct-08 | N | 2056.38 | 2075 | 19 | 0.283 | <0.001 | 0.01F | <0.05 | 10.2 | 0.0079 | 3.4 | 0.02F | 0.4F | <0.0005 | 0.0002F | 0.006F | 0.04F |
| | | 21-Oct-08 | N | 2056.38 | 2075 | 15.8 | 0.248 | <0.001 | 0.02F | <0.05 | 10 | 0.0073B7 | 3.2 | <0.03 | 0.5F | <0.0005 | 0.0002F | <0.03 | 0.02F |
| | | 28-Oct-08 | N | 2056.38 | 2075 | 16.2D2 | 0.29D2 | <0.001 | <0.1D2 | <0.3D2 | 8.1D2 | 0.0068 | 3.7FD2 | <0.05D2 | <3D2 | <0.0005 | 0.0002F | <0.05D2 | 0.66 |
| | | 4-Nov-08 | N | 2056.38 | 2075 | 16.1 | 0.296 | <0.001 | 0.01F | <0.05 | 8.6 | 0.008 | 3.7 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.05 |
| | | 11-Nov-08 | N | 2056.38 | 2075 | 19.9 | 0.369 | <0.001 | <0.05 | 0.01F | 9.3 | 0.0099 | 3.4 | <0.03 | <2 | <0.0005 | 0.0002F | <0.03 | 0.07 |
| | | 18-Nov-08 | N | 2056.38 | 2075 | 12.3 | 0.269 | <0.001 | 0.02F | <0.05 | 6.2 | 0.0056 | 3.4 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.07 |
| | | 25-Nov-08 | N | 2056.38 | 2075 | 11.8 | 0.268 | <0.001 | 0.01F | 0.02F | 5.5 | 0.0058 | 2.8 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.07 |
| | | 2-Dec-08 | N | 2056.38 | 2075 | 12.7 | 0.301 | <0.001 | <0.05 | <0.05 | 5.4 | 0.0055 | 2.8 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.08 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 54 | 9-Dec-08 | N | 2056.38 | 2075 | 11.9 | 0.292 | <0.001 | <0.05 | <0.05 | 5.8 | 0.0056 | 2.7 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.08 |
| | | 16-Dec-08 | N | 2056.38 | 2075 | 10.3 | 0.253 | <0.001 | 0.01F | <0.05 | 3.3D1 | 0.0045 | 2 | <0.03 | <2 | <0.0005 | 0.0003F | <0.03 | 0.06FD1 |
| | | 23-Dec-08 | N | 2056.38 | 2075 | 10.3 | 0.274 | -- | <0.05 | <0.05 | 4.6 | 0.0055 | 2.4 | -- | <2 | <0.0005 | 0.0003F | -- | 0.09 |
| | | 30-Dec-08 | N | 2056.38 | 2075 | 9.9 | 0.308 | -- | <0.05V1 | <0.05 | 4.9 | 0.005 | 2.3 | -- | <2 | <0.0005 | 0.0003F | -- | 0.12 |
| | | 6-Jan-09 | N | 2056.38 | 2075 | 9.3 | 0.238 | -- | 0.02F | <0.05 | 3.9 | 0.0043 | 1.8F | -- | <2 | <0.0005 | 0.0003F | -- | 0.08 |
| | | 13-Jan-09 | N | 2056.38 | 2075 | 10.6 | 0.268 | <0.001 | <0.05 | 0.01F | 4.2 | 0.0056 | 2.7 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | 0.09 |
| | | 20-Jan-09 | N | 2056.38 | 2075 | 9.7 | 0.244 | -- | <0.05 | 0.02F | 3.6 | 0.0045 | 2.5 | -- | <2 | <0.0005 | 0.0003F | -- | 0.1 |
| | | 27-Jan-09 | N | 2056.38 | 2075 | 9 | 0.224 | -- | <0.05 | <0.05 | 3.8 | 0.0041 | 2.1 | -- | <2 | 0.0002F | 0.0003F | -- | 0.11 |
| | | 3-Feb-09 | N | 2056.38 | 2075 | 9.7 | 0.245 | -- | 0.01F | 0.02F | 4 | 0.0045 | 2.6 | -- | <2 | <0.0005 | 0.0004F | -- | 0.13 |
| | | 10-Feb-09 | N | 2056.38 | 2075 | 9.2 | 0.249 | -- | <0.05 | 0.01F | 4.3 | 0.002 | 2.6 | -- | <2 | <0.0005 | 0.0003F | -- | 0.13 |
| | | 17-Feb-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Feb-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Mar-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Mar-09 | N | 2056.38 | 2075 | 9.7 | 0.277 | <0.001 | <0.05 | 0.02F | 4.3 | 0.0041 | 2.2 | <0.03 | <2 | <0.0005 | 0.0004F | 0.006F | 0.18 |
| | | 17-Mar-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 24-Mar-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 31-Mar-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7-Apr-09 | N | 2056.38 | 2075 | 7.5 | 0.19 | <0.001 | <0.05 | <0.05 | 3.2 | 0.0039B7 | 2.2 | <0.03 | <2 | <0.0005 | 0.0004F | <0.03 | 0.17 |
| | | 14-Apr-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Apr-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Apr-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-May-09 | N | 2056.38 | 2075 | 8.9 | 0.219 | <0.001 | 0.02F | 0.02F | 3.3 | 0.004 | 2.1 | <0.03 | <2 | <0.0005 | 0.0004F | 0.005F | 0.22 |
| | | 12-May-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 19-May-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-May-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2-Jun-09 | N | 2056.38 | 2075 | 10.9 | 0.237 | <0.001 | <0.05 | 0.02F | 3.7 | 0.005 | 2.3 | <0.03 | <2 | <0.0005 | 0.0006 | 0.006F | 0.19 |
| | | 9-Jun-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 16-Jun-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 23-Jun-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 30-Jun-09 | N | 2056.38 | 2075 | 13.4 | 0.296 | <0.001 | <0.05 | 0.02F | 4.2 | 0.008B1 | 2.9 | <0.03 | <2 | <0.0005 | 0.001 | <0.03 | 0.26 |
| | | 7-Jul-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | Magnesium MG/L | Manganese MG/L | Mercury MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Uranium MG/L | Vanadium MG/L | Zinc MG/L |
| RES-009E | TEST 54 | 14-Jul-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 21-Jul-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 28-Jul-09 | N | 2056.38 | 2075 | 17 | 0.32 | <0.001 | <0.05 | 0.03F | 3.6 | 0.007 | 2.3 | <0.03 | <2 | <0.0005 | 0.0013 | <0.03 | 0.32 |
| | | 4-Aug-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-Aug-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 18-Aug-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 25-Aug-09 | N | 2056.38 | 2075 | 16.5 | 0.331 | <0.001 | <0.05 | 0.03F | 3.9 | 0.0067 | 3.1 | 0.02F | <2V1 | <0.0005 | 0.0015 | <0.03 | 0.34 |
| | | 1-Sep-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Sep-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Sep-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 22-Sep-09 | N | 2056.38 | 2075 | 16.9 | 0.354 | <0.001 | 0.03F | 0.06 | 3.2 | 0.0071 | 2.1 | <0.03 | <2 | <0.0005 | 0.0017 | 0.01F | 0.41 |
| | | 29-Sep-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6-Oct-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-Oct-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 20-Oct-09 | N | 2056.38 | 2075 | 10.5 | 0.231 | <0.001 | 0.03F | 0.04F | 2.6 | 0.0036 | 1.6F | <0.03 | <2 | <0.0005 | 0.001 | 0.01F | 0.39 |
| | | 27-Oct-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3-Nov-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10-Nov-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 17-Nov-09 | N | 2056.38 | 2075 | 7.8 | 0.18 | <0.001 | <0.05 | 0.02F | 2.7 | 0.0028 | 1.5F | <0.05D1 | <2 | <0.0005 | 0.001 | 0.01F | 0.29 |
| | | 24-Nov-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 1-Dec-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8-Dec-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 15-Dec-09 | N | 2056.38 | 2075 | 6.5 | 0.143 | <0.001 | <0.05 | 0.03FD1 | 2.2 | 0.0025 | 1F | <0.03 | 0.3F | <0.0005 | 0.0007 | <0.05D1 | 0.23 |
| | | 22-Dec-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 29-Dec-09 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5-Jan-10 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 12-Jan-10 | N | 2056.38 | 2075 | 5.7 | 0.127 | <0.001 | <0.05 | <0.05 | 1.6F | 0.0025 | 1F | <0.03 | <2 | <0.0005 | 0.0007 | <0.03 | 0.2 |
| | | 19-Jan-10 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 26-Jan-10 | N | 2056.38 | 2075 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-001C | TEST 1 | 26-Aug-08 | N | 1639 | 1642 | <20 | 218.04 | 3333 | <0.05 | 1770 | 8.06 | 2290 | 1070 |
| | | 2-Sep-08 | N | 1639 | 1642 | <20 | 109 | 3333 | <0.05 | 2840 | 8.08 | 512 | 107 |
| | | 9-Sep-08 | N | 1639 | 1642 | <20 | 30 | 3333 | <0.05 | 3304 | 7.96 | 123 | 21 |
| | | 16-Sep-08 | N | 1639 | 1642 | <20 | 73.47 | 3333 | <0.05 | 3141 | 8.41 | 251 | 40 |
| | | 23-Sep-08 | N | 1639 | 1642 | <20 | <20 | 3333 | <0.05 | 3247 | 7.43 | 119 | 18 |
| | | 30-Sep-08 | N | 1639 | 1642 | <20 | <20 | 3333 | <0.05 | 3244 | 7.43 | 84 | 13 |
| | | 7-Oct-08 | N | 1639 | 1642 | <20 | 46 | 3333 | <0.05 | 3182 | 8.81 | 138 | 25 |
| | | 14-Oct-08 | N | 1639 | 1642 | <20 | 52 | 3333 | <0.05 | 3125 | 8.03 | 189 | 29 |
| | | 21-Oct-08 | N | 1639 | 1642 | <20 | 38 | 3333 | <0.05 | 3283 | 7.79 | 130 | 21 |
| | | 28-Oct-08 | N | 1639 | 1642 | <20 | 38 | 3333 | <0.05 | 3173 | 7.46 | 142 | 24 |
| | | 4-Nov-08 | N | 1639 | 1642 | <20 | 21 | 3333 | <0.05 | 3170 | 7.38 | 69 | <10 |
| | TEST 1S | 11-Nov-08 | N | 1639 | 1642 | <20 | 55 | 3333 | <0.05 | 1517 | 7.86 | 279 | 66 |
| | | 18-Nov-08 | N | 1639 | 1642 | <20 | 25 | 3333 | <0.05 | 3310 | 7.36 | 118 | 29 |
| | | 25-Nov-08 | N | 1639 | 1642 | <5 | 19 | 3333 | <0.05 | 3312 | 6.83 | 104 | 30 |
| | | 2-Dec-08 | N | 1639 | 1642 | <5 | 14 | 3333 | <0.05 | 3220 | 6.85 | 87 | 21 |
| | | 9-Dec-08 | N | 1639 | 1642 | <5 | <5 | 3333 | <0.05 | 3254 | 7.32 | 65 | 17 |
| | | 16-Dec-08 | N | 1639 | 1642 | <5 | 13 | 3333 | <0.05 | 3256 | 7.01 | 70 | 16 |
| | | 23-Dec-08 | N | 1639 | 1642 | <5 | 10 | 3333 | <0.05 | 3266 | 6.77 | 46 | 11 |
| | | 30-Dec-08 | N | 1639 | 1642 | <5 | 13 | 3333 | <0.05 | 3266 | 7.73 | 73 | 19 |
| | | 6-Jan-09 | N | 1639 | 1642 | <5 | 13 | 3333 | <0.05 | 3204 | 7.69 | 82 | 22 |
| | | 13-Jan-09 | N | 1639 | 1642 | <5 | 14 | 3333 | <0.05 | 3263 | 7.79 | 66 | 18 |
| | | 20-Jan-09 | N | 1639 | 1642 | <5 | 11 | 3333 | <0.05 | 3223 | 7.54 | 74 | 20 |
| | | 27-Jan-09 | N | 1639 | 1642 | <5 | 7 | 3333 | <0.05 | 3203 | 7.66 | 67 | 19 |
| | | 3-Feb-09 | N | 1639 | 1642 | <5 | 9 | 3333 | <0.05 | 3133 | 7.72 | 64 | 14 |
| | | 10-Feb-09 | N | 1639 | 1642 | <5 | 14 | 3333 | <0.05 | 3215 | 7.71 | 82 | 22 |
| | | 17-Feb-09 | N | 1639 | 1642 | <5 | 15 | 3333 | <0.05 | 3230 | 7.71 | 93 | 23 |
| | TEST 2 | 26-Aug-08 | N | 1745 | 1748 | <20 | 45.03 | 3333 | <0.05 | 2200 | 7.37 | 2740 | 1860 |
| | | 2-Sep-08 | N | 1745 | 1748 | <20 | 20 | 3333 | <0.05 | 3143 | 7.32 | 1930 | 1060 |
| | | 9-Sep-08 | N | 1745 | 1748 | <20 | 17 | 3333 | <0.05 | 3229 | 7.38 | 1960 | 1200 |
| | | 16-Sep-08 | N | 1745 | 1748 | <20 | 17.775 | 3333 | <0.05 | 3137 | 7.54 | 1690 | 992 |
| | | 23-Sep-08 | N | 1745 | 1748 | <20 | 17 | 3333 | <0.05 | 3117 | 7.74 | 1450 | 884 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-001C | TEST 2 | 30-Sep-08 | N | 1745 | 1748 | <20 | 17 | 3333 | <0.05 | 3212 | 7.74 | 1830 | 1140 |
| | | 7-Oct-08 | N | 1745 | 1748 | <20 | 20 | 3333 | <0.05 | 2968 | 7.18 | 1510 | 907 |
| | | 14-Oct-08 | N | 1745 | 1748 | <20 | 17 | 3333 | <0.05 | 3166 | 7.48 | 1490 | 960 |
| | | 21-Oct-08 | N | 1745 | 1748 | <20 | 18 | 3333 | <0.05 | 3295 | 7.34 | 1240 | 732 |
| | | 28-Oct-08 | N | 1745 | 1748 | <20 | 19 | 3333 | <0.05 | 3051 | 7.88 | 1400 | 853 |
| | | 4-Nov-08 | N | 1745 | 1748 | <20 | 21 | 3333 | <0.05 | 3203 | 7.61 | 1830 | 1050 |
| | | 11-Nov-08 | N | 1745 | 1748 | <20 | 19 | 3333 | <0.05 | 3276 | 7.8 | 1290 | 753 |
| | | 18-Nov-08 | N | 1745 | 1748 | <20 | 12 | 3333 | <0.05 | 2620 | 8.02 | 466 | 230 |
| | | 25-Nov-08 | N | 1745 | 1748 | <5 | 18 | 3333 | <0.05 | 3842 | 7.62 | 1380 | 726 |
| | | 2-Dec-08 | N | 1745 | 1748 | <5 | 15 | 3333 | <0.05 | 3287 | 7.75 | 914 | 492 |
| | | 9-Dec-08 | N | 1745 | 1748 | <5 | 18 | 3333 | <0.05 | 3301 | 7.67 | 1210 | 708 |
| | | 16-Dec-08 | N | 1745 | 1748 | <5 | 15 | 3333 | <0.05 | 3068 | 7.6 | 865 | 457 |
| | | 23-Dec-08 | N | 1745 | 1748 | <5 | 14 | 3333 | <0.05 | 3097 | 7.49 | 848 | 415 |
| | | 30-Dec-08 | N | 1745 | 1748 | <5 | 14 | 3333 | <0.05 | 3119 | 7.66 | 749 | 383 |
| | | 6-Jan-09 | N | 1745 | 1748 | <5 | 14 | 3333 | <0.05 | 3177 | 7.54 | 857 | 452 |
| | | 13-Jan-09 | N | 1745 | 1748 | <5 | 15 | 3333 | <0.05 | 3047 | 7.64 | 890 | 462 |
| | | 20-Jan-09 | N | 1745 | 1748 | <5 | 14 | 3333 | <0.05 | 2987 | 7.66 | 863 | 445 |
| | | 27-Jan-09 | N | 1745 | 1748 | <5 | 14 | 3333 | <0.05 | 3083 | 7.62 | 880 | 504 |
| | | 3-Feb-09 | N | 1745 | 1748 | <5 | 14 | 3333 | <0.05 | 2962 | 7.74 | 921 | 461 |
| | | 10-Feb-09 | N | 1745 | 1748 | <5 | 15 | 3333 | 0.11 | 2494 | 7.49 | 1080 | 625 |
| | | 17-Feb-09 | N | 1745 | 1748 | <5 | 17 | 3333 | 0.14 | 3125 | 7.66 | 877 | 429 |
| | | 24-Feb-09 | N | 1745 | 1748 | <5 | 13.035 | 3333 | <0.05 | 3130 | 7.04 | 901 | 497 |
| | | 3-Mar-09 | N | 1745 | 1748 | <5 | 14.22 | 3333 | <0.05 | 2821 | 7.1 | 981 | 485 |
| | | 10-Mar-09 | N | 1745 | 1748 | <5 | 14.22 | 3333 | <0.05 | 2945 | 7.07 | 937 | 528 |
| | | 17-Mar-09 | N | 1745 | 1748 | <5 | 15.405 | 3333 | <0.05 | 2945 | 7.23 | 930 | 480 |
| | | 24-Mar-09 | N | 1745 | 1748 | <5 | 14.22 | 3333 | <0.05 | 2918 | 6.88 | 915 | 512 |
| | | 31-Mar-09 | N | 1745 | 1748 | 6.995 | 10.665 | 3333 | <0.05 | 2977 | 6.84 | 892 | 474 |
| | | 7-Apr-09 | N | 1745 | 1748 | <5 | 14.22 | 3333 | <0.05 | 3080 | 6.82 | 862 | 488 |
| | | 14-Apr-09 | N | 1745 | 1748 | <5 | 13.035 | 3333 | <0.05 | 2925 | 6.91 | 849 | 461 |
| | | 21-Apr-09 | N | 1745 | 1748 | <5 | 15.405 | 3333 | <0.05 | 3025 | 7.15 | 867 | 480 |
| | | 28-Apr-09 | N | 1745 | 1748 | <5 | 13.035 | 3333 | <0.05 | 2990 | 6.92 | 793 | 449 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-001C | TEST 2 | 5-May-09 | N | 1745 | 1748 | <5 | 13.035 | 3333 | <0.05 | 3168 | 7.3 | 901 | 491 |
| | | 12-May-09 | N | 1745 | 1748 | <5 | 9.48 | 3333 | <0.05 | 3013 | 7 | 873 | 493 |
| | | 19-May-09 | N | 1745 | 1748 | <5 | 14.22 | 3333 | <0.05 | 3111 | 7.03 | 964 | 555 |
| | | 26-May-09 | N | 1745 | 1748 | <5 | 13.92 | 3333 | <0.05 | 3005 | 7.16 | 1060 | 600 |
| | | 2-Jun-09 | N | 1745 | 1748 | <5 | 13.92 | 3333 | <0.05 | 2957 | 6.76 | 868 | 451 |
| | | 9-Jun-09 | N | 1745 | 1748 | <5 | 13.92 | 3333 | <0.05 | 3070 | 7.17 | 958 | 515 |
| | | 16-Jun-09 | N | 1745 | 1748 | <5 | 15.08 | 3333 | <0.05 | 2920 | 7.1 | 949 | 516 |
| | | 23-Jun-09 | N | 1745 | 1748 | <5 | 12.76 | 3333 | <0.05 | 2984 | 7.15 | 976 | 523 |
| | | 30-Jun-09 | N | 1745 | 1748 | 5 | 12.76 | 3333 | <0.05 | 2931 | 7.04 | 875 | 449 |
| | | 7-Jul-09 | N | 1745 | 1748 | <5 | 17.4 | 3333 | <0.05 | 2572 | 7.16 | 1120 | 637 |
| | | 14-Jul-09 | N | 1745 | 1748 | <5 | 15.08 | 3333 | <0.05 | 2843 | 7.14 | 975 | 518 |
| | | 21-Jul-09 | N | 1745 | 1748 | <5 | 16.24 | 3333 | <0.05 | 2822 | 7.53 | 1130 | 649 |
| | | 28-Jul-09 | N | 1745 | 1748 | <5 | 16.24 | 3333 | <0.05 | 2645 | 6.94 | 1240 | 747 |
| | | 4-Aug-09 | N | 1745 | 1748 | <5 | 17.4 | 3333 | <0.05 | 2629 | 7.44 | 1190 | 675 |
| | | 11-Aug-09 | N | 1745 | 1748 | <5 | 15.08 | 3333 | <0.05 | 2792 | 6.97 | 1100 | 677 |
| | | 18-Aug-09 | N | 1745 | 1748 | <5 | 13.92 | 3333 | <0.05 | 2894 | 6.97 | 1050 | 569 |
| | | 25-Aug-09 | N | 1745 | 1748 | <5 | 16.24 | 3333 | -- | 2922 | 7.05 | 1090 | 615 |
| | TEST 3 | 26-Aug-08 | N | 1771.75 | 1791.4 | <20 | 34.365 | 4000 | <0.05 | 2808 | 7.57 | 2000 | 1150 |
| | | 2-Sep-08 | N | 1771.75 | 1791.4 | <20 | 20 | 4000 | <0.05 | 3939 | 7.53 | 1800 | 1040 |
| | | 9-Sep-08 | N | 1771.75 | 1791.4 | <20 | 14 | 4000 | <0.05 | 3815 | 7.66 | 1620 | 834 |
| | | 16-Sep-08 | N | 1771.75 | 1791.4 | <20 | 17.775 | 4000 | 0.07 | 3731 | 7.64 | 1720 | 975 |
| | | 23-Sep-08 | N | 1771.75 | 1791.4 | <20 | 17 | 4000 | <0.05 | 3950 | 7.83 | 1240 | 697 |
| | | 30-Sep-08 | N | 1771.75 | 1791.4 | <20 | 17 | 4000 | <0.05 | 3780 | 7.83 | 1400 | 880 |
| | | 7-Oct-08 | N | 1771.75 | 1791.4 | <20 | 18 | 4000 | <0.05 | 3775 | 7.84 | 1280 | 737 |
| | | 14-Oct-08 | N | 1771.75 | 1791.4 | <20 | 19 | 4000 | <0.05 | 3885 | 7.33 | 1390 | 819 |
| | | 21-Oct-08 | N | 1771.75 | 1791.4 | <20 | 18 | 4000 | <0.05 | 3924 | 7.34 | 1450 | 874 |
| | | 28-Oct-08 | N | 1771.75 | 1791.4 | <20 | 18 | 4000 | <0.05 | 3798 | 7.54 | 1100 | 647 |
| | | 4-Nov-08 | N | 1771.75 | 1791.4 | <20 | 17 | 4000 | <0.05 | 3871 | 7.23 | 1150 | 702 |
| | | 11-Nov-08 | N | 1771.75 | 1791.4 | <20 | 19 | 4000 | <0.05 | 3816 | 7.69 | 1100 | 636 |
| | | 18-Nov-08 | N | 1771.75 | 1791.4 | <20 | 20 | 4000 | <0.05 | 3669 | 7.67 | 1200 | 806 |
| | | 25-Nov-08 | N | 1771.75 | 1791.4 | <5 | 18 | 4000 | <0.05 | 3825 | 7.58 | 968 | 234 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-001C | TEST 3 | 2-Dec-08 | N | 1771.75 | 1791.4 | <5 | 19 | 4000 | <0.05 | 3734 | 7.59 | 1050 | 592 |
| | | 9-Dec-08 | N | 1771.75 | 1791.4 | <5 | 18 | 4000 | <0.05 | 3721 | 7.56 | 1060 | 538 |
| | | 16-Dec-08 | N | 1771.75 | 1791.4 | <5 | 18 | 4000 | <0.05 | 3793 | 7.76 | 906 | 459 |
| | | 23-Dec-08 | N | 1771.75 | 1791.4 | <5 | 21 | 4000 | <0.05 | 3825 | 7.55 | 1170 | 678 |
| | | 30-Dec-08 | N | 1771.75 | 1791.4 | <5 | 18 | 4000 | <0.05 | 3851 | 7.45 | 855 | 431 |
| | | 6-Jan-09 | N | 1771.75 | 1791.4 | <5 | 18 | 4000 | <0.05 | 3889 | 7.46 | 1070 | 576 |
| | | 13-Jan-09 | N | 1771.75 | 1791.4 | <5 | 18 | 4000 | <0.05 | 3768 | 7.49 | 944 | 508 |
| | | 20-Jan-09 | N | 1771.75 | 1791.4 | <5 | 19 | 4000 | <0.05 | 3649 | 7.83 | 951 | 470 |
| | | 27-Jan-09 | N | 1771.75 | 1791.4 | <5 | 17 | 4000 | <0.05 | 3929 | 7.59 | 856 | 476 |
| | | 3-Feb-09 | N | 1771.75 | 1791.4 | <5 | 20 | 4000 | <0.05 | 3684 | 7.48 | 1130 | 670 |
| | | 10-Feb-09 | N | 1771.75 | 1791.4 | <5 | 19 | 4000 | <0.05 | 3922 | 7.49 | 1020 | 554 |
| | | 17-Feb-09 | N | 1771.75 | 1791.4 | <5 | 19 | 4000 | <0.05 | 3801 | 7.68 | 1100 | 565 |
| | TEST 4 | 26-Aug-08 | N | 1855 | 1858 | <20 | 58.065 | 1800 | <0.05 | 960 | 7.7 | 4280 | 2390 |
| | | 2-Sep-08 | N | 1855 | 1858 | <20 | 28 | 1800 | <0.05 | 1758 | 7.51 | 2200 | 1300 |
| | | 9-Sep-08 | N | 1855 | 1858 | <20 | 23 | 1800 | <0.05 | 1717 | 7.45 | 1360 | 791 |
| | | 16-Sep-08 | N | 1855 | 1858 | <20 | 22.515 | 1800 | <0.05 | 1717 | 7.75 | 1780 | 1260 |
| | | 23-Sep-08 | N | 1855 | 1858 | <20 | 14 | 1800 | <0.05 | 1721 | 7.27 | 462 | 183 |
| | | 30-Sep-08 | N | 1855 | 1858 | <20 | 14 | 1800 | <0.05 | 1528 | 7.27 | 605 | 295 |
| | | 7-Oct-08 | N | 1855 | 1858 | <20 | 21 | 1800 | <0.05 | 1752 | 7.32 | 1020 | 572 |
| | | 14-Oct-08 | N | 1855 | 1858 | <20 | 23 | 1800 | <0.05 | 1729 | 7.48 | 893 | 437 |
| | | 21-Oct-08 | N | 1855 | 1858 | <20 | 28 | 1800 | <0.05 | 1673 | 7.99 | 980 | 507 |
| | | 28-Oct-08 | N | 1855 | 1858 | <20 | 28 | 1800 | <0.05 | 1729 | 7.89 | 643 | 299 |
| | | 4-Nov-08 | N | 1855 | 1858 | <20 | 19 | 1800 | <0.05 | 1740 | 7.82 | 368 | 142 |
| | TEST 4S | 11-Nov-08 | N | 1855 | 1858 | <20 | 31 | 1800 | <0.05 | 1205 | 7.81 | 1120 | 652 |
| | | 18-Nov-08 | N | 1855 | 1858 | <20 | 21 | 1800 | <0.05 | 1758 | 7.89 | 342 | 151 |
| | | 25-Nov-08 | N | 1855 | 1858 | <5 | 14 | 1800 | <0.05 | 1771 | 7.56 | 297 | 125 |
| | | 2-Dec-08 | N | 1855 | 1858 | <5 | 17 | 1800 | <0.05 | 1776 | 7.52 | 265 | 111 |
| | | 9-Dec-08 | N | 1855 | 1858 | <5 | 11 | 1800 | <0.05 | 1742 | 7.39 | 195 | 80 |
| | | 16-Dec-08 | N | 1855 | 1858 | <5 | 8 | 1800 | <0.05 | 1736 | 7.37 | 202 | 82 |
| | | 23-Dec-08 | N | 1855 | 1858 | <5 | 9 | 1800 | <0.05 | 1737 | 7.43 | 200 | 84 |
| | TEST 5 | 26-Aug-08 | FD | 1855 | 1858 | <20 | 68 | 1800 | <0.05 | 1006 | 7.52 | 3850 | 2380 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-001C | TEST 5 | 2-Sep-08 | FD | 1855 | 1858 | <20 | 33 | 1800 | <0.05 | 1523 | 7.58 | 2480 | 1490 |
| | | 9-Sep-08 | FD | 1855 | 1858 | <20 | 24 | 1800 | <0.05 | 1582 | 7.55 | 1140 | 662 |
| | | 16-Sep-08 | FD | 1855 | 1858 | <20 | 22.515 | 1800 | <0.05 | 1678 | 7.95 | 1020 | 560 |
| | | 23-Sep-08 | FD | 1855 | 1858 | <20 | 14 | 1800 | <0.05 | 1576 | 7.05 | 1120 | 907 |
| | | 30-Sep-08 | FD | 1855 | 1858 | <20 | 14 | 1800 | <0.05 | 1831 | 7.05 | 1050 | 576 |
| | | 7-Oct-08 | FD | 1855 | 1858 | <20 | 19 | 1800 | <0.05 | 1691 | 7.38 | 755 | 360 |
| | | 14-Oct-08 | FD | 1855 | 1858 | <20 | 21 | 1800 | <0.05 | 1706 | 7.69 | 802 | 407 |
| | | 21-Oct-08 | FD | 1855 | 1858 | <20 | 23 | 1800 | <0.05 | 1765 | 7.84 | 645 | 323 |
| | | 28-Oct-08 | FD | 1855 | 1858 | <20 | 30 | 1800 | <0.05 | 1681 | 8 | 1120 | 613 |
| | | 4-Nov-08 | FD | 1855 | 1858 | <20 | 17 | 1800 | <0.05 | 1726 | 8.21 | 323 | 144 |
| | | 11-Nov-08 | FD | 1855 | 1858 | <20 | 17 | 1800 | <0.05 | 1705 | 7.74 | 314 | 129 |
| | | 18-Nov-08 | FD | 1855 | 1858 | <20 | 25 | 1800 | <0.05 | 1818 | 7.41 | 393 | 171 |
| | | 25-Nov-08 | FD | 1855 | 1858 | <5 | 21 | 1800 | <0.05 | 1695 | 7.47 | 337 | 130 |
| | | 2-Dec-08 | FD | 1855 | 1858 | <5 | 17 | 1800 | <0.05 | 1751 | 7.23 | 280 | 103 |
| | | 9-Dec-08 | FD | 1855 | 1858 | <5 | 21 | 1800 | <0.05 | 1671 | 7.13 | 334 | 142 |
| | | 16-Dec-08 | FD | 1855 | 1858 | <5 | 24 | 1800 | <0.05 | 1696 | 7.09 | 375 | 163 |
| | | 23-Dec-08 | FD | 1855 | 1858 | <5 | 23 | 1800 | <0.05 | 1659 | 7.07 | 316 | 129 |
| | TEST 6 | 26-Aug-08 | N | 1873 | 1876 | <20 | 61.62 | 2667 | <0.05 | 1275 | 7.16 | 2650 | 1720 |
| | | 2-Sep-08 | N | 1873 | 1876 | <20 | 47 | 2667 | <0.05 | 2304 | 7.65 | 974 | 350 |
| | | 9-Sep-08 | N | 1873 | 1876 | <20 | 38 | 2667 | <0.05 | 2711 | 7.84 | 414 | 119 |
| | | 16-Sep-08 | N | 1873 | 1876 | <20 | 75.84 | 2667 | <0.05 | 2473 | 8.36 | 419 | 81 |
| | | 23-Sep-08 | N | 1873 | 1876 | <20 | 40 | 2667 | <0.05 | 2582 | 7.75 | 199 | 46 |
| | | 30-Sep-08 | N | 1873 | 1876 | <20 | 40 | 2667 | <0.05 | 2512 | 7.75 | 142 | 24 |
| | | 7-Oct-08 | N | 1873 | 1876 | <20 | 28 | 2667 | <0.05 | 2496 | 8.01 | 124 | 26 |
| | | 14-Oct-08 | N | 1873 | 1876 | <20 | 24 | 2667 | <0.05 | 2538 | 8.19 | 130 | 31 |
| | | 21-Oct-08 | N | 1873 | 1876 | <20 | 21 | 2667 | <0.05 | 2581 | 7.29 | 270 | 94 |
| | | 28-Oct-08 | N | 1873 | 1876 | <20 | 27 | 2667 | <0.05 | 2608 | 7.95 | 222 | 85 |
| | | 4-Nov-08 | N | 1873 | 1876 | <20 | 28 | 2667 | <0.05 | 2425 | 7.94 | 129 | 28 |
| | | 11-Nov-08 | N | 1873 | 1876 | <20 | 24 | 2667 | <0.05 | 2519 | 8.3 | 82 | 14 |
| | | 18-Nov-08 | N | 1873 | 1876 | <20 | 18 | 2667 | <0.05 | 2540 | 8.39 | 93 | 17 |
| | | 25-Nov-08 | N | 1873 | 1876 | <5 | 21 | 2667 | <0.05 | 2552 | 8.23 | 93 | 19 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-001C | TEST 6 | 2-Dec-08 | N | 1873 | 1876 | <5 | 19 | 2667 | <0.05 | 2546 | 7.82 | 87 | 15 |
| | | 9-Dec-08 | N | 1873 | 1876 | <5 | 20 | 2667 | <0.05 | 2592 | 7.79 | 100 | 23 |
| | | 16-Dec-08 | N | 1873 | 1876 | <5 | 25 | 2667 | <0.05 | 2577 | 7.72 | 143 | 38 |
| | | 23-Dec-08 | N | 1873 | 1876 | <5 | 23 | 2667 | <0.05 | 2580 | 7.88 | 105 | 23 |
| | | 30-Dec-08 | N | 1873 | 1876 | <5 | 23 | 2667 | <0.05 | 2624 | 7.7 | 112 | 24 |
| | | 6-Jan-09 | N | 1873 | 1876 | <5 | 24 | 2667 | <0.05 | 2586 | 7.84 | 110 | 27 |
| | | 13-Jan-09 | N | 1873 | 1876 | <5 | 23 | 2667 | <0.05 | 2557 | 7.88 | 105 | 23 |
| | | 20-Jan-09 | N | 1873 | 1876 | <5 | 34 | 2667 | <0.05 | 2537 | 8.09 | 206 | 55 |
| | | 27-Jan-09 | N | 1873 | 1876 | <5 | 26 | 2667 | <0.05 | 2470 | 8.05 | 110 | 22 |
| | | 3-Feb-09 | N | 1873 | 1876 | <5 | 27 | 2667 | <0.05 | 2468 | 7.81 | 128 | 26 |
| | | 10-Feb-09 | N | 1873 | 1876 | <5 | 28 | 2667 | <0.05 | 2417 | 8.02 | 148 | 37 |
| | | 17-Feb-09 | N | 1873 | 1876 | <5 | 28 | 2667 | <0.05 | 2533 | 7.85 | 133 | 29 |
| | | 24-Feb-09 | N | 1873 | 1876 | <5 | 27.255 | 2667 | <0.05 | 2576 | 7.83 | 126 | 29 |
| | | 3-Mar-09 | N | 1873 | 1876 | <5 | 27.255 | 2667 | <0.05 | 2477 | 7.92 | 126 | 29 |
| | | 10-Mar-09 | N | 1873 | 1876 | <5 | 28.44 | 2667 | <0.05 | 2473 | 7.79 | 129 | 28 |
| | | 17-Mar-09 | N | 1873 | 1876 | <5 | 26.07 | 2667 | <0.05 | 2450 | 7.75 | 137 | 37 |
| | | 24-Mar-09 | N | 1873 | 1876 | <5 | 28.44 | 2667 | <0.05 | 2382 | 7.72 | 159 | 46 |
| | | 31-Mar-09 | N | 1873 | 1876 | <5 | 34.365 | 2667 | 0.09 | 2320 | 7.76 | 241 | 81 |
| | | 7-Apr-09 | N | 1873 | 1876 | <5 | 28.44 | 2667 | <0.05 | 2593 | 7.82 | 152 | 39 |
| | | 14-Apr-09 | N | 1873 | 1876 | <5 | 26.07 | 2667 | <0.05 | 2487 | 7.93 | 138 | 34 |
| | | 21-Apr-09 | N | 1873 | 1876 | <5 | 27.255 | 2667 | <0.05 | 2430 | 7.99 | 161 | 45 |
| | | 28-Apr-09 | N | 1873 | 1876 | <5 | 22.515 | 2667 | <0.05 | 2418 | 7.85 | 130 | 33 |
| | | 5-May-09 | N | 1873 | 1876 | <5 | 33.18 | 2667 | <0.05 | 2460 | 7.92 | 181 | 47 |
| | | 12-May-09 | N | 1873 | 1876 | <5 | 33.18 | 2667 | <0.05 | 2431 | 7.83 | 197 | 54 |
| | | 19-May-09 | N | 1873 | 1876 | <5 | 59.25 | 2667 | <0.05 | 2151 | 8.26 | 588 | 231 |
| | | 26-May-09 | N | 1873 | 1876 | <5 | 30.16 | 2667 | <0.05 | 2530 | 7.92 | 148 | 37 |
| | | 2-Jun-09 | N | 1873 | 1876 | <5 | 41.76 | 2667 | <0.05 | 2374 | 7.89 | 253 | 74 |
| | | 9-Jun-09 | N | 1873 | 1876 | <5 | 25.52 | 2667 | <0.05 | 2484 | 8.44 | 84 | 15 |
| | | 16-Jun-09 | N | 1873 | 1876 | <5 | 24.36 | 2667 | <0.05 | 2484 | 7.84 | 126 | 30 |
| | | 23-Jun-09 | N | 1873 | 1876 | <5 | 37.12 | 2667 | <0.05 | 2282 | 7.91 | 273 | 89 |
| | | 30-Jun-09 | N | 1873 | 1876 | <5 | 34.8 | 2667 | <0.05 | 2272 | 7.77 | 310 | 105 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-001C | TEST 6 | 7-Jul-09 | N | 1873 | 1876 | <5 | 53.36 | 2667 | <0.05 | 2033 | 7.88 | 643 | 265 |
| | | 14-Jul-09 | N | 1873 | 1876 | <5 | 56.84 | 2667 | <0.05 | 2465 | 7.92 | 384 | 115 |
| | | 21-Jul-09 | N | 1873 | 1876 | <5 | 54.52 | 2667 | <0.05 | 2164 | 8.03 | 462 | 152 |
| | | 28-Jul-09 | N | 1873 | 1876 | <5 | 54.52 | 2667 | <0.05 | 2420 | 7.94 | 377 | 114 |
| | | 4-Aug-09 | N | 1873 | 1876 | <5 | 59.16 | 2667 | <0.05 | 2331 | 7.98 | 354 | 103 |
| | | 11-Aug-09 | N | 1873 | 1876 | <5 | 37.12 | 2667 | <0.05 | 2283 | 7.83 | 353 | 137 |
| | | 18-Aug-09 | N | 1873 | 1876 | <5 | 39.44 | 2667 | <0.05 | 2539 | 7.73 | 184 | 41 |
| | | 25-Aug-09 | N | 1873 | 1876 | <5 | 40.6 | 2667 | -- | 2431 | 7.89 | 287 | 88 |
| | TEST 7 | 26-Aug-08 | N | 2041 | 2044 | <20 | 123.24 | 1000 | <0.05 | 712 | 7.84 | 3050 | 1680 |
| | | 2-Sep-08 | N | 2041 | 2044 | <20 | 33 | 1000 | <0.05 | 947 | 7.66 | 1200 | 600 |
| | | 9-Sep-08 | N | 2041 | 2044 | <20 | 24 | 1000 | <0.05 | 963 | 7.69 | 800 | 370 |
| | | 16-Sep-08 | N | 2041 | 2044 | <20 | 39.105 | 1000 | <0.05 | 938 | 7.82 | 1250 | 673 |
| | | 23-Sep-08 | N | 2041 | 2044 | <20 | 38 | 1000 | -- | 935 | 7.98 | 974 | 500 |
| | | 30-Sep-08 | N | 2041 | 2044 | <20 | 38 | 1000 | <0.05 | 859 | 7.98 | 974 | 488 |
| | | 7-Oct-08 | N | 2041 | 2044 | 6 | 28 | 1000 | <0.05 | 809 | 7.56 | 998 | 497 |
| | | 14-Oct-08 | N | 2041 | 2044 | <20 | 26 | 1000 | <0.05 | 915 | 7.31 | 563 | 212 |
| | | 21-Oct-08 | N | 2041 | 2044 | <20 | 30 | 1000 | <0.05 | 879 | 7.37 | 622 | 284 |
| | | 28-Oct-08 | N | 2041 | 2044 | <20 | 28 | 1000 | <0.05 | 911 | 7 | 569 | 316 |
| | | 4-Nov-08 | N | 2041 | 2044 | <20 | 26 | 1000 | <0.05 | 914 | 7.47 | 518 | 210 |
| | | 11-Nov-08 | N | 2041 | 2044 | <20 | 31 | 1000 | <0.05 | 821 | 7.85 | 554 | 246 |
| | | 18-Nov-08 | N | 2041 | 2044 | <20 | 36 | 1000 | <0.05 | 861 | 7.86 | 1130 | 604 |
| | | 25-Nov-08 | N | 2041 | 2044 | <5 | 25 | 1000 | <0.05 | 917 | 7.62 | 466 | 197 |
| | | 2-Dec-08 | N | 2041 | 2044 | <5 | 25 | 1000 | <0.05 | 920 | 7.55 | 463 | 196 |
| | | 9-Dec-08 | N | 2041 | 2044 | <5 | 30 | 1000 | <0.05 | 963 | 7.78 | 508 | 221 |
| | | 16-Dec-08 | N | 2041 | 2044 | <5 | 26 | 1000 | <0.05 | 920 | 7.64 | 391 | 162 |
| | | 23-Dec-08 | N | 2041 | 2044 | <5 | 31 | 1000 | <0.05 | 848 | 7.76 | 435 | 175 |
| | | 30-Dec-08 | N | 2041 | 2044 | <5 | 28 | 1000 | <0.05 | 953 | 7.74 | 431 | 182 |
| | | 6-Jan-09 | N | 2041 | 2044 | <5 | 30 | 1000 | <0.05 | 836 | 7.71 | 493 | 215 |
| | | 13-Jan-09 | N | 2041 | 2044 | <5 | 37 | 1000 | <0.05 | 880 | 7.75 | 514 | 234 |
| | | 20-Jan-09 | N | 2041 | 2044 | <5 | 38 | 1000 | <0.05 | 839 | 7.71 | 507 | 233 |
| | | 27-Jan-09 | N | 2041 | 2044 | <5 | 37 | 1000 | <0.05 | 842 | 7.82 | 534 | 232 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-001C | TEST 7 | 3-Feb-09 | N | 2041 | 2044 | <5 | 38 | 1000 | <0.05 | 844 | 7.79 | 532 | 223 |
| | | 10-Feb-09 | N | 2041 | 2044 | <5 | 38 | 1000 | <0.05 | 875 | 7.75 | 499 | 203 |
| | | 17-Feb-09 | N | 2041 | 2044 | <5 | 39 | 1000 | 0.06 | 945 | 7.75 | 495 | 206 |
| | TEST 8 | 26-Aug-08 | FD | 2041 | 2044 | <20 | 176.565 | 2667 | <0.05 | 1569 | 7.75 | 3300 | 2210 |
| | | 2-Sep-08 | FD | 2041 | 2044 | <20 | 36 | 2667 | <0.05 | 2603 | 7.33 | 2440 | 1460 |
| | | 9-Sep-08 | FD | 2041 | 2044 | <20 | 43 | 2667 | <0.05 | 2640 | 7.73 | 2150 | 1250 |
| | | 16-Sep-08 | FD | 2041 | 2044 | <20 | 36.735 | 2667 | <0.05 | 2609 | 7.86 | 1750 | 1050 |
| | | 23-Sep-08 | FD | 2041 | 2044 | <20 | 39 | 2667 | <0.05 | 2499 | 7.85 | 1590 | 932 |
| | | 30-Sep-08 | FD | 2041 | 2044 | <20 | 39 | 2667 | <0.05 | 2487 | 7.85 | 1530 | 840 |
| | | 7-Oct-08 | FD | 2041 | 2044 | <20 | 37 | 2667 | <0.05 | 2513 | 7.94 | 1490 | 1570 |
| | | 14-Oct-08 | FD | 2041 | 2044 | <20 | 33 | 2667 | <0.05 | 2479 | 7.87 | 1280 | 639 |
| | | 21-Oct-08 | FD | 2041 | 2044 | <20 | 38 | 2667 | <0.05 | 2562 | 7.86 | 1290 | 695 |
| | | 28-Oct-08 | FD | 2041 | 2044 | <20 | 38 | 2667 | <0.05 | 2470 | 7.31 | 1290 | 829 |
| | | 4-Nov-08 | FD | 2041 | 2044 | <20 | 41 | 2667 | <0.05 | 2401 | 7.89 | 1220 | 679 |
| | | 11-Nov-08 | FD | 2041 | 2044 | <20 | 40 | 2667 | <0.05 | 2454 | 7.75 | 1270 | 710 |
| | | 18-Nov-08 | FD | 2041 | 2044 | <20 | 43 | 2667 | <0.05 | 2369 | 7.87 | 1190 | 634 |
| | | 25-Nov-08 | FD | 2041 | 2044 | <5 | 39 | 2667 | <0.05 | 2533 | 7.75 | 1010 | 505 |
| | | 2-Dec-08 | FD | 2041 | 2044 | <5 | 75 | 2667 | <0.05 | 2685 | 7.76 | 1270 | 656 |
| | | 9-Dec-08 | FD | 2041 | 2044 | <5 | 38 | 2667 | <0.05 | 2449 | 7.51 | 1090 | 564 |
| | | 16-Dec-08 | FD | 2041 | 2044 | <5 | 39 | 2667 | <0.05 | 2545 | 7.75 | 934 | 433 |
| | | 23-Dec-08 | FD | 2041 | 2044 | <5 | 50 | 2667 | <0.05 | 2472 | 7.89 | 930 | 451 |
| | | 30-Dec-08 | FD | 2041 | 2044 | <5 | 55 | 2667 | <0.05 | 2486 | 7.78 | 966 | 478 |
| | | 6-Jan-09 | FD | 2041 | 2044 | <5 | 40 | 2667 | <0.05 | 2565 | 7.75 | 1030 | 520 |
| | | 13-Jan-09 | FD | 2041 | 2044 | <5 | 37 | 2667 | <0.05 | 2468 | 7.63 | 977 | 503 |
| | | 20-Jan-09 | FD | 2041 | 2044 | <5 | 38 | 2667 | <0.05 | 2358 | 7.68 | 926 | 437 |
| | | 27-Jan-09 | FD | 2041 | 2044 | <5 | 38 | 2667 | <0.05 | 2517 | 7.84 | 848 | 395 |
| | | 3-Feb-09 | FD | 2041 | 2044 | <5 | 38 | 2667 | <0.05 | 2328 | 7.77 | 842 | 437 |
| | | 10-Feb-09 | FD | 2041 | 2044 | <5 | 40 | 2667 | <0.05 | 2420 | 7.78 | 810 | 372 |
| | | 17-Feb-09 | FD | 2041 | 2044 | <5 | 43 | 2667 | 0.16 | 2413 | 7.78 | 798 | 359 |
| RES-002A | TEST 10 | 26-Aug-08 | N | 1154 | 1156 | 282.1 | 5.925 | 1800 | <0.05 | 950 | 4.68 | 2310 | 1310 |
| | | 2-Sep-08 | N | 1154 | 1156 | 24 | <20 | 1800 | <0.05 | 1710 | 5.32 | 268 | 48 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-002A | TEST 10 | 9-Sep-08 | N | 1154 | 1156 | 22 | <20 | 1800 | 0.14 | 1807 | 5.25 | 144 | 57 |
| | | 16-Sep-08 | N | 1154 | 1156 | 28.09 | <20 | 1800 | <0.05 | 1665 | 5.37 | 138 | 56 |
| | | 23-Sep-08 | N | 1154 | 1156 | 15 | <20 | 1800 | <0.05 | 1731 | 5.26 | 58 | 20 |
| | | 30-Sep-08 | N | 1154 | 1156 | 15 | <20 | 1800 | <0.05 | 1780 | 5.26 | 93 | 35 |
| | | 7-Oct-08 | N | 1154 | 1156 | 29 | <20 | 1800 | <0.05 | 1753 | 5.2 | 89 | 27 |
| | | 14-Oct-08 | N | 1154 | 1156 | 18 | <20 | 1800 | <0.05 | 1768 | 5.19 | 66 | 26 |
| | | 21-Oct-08 | N | 1154 | 1156 | 14 | <20 | 1800 | <0.05 | 1739 | 5.41 | 53 | 19 |
| | | 28-Oct-08 | N | 1154 | 1156 | 15 | <20 | 1800 | <0.05 | 1775 | 5.23 | 65 | 29 |
| | | 4-Nov-08 | N | 1154 | 1156 | 20 | <20 | 1800 | 0.08 | 1707 | 4.95 | 100 | 38 |
| | TEST 10S | 11-Nov-08 | N | 1154 | 1156 | 26 | <20 | 1800 | <0.05 | 1229 | 5.35 | 106 | 41 |
| | | 18-Nov-08 | N | 1154 | 1156 | 10 | <20 | 1800 | <0.05 | 1729 | 5.22 | 41 | 14 |
| | | 25-Nov-08 | N | 1154 | 1156 | 10 | <5 | 1800 | <0.05 | 1793 | 4.71 | 36 | 11 |
| | | 2-Dec-08 | N | 1154 | 1156 | 10 | <5 | 1800 | <0.05 | 1712 | 5.26 | 38 | <10 |
| | | 9-Dec-08 | N | 1154 | 1156 | 10 | <5 | 1800 | <0.05 | 1758 | 5.02 | 41 | 14 |
| | | 16-Dec-08 | N | 1154 | 1156 | 12 | <5 | 1800 | <0.05 | 1728 | 5.04 | 46 | 15 |
| | | 23-Dec-08 | N | 1154 | 1156 | <5 | <5 | 1800 | <0.05 | 1692 | 5.07 | 49 | 17 |
| | TEST 11 | 26-Aug-08 | N | 1414.6 | 1417 | 438.81 | <20 | 1800 | <0.05 | 985 | 4.38 | 1930 | 1080 |
| | | 2-Sep-08 | N | 1414.6 | 1417 | 145 | <20 | 1800 | <0.05 | 1849 | 4.69 | 505 | 215 |
| | | 9-Sep-08 | N | 1414.6 | 1417 | 271 | <20 | 1800 | <0.05 | 1757 | 4.44 | 746 | 427 |
| | | 16-Sep-08 | N | 1414.6 | 1417 | 359.36 | <20 | 1800 | <0.05 | 1673 | 4.61 | 841 | 516 |
| | | 23-Sep-08 | N | 1414.6 | 1417 | 315 | <20 | 1800 | <0.05 | 1725 | 4.5 | 739 | 376 |
| | | 30-Sep-08 | N | 1414.6 | 1417 | 315 | <20 | 1800 | <0.05 | 1697 | 4.5 | 618 | 342 |
| | | 7-Oct-08 | N | 1414.6 | 1417 | 334 | <20 | 1800 | <0.05 | 1641 | 4.43 | 709 | 342 |
| | | 14-Oct-08 | N | 1414.6 | 1417 | 179 | <20 | 1800 | <0.05 | 1713 | 4.45 | 437 | 216 |
| | | 21-Oct-08 | N | 1414.6 | 1417 | 105 | <20 | 1800 | <0.05 | 1728 | 4.26 | 282 | 128 |
| | | 28-Oct-08 | N | 1414.6 | 1417 | 193 | <20 | 1800 | <0.05 | 1715 | 4.4 | 521 | 250 |
| | | 4-Nov-08 | N | 1414.6 | 1417 | 181 | <20 | 1800 | <0.05 | 1707 | 4.13 | 458 | 273 |
| | | 11-Nov-08 | N | 1414.6 | 1417 | 76 | <20 | 1800 | 1.41 | 1793 | 4.14 | 222 | 85 |
| | | 18-Nov-08 | N | 1414.6 | 1417 | 59 | <20 | 1800 | 0.42 | 1770 | 4.24 | 194 | 87 |
| | | 25-Nov-08 | N | 1414.6 | 1417 | 60 | <5 | 1800 | 0.17 | 1705 | 4.21 | 184 | 68 |
| | | 2-Dec-08 | N | 1414.6 | 1417 | 128 | <5 | 1800 | <0.05 | 1717 | 4.16 | 337 | 143 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-002A | TEST 11 | 9-Dec-08 | N | 1414.6 | 1417 | 96 | <5 | 1800 | <0.05 | 1646 | 4.08 | 279 | 121 |
| | | 16-Dec-08 | N | 1414.6 | 1417 | 68 | <5 | 1800 | <0.05 | 1687 | 4.2 | 194 | 77 |
| | | 23-Dec-08 | N | 1414.6 | 1417 | 81 | <5 | 1800 | 0.51 | 1657 | 4.13 | 235 | 104 |
| | | 30-Dec-08 | N | 1414.6 | 1417 | 91 | <5 | 1800 | 0.11 | 1581 | 4.1 | 249 | 105 |
| | | 6-Jan-09 | N | 1414.6 | 1417 | 113 | <5 | 1800 | 0.35 | 1655 | 4.08 | 306 | 137 |
| | | 13-Jan-09 | N | 1414.6 | 1417 | 152 | <5 | 1800 | 0.75 | 1437 | 4.03 | 387 | 186 |
| | | 20-Jan-09 | N | 1414.6 | 1417 | 153 | <5 | 1800 | 0.82 | 1618 | 3.9 | 395 | 169 |
| | | 27-Jan-09 | N | 1414.6 | 1417 | 193 | <5 | 1800 | 0.86 | 1669 | 3.92 | 481 | 239 |
| | | 3-Feb-09 | N | 1414.6 | 1417 | 148 | <5 | 1800 | 3.05 | 1622 | 3.91 | 390 | 171 |
| | | 10-Feb-09 | N | 1414.6 | 1417 | 137 | <5 | 1800 | 3.74 | 1487 | 3.94 | 366 | 158 |
| | | 17-Feb-09 | N | 1414.6 | 1417 | 157 | <5 | 1800 | 4.8 | 1647 | 3.88 | 433 | 193 |
| | TEST 12 | 26-Aug-08 | N | 1454 | 1457 | 227.27 | 8.295 | 1800 | <0.05 | 1065 | 5.1 | 1470 | 773 |
| | | 2-Sep-08 | N | 1454 | 1457 | <20 | 12 | 1800 | <0.05 | 1718 | 6.6 | 155 | 57 |
| | | 9-Sep-08 | N | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1739 | 6.32 | 73 | 19 |
| | | 16-Sep-08 | N | 1454 | 1457 | 8.205 | 4.74 | 1800 | <0.05 | 1724 | 6.84 | 54 | 16 |
| | | 23-Sep-08 | N | 1454 | 1457 | 6 | <20 | 1800 | <0.05 | 1698 | 6.42 | 60 | 18 |
| | | 30-Sep-08 | N | 1454 | 1457 | 6 | <20 | 1800 | <0.05 | 1694 | 6.42 | 49 | 14 |
| | | 7-Oct-08 | N | 1454 | 1457 | 6 | 9 | 1800 | <0.05 | 1700 | 7.22 | 41 | 10 |
| | | 14-Oct-08 | N | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1689 | 6.71 | 30 | <10 |
| | | 21-Oct-08 | N | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1711 | 6.67 | 21 | <10 |
| | | 28-Oct-08 | N | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1682 | 7.61 | 22 | <10 |
| | | 4-Nov-08 | N | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1728 | 6.2 | 23 | <10 |
| | | 11-Nov-08 | N | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1682 | 6.43 | 18 | <10 |
| | | 18-Nov-08 | N | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1614 | 5.87 | 16 | 11 |
| | | 25-Nov-08 | N | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1543 | 5.39 | 17 | <10 |
| | | 2-Dec-08 | N | 1454 | 1457 | <5 | 6 | 1800 | <0.05 | 1336 | 6.14 | 15 | <10 |
| | | 9-Dec-08 | N | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1607 | 5.67 | 15 | <10 |
| | | 16-Dec-08 | N | 1454 | 1457 | 8 | <5 | 1800 | <0.05 | 1703 | 5.84 | 13 | <10 |
| | | 23-Dec-08 | N | 1454 | 1457 | 8 | <5 | 1800 | <0.05 | 1688 | 5.93 | 13 | <10 |
| | | 30-Dec-08 | N | 1454 | 1457 | 6 | 6 | 1800 | <0.05 | 1675 | 6.46 | 14 | <10 |
| | | 6-Jan-09 | N | 1454 | 1457 | <5 | 6 | 1800 | <0.05 | 1597 | 6.24 | 14 | <10 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-002A | TEST 12 | 13-Jan-09 | N | 1454 | 1457 | 5 | 7 | 1800 | <0.05 | 1672 | 6.3 | 14 | <10 |
| | | 20-Jan-09 | N | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1594 | 6.3 | 11 | <10 |
| | | 27-Jan-09 | N | 1454 | 1457 | 5 | <5 | 1800 | <0.05 | 1684 | 6.23 | 12 | <10 |
| | | 3-Feb-09 | N | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1595 | 6.53 | 12 | <10 |
| | | 10-Feb-09 | N | 1454 | 1457 | 5 | <5 | 1800 | <0.05 | 1595 | 6.4 | 12 | <10 |
| | | 17-Feb-09 | N | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1645 | 6.15 | 16 | <10 |
| | | 24-Feb-09 | N | 1454 | 1457 | 7.385 | <5 | 1800 | <0.05 | 1710 | 5.91 | 18 | <10 |
| | | 3-Mar-09 | N | 1454 | 1457 | 7.385 | <5 | 1800 | <0.05 | 1629 | 6.01 | 15 | <10 |
| | | 10-Mar-09 | N | 1454 | 1457 | 7.45 | <5 | 1800 | <0.05 | 1669 | 5.77 | 17 | <10 |
| | | 17-Mar-09 | N | 1454 | 1457 | 9.69 | <5 | 1800 | <0.05 | 1657 | 5.71 | 18 | <10 |
| | | 24-Mar-09 | N | 1454 | 1457 | 10.81 | <5 | 1800 | <0.05 | 1653 | 5.83 | 17 | <10 |
| | | 31-Mar-09 | N | 1454 | 1457 | 7.385 | <5 | 1800 | <0.05 | 1582 | 5.68 | 17 | <10 |
| | | 7-Apr-09 | N | 1454 | 1457 | 6.265 | <5 | 1800 | <0.05 | 1684 | 5.74 | 21 | <10 |
| | | 14-Apr-09 | N | 1454 | 1457 | 9.625 | <5 | 1800 | <0.05 | 1685 | 5.71 | 19 | <10 |
| | | 21-Apr-09 | N | 1454 | 1457 | 10.745 | <5 | 1800 | <0.05 | 1691 | 5.73 | 24 | <10 |
| | | 28-Apr-09 | N | 1454 | 1457 | 6.265 | <5 | 1800 | <0.05 | 1759 | 5.66 | 24 | <10 |
| | | 5-May-09 | N | 1454 | 1457 | 9.625 | <5 | 1800 | <0.05 | 1645 | 5.52 | 27 | <10 |
| | | 12-May-09 | N | 1454 | 1457 | 12.985 | <5 | 1800 | <0.05 | 1635 | 5.51 | 39 | 15 |
| | | 19-May-09 | N | 1454 | 1457 | 11.93 | <5 | 1800 | <0.05 | 1562 | 5.61 | 34 | 11 |
| | | 26-May-09 | N | 1454 | 1457 | 19.88 | <5 | 1800 | <0.05 | 1729 | 5.53 | 61 | 24 |
| | | 2-Jun-09 | N | 1454 | 1457 | 25.48 | <5 | 1800 | <0.05 | 1641 | 5.48 | 82 | 32 |
| | | 9-Jun-09 | N | 1454 | 1457 | 48.96 | <5 | 1800 | <0.05 | 1688 | 5.48 | 151 | 81 |
| | | 16-Jun-09 | N | 1454 | 1457 | 88.2 | <5 | 1800 | <0.05 | 1624 | 5.37 | 224 | 106 |
| | | 23-Jun-09 | N | 1454 | 1457 | 154.32 | <5 | 1800 | <0.05 | 1590 | 5.19 | 382 | 215 |
| | | 30-Jun-09 | N | 1454 | 1457 | 274.16 | <5 | 1800 | <0.05 | 1656 | 5.03 | 561 | 310 |
| | | 7-Jul-09 | N | 1454 | 1457 | 422 | <5 | 1800 | <0.05 | 1563 | 4.97 | 949 | 577 |
| | | 14-Jul-09 | N | 1454 | 1457 | 587.76 | <5 | 1800 | <0.05 | 1545 | 4.85 | 1200 | 736 |
| | | 21-Jul-09 | N | 1454 | 1457 | 646.96 | <5 | 1800 | <0.05 | 1451 | 4.75 | 1350 | 908 |
| | | 28-Jul-09 | N | 1454 | 1457 | 526 | <5 | 1800 | <0.05 | 1580 | 4.79 | 1090 | 642 |
| | | 4-Aug-09 | N | 1454 | 1457 | 485.68 | <5 | 1800 | <0.05 | 1633 | 4.85 | 1040 | 615 |
| | | 11-Aug-09 | N | 1454 | 1457 | 584.16 | <5 | 1800 | <0.05 | 1621 | 4.77 | 1170 | 686 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-002A | TEST 12 | 18-Aug-09 | N | 1454 | 1457 | 664.8 | <5 | 1800 | <0.05 | 1478 | 4.7 | 1370 | 865 |
| | | 25-Aug-09 | N | 1454 | 1457 | 685.04 | <5 | 1800 | -- | 1646 | 4.72 | 1370 | 875 |
| | | 1-Sep-09 | N | 1454 | 1457 | 698 | <5 | 1800 | <0.05 | 1533 | 4.57 | 1320 | 890 |
| | | 8-Sep-09 | N | 1454 | 1457 | 870.88 | <5 | 1800 | 0.09 | 1403 | 4.66 | 1710 | 1160 |
| | | 15-Sep-09 | N | 1454 | 1457 | 805.92 | <5 | 1800 | <0.05 | 1271 | 4.8 | 1420 | 987 |
| | | 22-Sep-09 | N | 1454 | 1457 | 727.6 | <5 | 1800 | 0 | 1534 | 4.55 | 1320 | 885 |
| | | 29-Sep-09 | N | 1454 | 1457 | 508 | <5 | 1800 | <1 | 1488 | 5.01 | 945 | 652 |
| | | 6-Oct-09 | N | 1454 | 1457 | 626.88 | <5 | 1800 | <0.05 | 1534 | 4.69 | 1130 | 745 |
| | | 13-Oct-09 | N | 1454 | 1457 | 380.48 | <5 | 1800 | <0.05 | 1579 | 4.84 | 924 | 531 |
| | | 20-Oct-09 | N | 1454 | 1457 | 355.76 | <5 | 1800 | <0.05 | 1568 | 4.89 | 829 | 473 |
| | | 27-Oct-09 | N | 1454 | 1457 | 301.92 | <2.5 | 1800 | <0.025 | 1614 | 4.99 | 713 | 400 |
| | | 3-Nov-09 | N | 1454 | 1457 | 301.84 | <2.5 | 1800 | <0.025 | 1665 | -- | 750 | 412 |
| | | 10-Nov-09 | N | 1454 | 1457 | 366.96 | <2.5 | 1800 | <0.025 | 1599 | 4.96 | 882 | 492 |
| | | 17-Nov-09 | N | 1454 | 1457 | 443.12 | <5 | 1800 | <0.05 | 1419 | 4.9 | 989 | 604 |
| | | 24-Nov-09 | N | 1454 | 1457 | 315 | <5 | -- | <0.05 | 1616 | 5.1 | 740 | 402 |
| | | 1-Dec-09 | N | 1454 | 1457 | 346.8 | <5 | 1800 | <0.05 | 1638 | 4.97 | 785 | 429 |
| | | 8-Dec-09 | N | 1454 | 1457 | 351.28 | <5 | 1800 | <0.05 | 1623 | 4.91 | 787 | 441 |
| | | 15-Dec-09 | N | 1454 | 1457 | 346.8 | <5 | 1800 | <0.05 | 1584 | 4.98 | 794 | 455 |
| | | 22-Dec-09 | N | 1454 | 1457 | 308.8 | <5 | 1800 | <0.05 | 1598 | 5.06 | 746 | 424 |
| | | 29-Dec-09 | N | 1454 | 1457 | 378.384 | <5 | -- | <0.05 | 1601 | 4.95 | 837 | 510 |
| | | 5-Jan-10 | N | 1454 | 1457 | 362.4 | <5 | -- | <0.05 | 1662 | 5.07 | 815 | 448 |
| | | 12-Jan-10 | N | 1454 | 1457 | 328.96 | <5 | -- | <0.05 | 1683 | 4.92 | 742 | 376 |
| | | 19-Jan-10 | N | 1454 | 1457 | 322.24 | <5 | -- | <0.05 | 1639 | 4.9 | 707 | 372 |
| | | 26-Jan-10 | N | 1454 | 1457 | 346.96 | <5 | -- | <0.05 | 1659 | 4.95 | 770 | 431 |
| | TEST 13 | 26-Aug-08 | FD | 1454 | 1457 | 224.31 | 7.11 | 1800 | <0.05 | 1091 | 5.14 | 1420 | 808 |
| | | 2-Sep-08 | FD | 1454 | 1457 | <20 | 5 | 1800 | <0.05 | 1573 | 6.04 | 125 | 35 |
| | | 9-Sep-08 | FD | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1654 | 6.38 | 74 | 22 |
| | | 16-Sep-08 | FD | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1317 | 6.67 | 61 | 18 |
| | | 23-Sep-08 | FD | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1660 | 6.3 | 34 | <10 |
| | | 30-Sep-08 | FD | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1447 | 6.3 | 64 | 19 |
| | | 7-Oct-08 | FD | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1530 | 6.82 | 44 | 12 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-002A | TEST 13 | 14-Oct-08 | FD | 1454 | 1457 | <20 | 6 | 1800 | <0.05 | 1415 | 7.06 | 26 | <10 |
| | | 21-Oct-08 | FD | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1505 | 6.8 | 26 | <10 |
| | | 28-Oct-08 | FD | 1454 | 1457 | <20 | 6 | 1800 | <0.05 | 1531 | 7.33 | 20 | <10 |
| | | 4-Nov-08 | FD | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1659 | 7.05 | 14 | <10 |
| | | 11-Nov-08 | FD | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1648 | 6.58 | 15 | <10 |
| | | 18-Nov-08 | FD | 1454 | 1457 | <20 | <20 | 1800 | <0.05 | 1368 | 5.96 | 16 | <10 |
| | | 25-Nov-08 | FD | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1570 | 6.69 | 15 | <10 |
| | | 2-Dec-08 | FD | 1454 | 1457 | <5 | 7 | 1800 | <0.05 | 1526 | 6.57 | 16 | <10 |
| | | 9-Dec-08 | FD | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1556 | 6.61 | 15 | <10 |
| | | 16-Dec-08 | FD | 1454 | 1457 | 20 | <5 | 1800 | <0.05 | 1471 | 5.98 | 11 | <10 |
| | | 23-Dec-08 | FD | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1619 | 6.35 | 12 | <10 |
| | | 30-Dec-08 | FD | 1454 | 1457 | <5 | 6 | 1800 | <0.05 | 1343 | 6.47 | 17 | <10 |
| | | 6-Jan-09 | FD | 1454 | 1457 | 5 | <5 | 1800 | <0.05 | 1486 | 6.5 | 17 | <10 |
| | | 13-Jan-09 | FD | 1454 | 1457 | <5 | 7 | 1800 | <0.05 | 1316 | 6.29 | 16 | <10 |
| | | 20-Jan-09 | FD | 1454 | 1457 | <5 | 7 | 1800 | <0.05 | 1372 | 6.47 | 18 | <10 |
| | | 27-Jan-09 | FD | 1454 | 1457 | 5 | 6 | 1800 | <0.05 | 1339 | 6.44 | 22 | <10 |
| | | 3-Feb-09 | FD | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1600 | 6.56 | 12 | <10 |
| | | 10-Feb-09 | FD | 1454 | 1457 | <5 | <5 | 1800 | <0.05 | 1612 | 6.16 | 12 | <10 |
| | | 17-Feb-09 | FD | 1454 | 1457 | 5 | 6 | 1800 | <0.05 | 1553 | 6.59 | 18 | <10 |
| | TEST 14 | 26-Aug-08 | N | 1927 | 1930 | <20 | 58.065 | 3333 | <0.05 | 1864 | 7.01 | 4840 | 1590 |
| | | 2-Sep-08 | N | 1927 | 1930 | <20 | 24 | 3333 | <0.05 | 3207 | 7.25 | 2860 | 1820 |
| | | 9-Sep-08 | N | 1927 | 1930 | <20 | 17 | 3333 | <0.05 | 3240 | 7.27 | 2640 | 1710 |
| | | 16-Sep-08 | N | 1927 | 1930 | <20 | 13.035 | 3333 | <0.05 | 3215 | 7.22 | 2590 | 1870 |
| | | 23-Sep-08 | N | 1927 | 1930 | 7 | 17 | 3333 | <0.05 | 3253 | 7.44 | 2370 | 1600 |
| | | 30-Sep-08 | N | 1927 | 1930 | 7 | 17 | 3333 | <0.05 | 3251 | 7.44 | 2410 | 1530 |
| | | 7-Oct-08 | N | 1927 | 1930 | 8 | 9 | 3333 | <0.05 | 3220 | 6.75 | 2260 | 1510 |
| | | 14-Oct-08 | N | 1927 | 1930 | 9 | 6 | 3333 | <0.05 | 3179 | 6.44 | 2150 | 1450 |
| | | 21-Oct-08 | N | 1927 | 1930 | 9 | 7 | 3333 | <0.05 | 3220 | 6.37 | 2170 | 1450 |
| | | 28-Oct-08 | N | 1927 | 1930 | 9 | <20 | 3333 | <0.05 | 3214 | 6.15 | 2000 | 1220 |
| | | 4-Nov-08 | N | 1927 | 1930 | 11 | <20 | 3333 | <0.05 | 3214 | 6.26 | 2130 | 1360 |
| | | 11-Nov-08 | N | 1927 | 1930 | <20 | 6 | 3333 | <0.05 | 3236 | 6.11 | 2030 | 1340 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-002A | TEST 14 | 18-Nov-08 | N | 1927 | 1930 | <20 | <20 | 3333 | <0.05 | 3058 | 6.14 | 2050 | 1340 |
| | | 25-Nov-08 | N | 1927 | 1930 | 14 | 6 | 3333 | <0.05 | 3218 | 6.05 | 2070 | 1330 |
| | | 2-Dec-08 | N | 1927 | 1930 | 22 | 6 | 3333 | <0.05 | 3241 | 6.16 | 2070 | 1110 |
| | | 9-Dec-08 | N | 1927 | 1930 | 20 | 6 | 3333 | <0.05 | 3254 | 5.95 | 2020 | 1350 |
| | | 16-Dec-08 | N | 1927 | 1930 | 20 | <5 | 3333 | <0.05 | 3268 | 5.98 | 1940 | 1290 |
| | | 23-Dec-08 | N | 1927 | 1930 | 22 | 6 | 3333 | <0.05 | 3279 | 5.91 | 2030 | 1380 |
| | | 30-Dec-08 | N | 1927 | 1930 | 19 | <5 | 3333 | <0.05 | 3287 | 5.95 | 1900 | 1100 |
| | | 6-Jan-09 | N | 1927 | 1930 | 22 | <5 | 3333 | <0.05 | 3299 | 5.84 | 1960 | 1260 |
| | | 13-Jan-09 | N | 1927 | 1930 | 22 | <5 | 3333 | <0.05 | 3260 | 5.88 | 1820 | 1150 |
| | | 20-Jan-09 | N | 1927 | 1930 | 24 | <5 | 3333 | <0.05 | 3192 | 5.99 | 1910 | 1130 |
| | | 27-Jan-09 | N | 1927 | 1930 | 21 | <5 | 3333 | <0.05 | 3271 | 5.95 | 1700 | 1080 |
| | | 3-Feb-09 | N | 1927 | 1930 | 23 | <5 | 3333 | <0.05 | 3194 | 5.88 | 1770 | 1000 |
| | | 10-Feb-09 | N | 1927 | 1930 | 23 | <5 | 3333 | <0.05 | 3293 | 5.85 | 1710 | 1040 |
| | | 17-Feb-09 | N | 1927 | 1930 | 28 | <5 | 3333 | <0.05 | 3247 | 5.8 | 1770 | 1130 |
| | | 24-Feb-09 | N | 1927 | 1930 | 34.265 | <5 | 3333 | <0.05 | 3287 | 5.72 | 1850 | 1080 |
| | | 3-Mar-09 | N | 1927 | 1930 | 29.785 | <5 | 3333 | <0.05 | 3174 | 5.67 | 1730 | 1090 |
| | | 10-Mar-09 | N | 1927 | 1930 | 29.85 | <5 | 3333 | <0.05 | 3215 | 5.62 | 1740 | 1090 |
| | | 17-Mar-09 | N | 1927 | 1930 | 32.025 | <5 | 3333 | <0.05 | 3245 | 5.61 | 1800 | 1120 |
| | | 24-Mar-09 | N | 1927 | 1930 | 32.025 | <5 | 3333 | <0.05 | 3115 | 5.66 | 1700 | 1180 |
| | | 31-Mar-09 | N | 1927 | 1930 | 33.21 | <5 | 3333 | <0.05 | 3024 | 5.6 | 1750 | 1090 |
| | | 7-Apr-09 | N | 1927 | 1930 | 33.145 | <5 | 3333 | <0.05 | 3277 | 5.68 | 1810 | 1250 |
| | | 14-Apr-09 | N | 1927 | 1930 | 33.145 | <5 | 3333 | <0.05 | 3120 | 5.63 | 1630 | 1010 |
| | | 21-Apr-09 | N | 1927 | 1930 | 35.385 | <5 | 3333 | <0.05 | 3171 | 5.79 | 1640 | 1070 |
| | | 28-Apr-09 | N | 1927 | 1930 | 34.265 | <5 | 3333 | <0.05 | 3069 | 5.57 | 1630 | 999 |
| | | 5-May-09 | N | 1927 | 1930 | 33.145 | <5 | 3333 | <0.05 | 3226 | 5.76 | 1820 | 1080 |
| | | 12-May-09 | N | 1927 | 1930 | 33.145 | <5 | 3333 | <0.05 | 3203 | 5.7 | 1710 | 1120 |
| | | 19-May-09 | N | 1927 | 1930 | 34.265 | <5 | 3333 | 0.2 | 3030 | 5.53 | 1790 | 1080 |
| | | 26-May-09 | N | 1927 | 1930 | 36.68 | <5 | 3333 | <0.05 | 3097 | 5.68 | 1710 | 1100 |
| | | 2-Jun-09 | N | 1927 | 1930 | 35.56 | <5 | 3333 | <0.05 | 3262 | 5.58 | 1710 | 1060 |
| | | 9-Jun-09 | N | 1927 | 1930 | 33.28 | <5 | 3333 | <0.05 | 3121 | 5.94 | 1630 | 1020 |
| | | 16-Jun-09 | N | 1927 | 1930 | 37.8 | <5 | 3333 | <0.05 | 3215 | 5.95 | 1730 | 1120 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-002A | TEST 14 | 23-Jun-09 | N | 1927 | 1930 | 32.2 | 5.8 | 3333 | <0.05 | 3155 | 5.96 | 1660 | 1080 |
| | | 30-Jun-09 | N | 1927 | 1930 | 43.32 | 5.8 | 3333 | <0.05 | 3119 | 5.91 | 1540 | 921 |
| | | 7-Jul-09 | N | 1927 | 1930 | 51.2 | <5 | 3333 | <0.05 | 2997 | 5.83 | 1680 | 1070 |
| | | 14-Jul-09 | N | 1927 | 1930 | 51.24 | <5 | 3333 | <0.05 | 3182 | 5.71 | 1600 | 996 |
| | | 21-Jul-09 | N | 1927 | 1930 | 61.12 | 8.12 | 3333 | <0.05 | 3071 | 5.74 | 1790 | 1080 |
| | | 28-Jul-09 | N | 1927 | 1930 | 62.4 | <5 | 3333 | 0.05 | 3029 | 5.68 | 1710 | 1180 |
| | | 4-Aug-09 | N | 1927 | 1930 | 67.96 | <5 | 3333 | <0.05 | 3110 | 5.72 | 1670 | 1060 |
| | | 11-Aug-09 | N | 1927 | 1930 | 74.72 | <5 | 3333 | <0.05 | 3151 | 5.66 | 1720 | 1080 |
| | | 18-Aug-09 | N | 1927 | 1930 | 63.52 | <5 | 3333 | 0.06 | 3150 | 5.66 | 1670 | 1060 |
| | | 25-Aug-09 | N | 1927 | 1930 | 64.48 | <5 | 3333 | -- | 3156 | 5.77 | 1860 | 807 |
| | TEST 9 | 26-Aug-08 | N | 888 | 891 | <20 | 16.59 | 2667 | <0.05 | 1403 | 7.78 | 37 | <10 |
| | | 2-Sep-08 | N | 888 | 891 | <20 | 30 | 2667 | <0.05 | 2231 | 7.57 | 138 | 24 |
| | | 9-Sep-08 | N | 888 | 891 | <20 | 19 | 2667 | <0.05 | 2651 | 7.55 | 80 | 19 |
| | | 16-Sep-08 | N | 888 | 891 | <20 | 9.48 | 2667 | <0.05 | 2562 | 7.29 | 31 | <10 |
| | | 23-Sep-08 | N | 888 | 891 | <20 | 20 | 2667 | <0.05 | 2422 | 7.78 | 56 | <10 |
| | | 30-Sep-08 | N | 888 | 891 | <20 | 20 | 2667 | <0.05 | 2695 | 7.78 | 24 | <10 |
| | | 7-Oct-08 | N | 888 | 891 | <20 | <20 | 2667 | <0.05 | 2519 | 8.13 | 12 | <10 |
| | | 14-Oct-08 | N | 888 | 891 | <20 | <20 | 2667 | <0.05 | 2615 | 8.19 | 15 | <10 |
| | | 21-Oct-08 | N | 888 | 891 | <20 | 9 | 2667 | <0.05 | 2512 | 7.93 | 28 | <10 |
| | | 28-Oct-08 | N | 888 | 891 | <20 | 9 | 2667 | <0.05 | 2495 | 7.93 | 30 | <10 |
| | | 4-Nov-08 | N | 888 | 891 | <20 | 19 | 2667 | <0.05 | 2434 | 7.84 | 54 | <10 |
| | TEST 9S | 11-Nov-08 | N | 888 | 891 | <20 | 47 | 2667 | <0.05 | 2322 | 7.75 | 132 | 11 |
| | | 18-Nov-08 | N | 888 | 891 | <20 | 7 | 2667 | <0.05 | 2414 | 7.12 | 21 | <10 |
| | | 25-Nov-08 | N | 888 | 891 | <5 | <5 | 2667 | <0.05 | 2621 | 7 | 14 | <10 |
| | | 2-Dec-08 | N | 888 | 891 | <5 | <5 | 2667 | <0.05 | 2419 | 6.73 | 18 | <10 |
| | | 9-Dec-08 | N | 888 | 891 | <5 | 11 | 2667 | <0.05 | 2581 | 6.87 | 10 | <10 |
| | | 16-Dec-08 | N | 888 | 891 | <5 | <5 | 2667 | <0.05 | 2564 | 6.99 | 12 | <10 |
| | | 23-Dec-08 | N | 888 | 891 | <5 | 6 | 2667 | <0.05 | 2569 | 6.59 | 11 | <10 |
| RES-005I | TEST 15 | 26-Aug-08 | N | 1317.28 | 1320.28 | <20 | 50.955 | 4000 | <0.05 | 2566 | 8.25 | 574 | 236 |
| | | 2-Sep-08 | N | 1317.28 | 1320.28 | <20 | 36 | 4000 | <0.05 | 3862 | 8.79 | 592 | 194 |
| | | 9-Sep-08 | N | 1317.28 | 1320.28 | <20 | 36 | 4000 | <0.05 | 3893 | 8.85 | 581 | 200 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 15 | 16-Sep-08 | N | 1317.28 | 1320.28 | <20 | 30.81 | 4000 | <0.05 | 3841 | 8.72 | 462 | 149 |
| | | 23-Sep-08 | N | 1317.28 | 1320.28 | <20 | 28 | 4000 | <0.05 | 3875 | 8.77 | 385 | 137 |
| | | 30-Sep-08 | N | 1317.28 | 1320.28 | <20 | 28 | 4000 | <0.05 | 3872 | 8.77 | 374 | 129 |
| | | 7-Oct-08 | N | 1317.28 | 1320.28 | <20 | 30 | 4000 | <0.05 | 3749 | 9.01 | 370 | 132 |
| | | 14-Oct-08 | N | 1317.28 | 1320.28 | <20 | 28 | 4000 | <0.05 | 3888 | 8.14 | 279 | 88 |
| | | 21-Oct-08 | N | 1317.28 | 1320.28 | <20 | 28 | 4000 | <0.05 | 3812 | 8.3 | 255 | 80 |
| | | 28-Oct-08 | N | 1317.28 | 1320.28 | <20 | 30 | 4000 | <0.05 | 3818 | 7.71 | 223 | 70 |
| | | 4-Nov-08 | N | 1317.28 | 1320.28 | <20 | 26 | 4000 | <0.05 | 3783 | 8.81 | 219 | 69 |
| | | 11-Nov-08 | N | 1317.28 | 1320.28 | <20 | 31 | 4000 | <0.05 | 3825 | 8.64 | 197 | 58 |
| | | 18-Nov-08 | N | 1317.28 | 1320.28 | <20 | 28 | 4000 | <0.05 | 3765 | 8.59 | 202 | 55 |
| | | 25-Nov-08 | N | 1317.28 | 1320.28 | <5 | 26 | 4000 | <0.05 | 3838 | 8.7 | 150 | 46 |
| | | 2-Dec-08 | N | 1317.28 | 1320.28 | <5 | 27 | 4000 | <0.05 | 3759 | 7.99 | 165 | 42 |
| | | 9-Dec-08 | N | 1317.28 | 1320.28 | <5 | 21 | 4000 | <0.05 | 3739 | 8.44 | 135 | 36 |
| | | 16-Dec-08 | N | 1317.28 | 1320.28 | <5 | 26 | 4000 | <0.05 | 3828 | 8.5 | 111 | 24 |
| | | 23-Dec-08 | N | 1317.28 | 1320.28 | <5 | 27 | 4000 | <0.05 | 3773 | 8.11 | 120 | 26 |
| | TEST 16 | 26-Aug-08 | N | 1428.18 | 1431.18 | <20 | 132.72 | 2000 | 0.09 | 1065 | 8.04 | 1340 | 376 |
| | | 2-Sep-08 | N | 1428.18 | 1431.18 | <20 | 9 | 2000 | <0.05 | 2055 | 7.27 | 141 | 12 |
| | | 9-Sep-08 | N | 1428.18 | 1431.18 | <20 | 8 | 2000 | <0.05 | 1936 | 7.19 | 35 | 12 |
| | | 16-Sep-08 | N | 1428.18 | 1431.18 | 7.19 | <20 | 2000 | 0.06 | 1809 | 7.52 | 16 | <10 |
| | | 23-Sep-08 | N | 1428.18 | 1431.18 | <20 | <20 | 2000 | <0.05 | 1885 | 7.14 | 6 | <10 |
| | | 30-Sep-08 | N | 1428.18 | 1431.18 | <20 | <20 | 2000 | <0.05 | 1897 | 7.14 | 4 | <10 |
| | | 7-Oct-08 | N | 1428.18 | 1431.18 | 10 | <20 | 2000 | 0.05 | 1793 | 5.64 | 4 | <10 |
| | | 14-Oct-08 | N | 1428.18 | 1431.18 | <20 | <20 | 2000 | <0.05 | 1826 | 6.11 | 3 | <10 |
| | | 21-Oct-08 | N | 1428.18 | 1431.18 | <20 | 7 | 2000 | 0.08 | 1812 | 6.98 | 46 | <10 |
| | | 28-Oct-08 | N | 1428.18 | 1431.18 | <20 | <20 | 2000 | <0.05 | 1879 | 7.29 | 19 | <10 |
| | | 4-Nov-08 | N | 1428.18 | 1431.18 | <20 | <20 | 2000 | <0.05 | 1869 | 5.74 | 4 | <10 |
| | TEST 16S | 11-Nov-08 | N | 1428.18 | 1431.18 | <20 | 6 | 2000 | <0.05 | 1631 | 7.41 | 28 | <10 |
| | | 18-Nov-08 | N | 1428.18 | 1431.18 | <20 | <20 | 2000 | <0.05 | 1914 | 7.19 | 10 | <10 |
| | | 25-Nov-08 | N | 1428.18 | 1431.18 | <5 | <5 | 2000 | <0.05 | 1891 | 7.49 | 6 | <10 |
| | | 2-Dec-08 | N | 1428.18 | 1431.18 | <5 | <5 | 2000 | <0.05 | 1864 | 7.23 | 8 | <10 |
| | | 9-Dec-08 | N | 1428.18 | 1431.18 | <5 | <5 | 2000 | <0.05 | 1910 | 7.32 | 7 | <10 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 16S | 16-Dec-08 | N | 1428.18 | 1431.18 | <5 | <5 | 2000 | <0.05 | 1913 | 7.08 | 7 | <10 |
| | | 23-Dec-08 | N | 1428.18 | 1431.18 | <5 | <5 | 2000 | <0.05 | 1924 | 7.17 | 6 | <10 |
| | TEST 17 | 26-Aug-08 | FD | 1428.18 | 1431.18 | <20 | 106.65 | 2000 | 0.07 | 1184 | 7.93 | 1180 | 406 |
| | | 2-Sep-08 | FD | 1428.18 | 1431.18 | <20 | 18 | 2000 | <0.05 | 2163 | 7.51 | 119 | <10 |
| | | 9-Sep-08 | FD | 1428.18 | 1431.18 | <20 | 9 | 2000 | <0.05 | 1867 | 7.08 | 39 | <10 |
| | | 16-Sep-08 | FD | 1428.18 | 1431.18 | <20 | 9.48 | 2000 | 0.08 | 1831 | 7.04 | 38 | <10 |
| | | 23-Sep-08 | FD | 1428.18 | 1431.18 | 5 | 5 | 2000 | 0.05 | 1842 | 7.83 | 18 | <10 |
| | | 30-Sep-08 | FD | 1428.18 | 1431.18 | 5 | 5 | 2000 | 0.07 | 1831 | 7.83 | 35 | <10 |
| | | 7-Oct-08 | FD | 1428.18 | 1431.18 | 11 | 14 | 2000 | <0.05 | 1832 | 7.97 | 30 | 10 |
| | | 14-Oct-08 | FD | 1428.18 | 1431.18 | <20 | 6 | 2000 | <0.05 | 1876 | 7.34 | 22 | <10 |
| | | 21-Oct-08 | FD | 1428.18 | 1431.18 | <20 | 7 | 2000 | <0.05 | 1854 | 7.9 | 16 | <10 |
| | | 28-Oct-08 | FD | 1428.18 | 1431.18 | <20 | 6 | 2000 | <0.05 | 1818 | 7.01 | 15 | <10 |
| | | 4-Nov-08 | FD | 1428.18 | 1431.18 | <20 | <20 | 2000 | <0.05 | 1867 | 7.24 | 13 | <10 |
| | TEST 17S | 11-Nov-08 | FD | 1428.18 | 1431.18 | <20 | 6 | 2000 | 0.06 | 1678 | 7.79 | 18 | <10 |
| | | 18-Nov-08 | FD | 1428.18 | 1431.18 | <20 | <20 | 2000 | <0.05 | 1885 | 7.32 | 9 | <10 |
| | | 25-Nov-08 | FD | 1428.18 | 1431.18 | <5 | <5 | 2000 | <0.05 | 1601 | 7.82 | 9 | <10 |
| | | 2-Dec-08 | FD | 1428.18 | 1431.18 | <5 | <5 | 2000 | <0.05 | 1826 | 7.34 | 10 | <110 |
| | | 9-Dec-08 | FD | 1428.18 | 1431.18 | <5 | 6 | 2000 | <0.05 | 1842 | 7.53 | 9 | <10 |
| | | 16-Dec-08 | FD | 1428.18 | 1431.18 | <5 | <5 | 2000 | <0.05 | 1738 | 6.86 | 7 | <10 |
| | | 23-Dec-08 | FD | 1428.18 | 1431.18 | <5 | <5 | 2000 | <0.05 | 1913 | 7.23 | 6 | <10 |
| | TEST 18 | 26-Aug-08 | N | 1499 | 1502 | <20 | 4.74 | 2000 | <0.05 | 1292 | 7.18 | 18 | <10 |
| | | 2-Sep-08 | N | 1499 | 1502 | <20 | 31 | 2000 | <0.05 | 1568 | 7.5 | 402 | 44 |
| | | 9-Sep-08 | N | 1499 | 1502 | <20 | 12 | 2000 | <0.05 | 2010 | 7.19 | 74 | <10 |
| | | 16-Sep-08 | N | 1499 | 1502 | <20 | 8.295 | 2000 | <0.05 | 1800 | 7.21 | 70 | <10 |
| | | 23-Sep-08 | N | 1499 | 1502 | <20 | 11 | 2000 | <0.05 | 1791 | 7.48 | 35 | <10 |
| | | 30-Sep-08 | N | 1499 | 1502 | <20 | 11 | 2000 | <0.05 | 1847 | 7.48 | 69 | <10 |
| | | 7-Oct-08 | N | 1499 | 1502 | 8 | 12 | 2000 | <0.05 | 1842 | 8.09 | 44 | <10 |
| | | 14-Oct-08 | N | 1499 | 1502 | <20 | 9 | 2000 | <0.05 | 1904 | 7.83 | 34 | <10 |
| | | 21-Oct-08 | N | 1499 | 1502 | <20 | 11 | 2000 | <0.05 | 1891 | 8.16 | 40 | <10 |
| | | 28-Oct-08 | N | 1499 | 1502 | <20 | 11 | 2000 | <0.05 | 1939 | 7.89 | 28 | <10 |
| | | 4-Nov-08 | N | 1499 | 1502 | <20 | 8 | 2000 | <0.05 | 1893 | 7.53 | 21 | <10 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 18S | 11-Nov-08 | N | 1499 | 1502 | <20 | 13 | 2000 | <0.05 | 1654 | 7.42 | 43 | <10 |
| | | 18-Nov-08 | N | 1499 | 1502 | <20 | 7 | 2000 | <0.05 | 1877 | 7.01 | 14 | <10 |
| | | 25-Nov-08 | N | 1499 | 1502 | <5 | <5 | 2000 | <0.05 | 1980 | 6.71 | 15 | <10 |
| | | 2-Dec-08 | N | 1499 | 1502 | <5 | <5 | 2000 | <0.05 | 1808 | 7.18 | 23 | <10 |
| | | 9-Dec-08 | N | 1499 | 1502 | <5 | <5 | 2000 | <0.05 | 1882 | 6.63 | 14 | <10 |
| | | 16-Dec-08 | N | 1499 | 1502 | <5 | <5 | 2000 | <0.05 | 1952 | 6.7 | 12 | <10 |
| | | 23-Dec-08 | N | 1499 | 1502 | <5 | <5 | 2000 | <0.05 | 1936 | 6.61 | 9 | <10 |
| | TEST 19 | 26-Aug-08 | N | 1586.46 | 1589.46 | <20 | 23.7 | 2000 | <0.05 | 1208 | 7.23 | 488 | 166 |
| | | 2-Sep-08 | N | 1586.46 | 1589.46 | <20 | 19 | 2000 | 0.09 | 1632 | 7.4 | 217 | 43 |
| | | 9-Sep-08 | N | 1586.46 | 1589.46 | <20 | 9 | 2000 | <0.05 | 1799 | 7.32 | 90 | 16 |
| | | 16-Sep-08 | N | 1586.46 | 1589.46 | <20 | 5.925 | 2000 | <0.05 | 1701 | 7.71 | 54 | <10 |
| | | 23-Sep-08 | N | 1586.46 | 1589.46 | <20 | <20 | 2000 | <0.05 | 1895 | 7.36 | 39 | <10 |
| | | 30-Sep-08 | N | 1586.46 | 1589.46 | <20 | <20 | 2000 | <0.05 | 1858 | 7.36 | 98 | 22 |
| | | 7-Oct-08 | N | 1586.46 | 1589.46 | <20 | 9 | 2000 | <0.05 | 1912 | 7.86 | 38 | <10 |
| | | 14-Oct-08 | N | 1586.46 | 1589.46 | <20 | 6 | 2000 | <0.05 | 1936 | 7.48 | 20 | <10 |
| | | 21-Oct-08 | N | 1586.46 | 1589.46 | <20 | 7 | 2000 | 0.08 | 1900 | 6.71 | 30 | <10 |
| | | 28-Oct-08 | N | 1586.46 | 1589.46 | <20 | <20 | 2000 | 0.17 | 1924 | 7.74 | 16 | <10 |
| | | 4-Nov-08 | N | 1586.46 | 1589.46 | <20 | <20 | 2000 | 0.11 | 1893 | 7.37 | 22 | <10 |
| | TEST 19S | 11-Nov-08 | N | 1586.46 | 1589.46 | <20 | 11 | 2000 | <0.05 | 1723 | 7.52 | 49 | <10 |
| | | 18-Nov-08 | N | 1586.46 | 1589.46 | <20 | <20 | 2000 | <0.05 | 1856 | 7.39 | 14 | <10 |
| | | 25-Nov-08 | N | 1586.46 | 1589.46 | <5 | <5 | 2000 | 0.05 | 1945 | 4.72 | 21 | <10 |
| | | 2-Dec-08 | N | 1586.46 | 1589.46 | <5 | <5 | 2000 | 0.1 | 1887 | 7.07 | 11 | <10 |
| | | 9-Dec-08 | N | 1586.46 | 1589.46 | <5 | <5 | 2000 | 0.1 | 1888 | 6.93 | 8 | <10 |
| | | 16-Dec-08 | N | 1586.46 | 1589.46 | <5 | <5 | 2000 | <0.05 | 1730 | 7.15 | 9 | <10 |
| | | 23-Dec-08 | N | 1586.46 | 1589.46 | <5 | <5 | 2000 | <0.05 | 1835 | 6.36 | 10 | <10 |
| | TEST 20 | 26-Aug-08 | N | 1632.56 | 1635.56 | <20 | 24.885 | 1800 | <0.05 | 972 | 6.68 | 2290 | 1000 |
| | | 2-Sep-08 | N | 1632.56 | 1635.56 | <20 | 5 | 1800 | <0.05 | 1867 | 6.7 | 162 | 45 |
| | | 9-Sep-08 | N | 1632.56 | 1635.56 | <20 | <20 | 1800 | <0.05 | 1444 | 6.09 | 128 | 38 |
| | | 16-Sep-08 | N | 1632.56 | 1635.56 | 4.82 | <20 | 1800 | <0.05 | 1396 | 6.6 | 169 | 44 |
| | | 23-Sep-08 | N | 1632.56 | 1635.56 | 10 | <20 | 1800 | <0.05 | 1600 | 4.78 | 64 | 18 |
| | | 30-Sep-08 | N | 1632.56 | 1635.56 | 10 | <20 | 1800 | 0.07 | 1689 | 4.78 | 94 | 30 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 20 | 7-Oct-08 | N | 1632.56 | 1635.56 | 10 | <20 | 1800 | <0.05 | 1708 | 5.54 | 63 | 20 |
| | | 14-Oct-08 | N | 1632.56 | 1635.56 | 11 | <20 | 1800 | <0.05 | 1665 | 5.6 | 89 | 30 |
| | | 21-Oct-08 | N | 1632.56 | 1635.56 | 12 | <20 | 1800 | <0.05 | 1674 | 5.59 | 122 | 43 |
| | | 28-Oct-08 | N | 1632.56 | 1635.56 | 13 | <20 | 1800 | <0.05 | 1734 | 5.54 | 107 | 39 |
| | | 4-Nov-08 | N | 1632.56 | 1635.56 | 13 | <20 | 1800 | <0.05 | 1751 | 5.13 | 104 | 37 |
| | TEST 20S | 11-Nov-08 | N | 1632.56 | 1635.56 | 19 | <20 | 1800 | <0.05 | 1152 | 5.92 | 209 | 80 |
| | | 18-Nov-08 | N | 1632.56 | 1635.56 | 9 | <20 | 1800 | <0.05 | 1716 | 5.62 | 62 | 19 |
| | | 25-Nov-08 | N | 1632.56 | 1635.56 | 11 | <5 | 1800 | <0.05 | 1799 | 4.64 | 64 | 22 |
| | | 2-Dec-08 | N | 1632.56 | 1635.56 | 13 | <5 | 1800 | <0.05 | 1728 | 5.3 | 62 | 17 |
| | | 9-Dec-08 | N | 1632.56 | 1635.56 | 11 | <5 | 1800 | <0.05 | 1745 | 5.24 | 55 | 19 |
| | | 16-Dec-08 | N | 1632.56 | 1635.56 | 11 | <5 | 1800 | <0.05 | 1730 | 5.44 | 57 | 19 |
| | | 23-Dec-08 | N | 1632.56 | 1635.56 | 25 | <5 | 1800 | <0.05 | 1695 | 5.57 | 61 | 21 |
| | | 30-Dec-08 | N | 1632.56 | 1635.56 | 19 | <5 | 1800 | <0.05 | 1768 | 5.08 | 81 | 30 |
| | | 6-Jan-09 | N | 1632.56 | 1635.56 | 20 | <5 | 1800 | 0.13 | 1695 | 5.14 | 85 | 30 |
| | | 13-Jan-09 | N | 1632.56 | 1635.56 | 22 | <5 | 1800 | 0.07 | 1754 | 5.06 | 85 | 32 |
| | | 20-Jan-09 | N | 1632.56 | 1635.56 | 26 | <5 | 1800 | 0.12 | 1596 | 5.01 | 98 | 35 |
| | | 27-Jan-09 | N | 1632.56 | 1635.56 | 23 | <5 | 1800 | 0.11 | 1692 | 4.96 | 90 | 33 |
| | | 3-Feb-09 | N | 1632.56 | 1635.56 | 29 | <5 | 1800 | 0.16 | 1615 | 4.94 | 106 | 40 |
| | | 10-Feb-09 | N | 1632.56 | 1635.56 | 26 | <5 | 1800 | 0.11 | 1714 | 4.94 | 98 | 36 |
| | | 17-Feb-09 | N | 1632.56 | 1635.56 | 29 | <5 | 1800 | 0.2 | 1735 | 4.92 | 110 | 43 |
| | TEST 21 | 26-Aug-08 | N | 1652 | 1654.93 | 36.38 | 7.11 | 1500 | <0.05 | 1130 | 5.86 | 1070 | 436 |
| | | 2-Sep-08 | N | 1652 | 1654.93 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 9-Sep-08 | N | 1652 | 1654.93 | 7 | <20 | 1500 | 0.06 | 1461 | 5.73 | 54 | 14 |
| | | 16-Sep-08 | N | 1652 | 1654.93 | 26.99 | <20 | 1500 | <0.05 | 1387 | 5.37 | 249 | 81 |
| | | 23-Sep-08 | N | 1652 | 1654.93 | 37 | <20 | 1500 | <0.05 | 1423 | 5.18 | 182 | 68 |
| | | 30-Sep-08 | N | 1652 | 1654.93 | 37 | <20 | 1500 | <0.05 | 1345 | 5.18 | 442 | 210 |
| | | 7-Oct-08 | N | 1652 | 1654.93 | 140 | <20 | 1500 | <0.05 | 1375 | 4.99 | 358 | 161 |
| | | 14-Oct-08 | N | 1652 | 1654.93 | 201 | <20 | 1500 | <0.05 | 1328 | 4.85 | 563 | 293 |
| | | 21-Oct-08 | N | 1652 | 1654.93 | 54 | <20 | 1500 | <0.05 | 1410 | 4.78 | 149 | 61 |
| | | 28-Oct-08 | N | 1652 | 1654.93 | 113 | <20 | 1500 | <0.05 | 1369 | 4.77 | 313 | 245 |
| | | 4-Nov-08 | N | 1652 | 1654.93 | 171 | <20 | 1500 | <0.05 | 1333 | 4.49 | 453 | 219 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 21 | 11-Nov-08 | N | 1652 | 1654.93 | 108 | <20 | 1500 | <0.05 | 1286 | 4.43 | 296 | 129 |
| | | 18-Nov-08 | N | 1652 | 1654.93 | 130 | <20 | 1500 | 0.14 | 1332 | 4.43 | 353 | 159 |
| | | 25-Nov-08 | N | 1652 | 1654.93 | 25 | <5 | 1500 | 0.46 | 1450 | 4.47 | 79 | 33 |
| | | 2-Dec-08 | N | 1652 | 1654.93 | 51 | <5 | 1500 | 0.27 | 1452 | 4.46 | 151 | 55 |
| | | 9-Dec-08 | N | 1652 | 1654.93 | 28 | <5 | 1500 | 0.24 | 1469 | 4.35 | 89 | 29 |
| | | 16-Dec-08 | N | 1652 | 1654.93 | 103 | <5 | 1500 | 0.12 | 1324 | 4.21 | 275 | 122 |
| | | 23-Dec-08 | N | 1652 | 1654.93 | 84 | <5 | 1500 | 0.07 | 1346 | 4.25 | 232 | 96 |
| | | 30-Dec-08 | N | 1652 | 1654.93 | 85 | <5 | 1500 | 0.41 | 1419 | 4.15 | 231 | 96 |
| | | 6-Jan-09 | N | 1652 | 1654.93 | 112 | <5 | 1500 | 0.65 | 1432 | 4.11 | 298 | 134 |
| | | 13-Jan-09 | N | 1652 | 1654.93 | 106 | <5 | 1500 | 0.87 | 1283 | 4.04 | 270 | 128 |
| | | 20-Jan-09 | N | 1652 | 1654.93 | 106 | <5 | 1500 | 0.83 | 1309 | 3.98 | 289 | 133 |
| | | 27-Jan-09 | N | 1652 | 1654.93 | 112 | <5 | 1500 | 3.31 | 1264 | 4.01 | 289 | 119 |
| | | 3-Feb-09 | N | 1652 | 1654.93 | 86 | <5 | 1500 | 3.16 | 1334 | 4.02 | 240 | 91 |
| | | 10-Feb-09 | N | 1652 | 1654.93 | 108 | <5 | 1500 | 3.6 | 1293 | 3.98 | 281 | 114 |
| | | 17-Feb-09 | N | 1652 | 1654.93 | 102 | <5 | 1500 | 3.63 | 1313 | 4 | 269 | 115 |
| | | 24-Feb-09 | N | 1652 | 1654.93 | 134.4 | <5 | 1500 | 8.14 | 1282 | 3.9 | 333 | 139 |
| | | 3-Mar-09 | N | 1652 | 1654.93 | 94.08 | <5 | 1500 | 6 | 1370 | 3.93 | 247 | 95 |
| | | 10-Mar-09 | N | 1652 | 1654.93 | 107.52 | <5 | 1500 | 3.97 | 1389 | 3.87 | 273 | 110 |
| | | 17-Mar-09 | N | 1652 | 1654.93 | 107.52 | <5 | 1500 | 7.11 | 1398 | 3.85 | 280 | 111 |
| | | 24-Mar-09 | N | 1652 | 1654.93 | 113.12 | <5 | 1500 | 6.61 | 1373 | 3.86 | 299 | 125 |
| | | 31-Mar-09 | N | 1652 | 1654.93 | 103.04 | <5 | 1500 | 5.46 | 1292 | 3.83 | 266 | 106 |
| | | 7-Apr-09 | N | 1652 | 1654.93 | 106.4 | <5 | 1500 | 6.48 | 1312 | 3.77 | 269 | 118 |
| | | 14-Apr-09 | N | 1652 | 1654.93 | 106.4 | <5 | 1500 | 6.49 | 1340 | 3.78 | 261 | 100 |
| | | 21-Apr-09 | N | 1652 | 1654.93 | 87.36 | <5 | 1500 | 5.89 | 1297 | 3.82 | 242 | 98 |
| | | 28-Apr-09 | N | 1652 | 1654.93 | 106.4 | <5 | 1500 | 6.94 | 1301 | 3.76 | 283 | 116 |
| | | 5-May-09 | N | 1652 | 1654.93 | 114.24 | <5 | 1500 | 10 | 1278 | 3.75 | 309 | 129 |
| | | 12-May-09 | N | 1652 | 1654.93 | 105.28 | <5 | 1500 | 8.38 | 1333 | 3.73 | 288 | 111 |
| | | 19-May-09 | N | 1652 | 1654.93 | 122.08 | <5 | 1500 | 14.3 | 1269 | 3.68 | 330 | 134 |
| | | 26-May-09 | N | 1652 | 1654.93 | 123.2 | <5 | 1500 | 9.93 | 1312 | 3.76 | 340 | 143 |
| | | 2-Jun-09 | N | 1652 | 1654.93 | 125.44 | <5 | 1500 | 13 | 1292 | 3.68 | 348 | 140 |
| | | 9-Jun-09 | N | 1652 | 1654.93 | 120.96 | <5 | 1500 | 10.5 | 1313 | 3.66 | 326 | 134 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 21 | 16-Jun-09 | N | 1652 | 1654.93 | 117.6 | <5 | 1500 | 15 | 1280 | 3.69 | 327 | 119 |
| | | 23-Jun-09 | N | 1652 | 1654.93 | 134.4 | <5 | 1500 | 17.3 | 1287 | 3.6 | 377 | 138 |
| | | 30-Jun-09 | N | 1652 | 1654.93 | 140 | <5 | 1500 | 17.1 | 1285 | 3.59 | 366 | 143 |
| | | 7-Jul-09 | N | 1652 | 1654.93 | 150.08 | <5 | 1500 | 17.2 | 1285 | 3.61 | 384 | 159 |
| | | 14-Jul-09 | N | 1652 | 1654.93 | 151.2 | <5 | 1500 | 17.3 | 1291 | 3.52 | 403 | 154 |
| | | 21-Jul-09 | N | 1652 | 1654.93 | 129.92 | <5 | 1500 | 18.2 | 1286 | 3.57 | 390 | 133 |
| | | 28-Jul-09 | N | 1652 | 1654.93 | 176.96 | <5 | 1500 | 20 | 785 | 3.55 | 460 | 191 |
| | | 4-Aug-09 | N | 1652 | 1654.93 | 154.56 | <5 | 1500 | 21.1 | 1280 | 3.56 | 406 | 153 |
| | | 11-Aug-09 | N | 1652 | 1654.93 | 162.4 | <5 | 1500 | 23.4 | 1279 | 3.59 | 437 | 155 |
| | | 18-Aug-09 | N | 1652 | 1654.93 | 145.6 | <5 | 1500 | 23.4 | 1226 | 3.54 | 405 | 135 |
| | | 25-Aug-09 | N | 1652 | 1654.93 | 107.52 | <5 | 1500 | -- | 1409 | 3.63 | 333 | 105 |
| | TEST 22 | 26-Aug-08 | N | 1654.93 | 1659.8 | <20 | 31.995 | 2000 | <0.05 | 1385 | 7.46 | 1270 | 489 |
| | | 2-Sep-08 | N | 1654.93 | 1659.8 | <20 | 7 | 2000 | <0.05 | 1861 | 7.15 | 198 | 55 |
| | | 9-Sep-08 | N | 1654.93 | 1659.8 | <20 | 5 | 2000 | <0.05 | 1933 | 6.54 | 74 | 16 |
| | | 16-Sep-08 | N | 1654.93 | 1659.8 | 5.075 | <20 | 2000 | <0.05 | 1713 | 6.16 | 65 | 18 |
| | | 23-Sep-08 | N | 1654.93 | 1659.8 | 5 | <20 | 2000 | <0.05 | 1870 | 6.16 | 46 | <10 |
| | | 30-Sep-08 | N | 1654.93 | 1659.8 | 5 | <20 | 2000 | <0.05 | 1855 | 6.16 | 143 | 45 |
| | | 7-Oct-08 | N | 1654.93 | 1659.8 | 9 | <20 | 2000 | <0.05 | 1725 | 6.04 | 104 | 35 |
| | | 14-Oct-08 | N | 1654.93 | 1659.8 | 7 | <20 | 2000 | <0.05 | 1889 | 6.03 | 87 | 28 |
| | | 21-Oct-08 | N | 1654.93 | 1659.8 | 5 | <20 | 2000 | <0.05 | 1891 | 6.05 | 61 | 16 |
| | | 28-Oct-08 | N | 1654.93 | 1659.8 | 5 | <20 | 2000 | <0.05 | 1749 | 6.16 | 74 | 26 |
| | | 4-Nov-08 | N | 1654.93 | 1659.8 | 11 | <20 | 2000 | <0.05 | 1987 | 5.64 | 99 | 35 |
| | TEST 22S | 11-Nov-08 | N | 1654.93 | 1659.8 | 9 | 8 | 2000 | <0.05 | 1480 | 6.53 | 70 | 19 |
| | | 18-Nov-08 | N | 1654.93 | 1659.8 | 7 | 6 | 2000 | <0.05 | 1971 | 6.35 | 34 | <10 |
| | | 25-Nov-08 | N | 1654.93 | 1659.8 | 7 | <5 | 2000 | <0.05 | 1987 | 6.27 | 26 | <10 |
| | | 2-Dec-08 | N | 1654.93 | 1659.8 | 5 | 6 | 2000 | <0.05 | 1962 | 6.38 | 29 | <10 |
| | | 9-Dec-08 | N | 1654.93 | 1659.8 | 5 | <5 | 2000 | 0.09 | 1940 | 5.64 | 32 | <10 |
| | | 16-Dec-08 | N | 1654.93 | 1659.8 | 6 | <5 | 2000 | <0.05 | 1937 | 6.04 | 28 | <10 |
| | | 23-Dec-08 | N | 1654.93 | 1659.8 | 7 | <5 | 2000 | <0.05 | 1940 | 6.24 | 30 | 10 |
| | | 30-Dec-08 | N | 1654.93 | 1659.8 | 11 | <5 | 2000 | <0.05 | 1949 | 6.04 | 41 | 11 |
| | | 6-Jan-09 | N | 1654.93 | 1659.8 | 10 | <5 | 2000 | 0.09 | 1971 | 6.02 | 37 | 11 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 22S | 13-Jan-09 | N | 1654.93 | 1659.8 | 11 | <5 | 2000 | 0.06 | 1943 | 5.96 | 39 | 11 |
| | | 20-Jan-09 | N | 1654.93 | 1659.8 | 15 | <5 | 2000 | <0.05 | 1856 | 5.9 | 48 | 14 |
| | | 27-Jan-09 | N | 1654.93 | 1659.8 | 15 | <5 | 2000 | <0.05 | 1936 | 6.16 | 50 | 16 |
| | | 3-Feb-09 | N | 1654.93 | 1659.8 | 19 | <5 | 2000 | <0.05 | 1877 | 6.03 | 58 | 19 |
| | | 10-Feb-09 | N | 1654.93 | 1659.8 | 23 | <5 | 2000 | 0.16 | 1844 | 5.9 | 82 | 30 |
| | | 17-Feb-09 | N | 1654.93 | 1659.8 | 30 | <5 | 2000 | <0.05 | 1889 | 5.8 | 92 | 36 |
| | TEST 23 | 26-Aug-08 | N | 1759.23 | 1761.23 | 279.65 | <20 | 1000 | 4.36 | 670 | 4.38 | 1900 | 997 |
| | | 2-Sep-08 | N | 1759.23 | 1761.23 | 16 | <20 | 1000 | 0.06 | 909 | 5.01 | 150 | 55 |
| | | 9-Sep-08 | N | 1759.23 | 1761.23 | 22 | <20 | 1000 | 0.14 | 932 | 4.96 | 146 | 61 |
| | | 16-Sep-08 | N | 1759.23 | 1761.23 | 204.175 | <20 | 1000 | <0.05 | 873 | 4.43 | 852 | 324 |
| | | 23-Sep-08 | N | 1759.23 | 1761.23 | 648 | <20 | 1000 | <0.05 | 843 | 4.33 | 1400 | 781 |
| | | 30-Sep-08 | N | 1759.23 | 1761.23 | 648 | <20 | 1000 | <0.05 | 843 | 4.33 | 808 | 449 |
| | | 7-Oct-08 | N | 1759.23 | 1761.23 | 302 | <20 | 1000 | <0.05 | 843 | 4.43 | 658 | 295 |
| | | 14-Oct-08 | N | 1759.23 | 1761.23 | 286 | <20 | 1000 | <0.05 | 838 | 4.37 | 671 | 396 |
| | | 21-Oct-08 | N | 1759.23 | 1761.23 | 205 | <20 | 1000 | <0.05 | 831 | 4.23 | 522 | 225 |
| | | 28-Oct-08 | N | 1759.23 | 1761.23 | 111 | <20 | 1000 | <0.05 | 932 | 4.45 | 314 | 139 |
| | | 4-Nov-08 | N | 1759.23 | 1761.23 | 354 | <20 | 1000 | <0.05 | 822 | 4.12 | 822 | 461 |
| | | 11-Nov-08 | N | 1759.23 | 1761.23 | 154 | <20 | 1000 | <0.05 | 911 | 4.35 | 394 | 186 |
| | | 18-Nov-08 | N | 1759.23 | 1761.23 | 261 | <20 | 1000 | <0.05 | 778 | 4.23 | 641 | 325 |
| | | 25-Nov-08 | N | 1759.23 | 1761.23 | 255 | <5 | 1000 | <0.05 | 899 | 4.27 | 619 | 317 |
| | | 2-Dec-08 | N | 1759.23 | 1761.23 | 172 | <5 | 1000 | <0.05 | 918 | 4.21 | 458 | 215 |
| | | 9-Dec-08 | N | 1759.23 | 1761.23 | 239 | <5 | 1000 | <0.05 | 922 | 4.19 | 599 | 300 |
| | | 16-Dec-08 | N | 1759.23 | 1761.23 | 58 | <5 | 1000 | <0.05 | 903 | 4.19 | 174 | 308 |
| | | 23-Dec-08 | N | 1759.23 | 1761.23 | 219 | <5 | 1000 | <0.05 | 892 | 4.19 | 558 | 295 |
| | | 30-Dec-08 | N | 1759.23 | 1761.23 | 225 | <5 | 1000 | <0.05 | 788 | 4.17 | 570 | 270 |
| | | 6-Jan-09 | N | 1759.23 | 1761.23 | 271 | <5 | 1000 | <0.05 | 798 | 4.1 | 660 | 321 |
| | | 13-Jan-09 | N | 1759.23 | 1761.23 | 182 | <5 | 1000 | <0.05 | 781 | 4.16 | 461 | 221 |
| | | 20-Jan-09 | N | 1759.23 | 1761.23 | 189 | <5 | 1000 | 0.17 | 789 | 4.15 | 513 | 233 |
| | | 27-Jan-09 | N | 1759.23 | 1761.23 | 204 | <5 | 1000 | 3.85 | 779 | 4.11 | 496 | 256 |
| | | 3-Feb-09 | N | 1759.23 | 1761.23 | 185 | <5 | 1000 | 3.58 | 851 | 4.12 | 478 | 223 |
| | | 10-Feb-09 | N | 1759.23 | 1761.23 | 138 | <5 | 1000 | 5.47 | 773 | 4.15 | 379 | 168 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 23 | 17-Feb-09 | N | 1759.23 | 1761.23 | 190 | <5 | 1000 | 3.63 | 900 | 4.12 | 509 | 228 |
| | | 24-Feb-09 | N | 1759.23 | 1761.23 | 155.55 | <5 | 1000 | 3.93 | 873 | 4.16 | 417 | 176 |
| | | 3-Mar-09 | N | 1759.23 | 1761.23 | 202.59 | <5 | 1000 | 4.85 | 846 | 4.08 | 494 | 257 |
| | | 10-Mar-09 | N | 1759.23 | 1761.23 | 165.63 | <5 | 1000 | 4.04 | 816 | 4.06 | 403 | 195 |
| | | 17-Mar-09 | N | 1759.23 | 1761.23 | 184.735 | <5 | 1000 | 5.54 | 850 | 4.01 | 487 | 229 |
| | | 24-Mar-09 | N | 1759.23 | 1761.23 | 160.03 | <5 | 1000 | 4.42 | 920 | 4.07 | 419 | 198 |
| | | 31-Mar-09 | N | 1759.23 | 1761.23 | 189.215 | <5 | 1000 | 4.95 | 885 | 4.01 | 467 | 264 |
| | | 7-Apr-09 | N | 1759.23 | 1761.23 | 168 | <5 | 1000 | 6.79 | 799 | 3.94 | 438 | 210 |
| | | 14-Apr-09 | N | 1759.23 | 1761.23 | 170.24 | <5 | 1000 | 4.84 | 816 | 3.96 | 422 | 207 |
| | | 21-Apr-09 | N | 1759.23 | 1761.23 | 180.19 | <5 | 1000 | 4.58 | 872 | 4.02 | 440 | 221 |
| | | 28-Apr-09 | N | 1759.23 | 1761.23 | 201.6 | <5 | 1000 | 5.85 | 861 | 3.95 | 505 | 245 |
| | | 5-May-09 | N | 1759.23 | 1761.23 | 154.56 | <5 | 1000 | 8.3 | 781 | 3.95 | 416 | 184 |
| | | 12-May-09 | N | 1759.23 | 1761.23 | 181.44 | <5 | 1000 | 7.58 | 802 | 3.91 | 474 | 223 |
| | | 19-May-09 | N | 1759.23 | 1761.23 | 219.52 | <5 | 1000 | 11.9 | 784 | 3.85 | 550 | 261 |
| | | 26-May-09 | N | 1759.23 | 1761.23 | 232.96 | <5 | 1000 | 7.93 | 838 | 3.93 | 606 | 316 |
| | | 2-Jun-09 | N | 1759.23 | 1761.23 | 219.52 | <5 | 1000 | 10.3 | 842 | 3.86 | 555 | 265 |
| | | 9-Jun-09 | N | 1759.23 | 1761.23 | 208.32 | <5 | 1000 | 10.5 | 805 | 3.84 | 539 | 247 |
| | | 16-Jun-09 | N | 1759.23 | 1761.23 | 206.08 | <5 | 1000 | 13.3 | 785 | 3.84 | 525 | 235 |
| | | 23-Jun-09 | N | 1759.23 | 1761.23 | 199.36 | <5 | 1000 | 14.4 | 793 | 3.79 | 529 | 277 |
| | | 30-Jun-09 | N | 1759.23 | 1761.23 | 269.92 | <5 | 1000 | 13.3 | 880 | 3.78 | 667 | 321 |
| | | 7-Jul-09 | N | 1759.23 | 1761.23 | 227.36 | <5 | 1000 | 24.7 | 784 | 3.78 | 547 | 256 |
| | | 14-Jul-09 | N | 1759.23 | 1761.23 | 239.68 | <5 | 1000 | 17.2 | 800 | 3.69 | 596 | 262 |
| | | 21-Jul-09 | N | 1759.23 | 1761.23 | 304.64 | <5 | 1000 | 25.1 | 784 | 3.67 | 758 | 373 |
| | | 28-Jul-09 | N | 1759.23 | 1761.23 | 275.52 | <5 | 1000 | 24.6 | 1298 | 3.71 | 648 | 309 |
| | | 4-Aug-09 | N | 1759.23 | 1761.23 | 290.08 | <5 | 1000 | 31.4 | 781 | 3.66 | 662 | 312 |
| | | 11-Aug-09 | N | 1759.23 | 1761.23 | 322.56 | <5 | 1000 | 30.2 | 775 | 3.69 | 732 | 332 |
| | | 18-Aug-09 | N | 1759.23 | 1761.23 | 311.36 | <5 | 1000 | 20.7 | 825 | 3.69 | 705 | 373 |
| | | 25-Aug-09 | N | 1759.23 | 1761.23 | 329.28 | <5 | 1000 | -- | 795 | 3.68 | 747 | 382 |
| | TEST 24 | 26-Aug-08 | N | 1892.81 | 1895 | 115.58 | 7.11 | 1000 | 0.22 | 579 | 4.82 | 1820 | 832 |
| | | 2-Sep-08 | N | 1892.81 | 1895 | <20 | 5 | 1000 | 0.28 | 981 | 5.27 | 36 | 11 |
| | | 9-Sep-08 | N | 1892.81 | 1895 | 58 | <20 | 1000 | 15.9 | 948 | 4.43 | 234 | 108 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 24 | 16-Sep-08 | N | 1892.81 | 1895 | 54.66 | <20 | 1000 | 0.66 | 919 | 4.63 | 278 | 104 |
| | | 23-Sep-08 | N | 1892.81 | 1895 | 151 | <20 | 1000 | 0.17 | 836 | 4.43 | 478 | 216 |
| | | 30-Sep-08 | N | 1892.81 | 1895 | 151 | <20 | 1000 | <0.05 | 850 | 4.43 | 408 | 186 |
| | | 7-Oct-08 | N | 1892.81 | 1895 | 126 | <20 | 1000 | 0.13 | 922 | 4.4 | 288 | 112 |
| | | 14-Oct-08 | N | 1892.81 | 1895 | 132 | <20 | 1000 | 0.15 | 894 | 4.26 | 356 | 167 |
| | | 21-Oct-08 | N | 1892.81 | 1895 | 95 | <20 | 1000 | 0.23 | 874 | 4.14 | 269 | 113 |
| | | 28-Oct-08 | N | 1892.81 | 1895 | 162 | <20 | 1000 | 0.12 | 853 | 4.29 | 400 | 198 |
| | | 4-Nov-08 | N | 1892.81 | 1895 | 116 | <20 | 1000 | 0.5 | 944 | 4.19 | 286 | 108 |
| | | 11-Nov-08 | N | 1892.81 | 1895 | 116 | <20 | 1000 | 0.15 | 713 | 4.45 | 306 | 148 |
| | | 18-Nov-08 | N | 1892.81 | 1895 | 78 | <20 | 1000 | 0.35 | 884 | 4.41 | 213 | 88 |
| | | 25-Nov-08 | N | 1892.81 | 1895 | 132 | <5 | 1000 | 0.09 | 830 | 4.1 | 316 | 165 |
| | | 2-Dec-08 | N | 1892.81 | 1895 | 96 | <5 | 1000 | 0.16 | 835 | 4.18 | 263 | 116 |
| | | 9-Dec-08 | N | 1892.81 | 1895 | 57 | <5 | 1000 | 1.33 | 954 | 4.21 | 166 | 66 |
| | | 16-Dec-08 | N | 1892.81 | 1895 | 57 | <5 | 1000 | 2.75 | 929 | 4.17 | 177 | 67 |
| | | 23-Dec-08 | N | 1892.81 | 1895 | 65 | <5 | 1000 | 2 | 937 | 4.19 | 189 | 79 |
| | | 30-Dec-08 | N | 1892.81 | 1895 | 131 | <5 | 1000 | 0.83 | 912 | 4.11 | 324 | 139 |
| | | 6-Jan-09 | N | 1892.81 | 1895 | 89 | <5 | 1000 | 1.74 | 828 | 4.22 | 243 | 101 |
| | | 13-Jan-09 | N | 1892.81 | 1895 | 160 | <5 | 1000 | 0.35 | 882 | 4.15 | 392 | 174 |
| | | 20-Jan-09 | N | 1892.81 | 1895 | 138 | <5 | 1000 | 0.41 | 830 | 4.11 | 353 | 153 |
| | | 27-Jan-09 | N | 1892.81 | 1895 | 124 | <5 | 1000 | 0.75 | 825 | 4.2 | 314 | 146 |
| | | 3-Feb-09 | N | 1892.81 | 1895 | 170 | <5 | 1000 | 0.5 | 877 | 4.16 | 426 | 207 |
| | | 10-Feb-09 | N | 1892.81 | 1895 | 151 | <5 | 1000 | 3.44 | 852 | 4.17 | 383 | 169 |
| | | 17-Feb-09 | N | 1892.81 | 1895 | 157 | <5 | 1000 | 3.57 | 915 | 4.17 | 410 | 197 |
| | TEST 25 | 26-Aug-08 | N | 1917.29 | 1920.9 | 13.53 | 16.59 | 1500 | <0.05 | 1101 | 6.25 | 1790 | 1020 |
| | | 2-Sep-08 | N | 1917.29 | 1920.9 | <20 | <20 | 1500 | <0.05 | 1472 | 6.16 | 126 | 41 |
| | | 9-Sep-08 | N | 1917.29 | 1920.9 | <20 | 5 | 1500 | 0.08 | 1471 | 6.43 | 825 | 23 |
| | | 16-Sep-08 | N | 1917.29 | 1920.9 | 8.205 | <20 | 1500 | <0.05 | 1363 | 5.69 | 197 | 75 |
| | | 23-Sep-08 | N | 1917.29 | 1920.9 | 11 | <20 | 1500 | <0.05 | 1409 | 5.43 | 231 | 84 |
| | | 30-Sep-08 | N | 1917.29 | 1920.9 | 11 | <20 | 1500 | 0.12 | 1353 | 5.43 | 445 | 771 |
| | | 7-Oct-08 | N | 1917.29 | 1920.9 | 24 | 7 | 1500 | <0.05 | 1323 | 6.36 | 216 | 86 |
| | | 14-Oct-08 | N | 1917.29 | 1920.9 | 13 | 6 | 1500 | <0.05 | 1388 | 6.14 | 134 | 47 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | TEST 25 | 21-Oct-08 | N | 1917.29 | 1920.9 | 16 | <20 | 1500 | 0.05 | 1349 | 5.8 | 225 | 92 |
| | | 28-Oct-08 | N | 1917.29 | 1920.9 | 20 | <20 | 1500 | 0.05 | 1384 | 5.77 | 168 | 71 |
| | | 4-Nov-08 | N | 1917.29 | 1920.9 | 19 | <20 | 1500 | 0.15 | 1401 | 5.15 | 261 | 100 |
| | | 18-Nov-08 | N | 1917.29 | 1920.9 | 5 | <20 | 1500 | <0.05 | 1388 | 5.21 | 57 | 18 |
| | TEST 25S | 11-Nov-08 | N | 1917.29 | 1920.9 | 11 | <20 | 1500 | 0.05 | 961 | 5.37 | 91 | 33 |
| | | 18-Nov-08 | N | 1917.29 | 1920.9 | 5 | <5 | 1500 | <0.05 | 1388 | 5.21 | 57 | 18 |
| | | 25-Nov-08 | N | 1917.29 | 1920.9 | 6 | <5 | 1500 | 0.09 | 1385 | 5.19 | 48 | 16 |
| | | 2-Dec-08 | N | 1917.29 | 1920.9 | 6 | <5 | 1500 | <0.05 | 1340 | 4.97 | 52 | 15 |
| | | 9-Dec-08 | N | 1917.29 | 1920.9 | 7 | <5 | 1500 | 0.05 | 1432 | 4.86 | 58 | <10 |
| | | 16-Dec-08 | N | 1917.29 | 1920.9 | 9 | <5 | 1500 | <0.05 | 1447 | 4.94 | 55 | 19 |
| | | 23-Dec-08 | N | 1917.29 | 1920.9 | 7 | <5 | 1500 | 0.15 | 1367 | 5.09 | 53 | 18 |
| | | 30-Dec-08 | N | 1917.29 | 1920.9 | 8 | <5 | 1500 | 0.21 | 1484 | 4.85 | 69 | 22 |
| | | 6-Jan-09 | N | 1917.29 | 1920.9 | 8 | <5 | 1500 | 0.19 | 1422 | 5 | 78 | 26 |
| | | 13-Jan-09 | N | 1917.29 | 1920.9 | 15 | <5 | 1500 | 0.22 | 1244 | 4.86 | 90 | 35 |
| | | 20-Jan-09 | N | 1917.29 | 1920.9 | 13 | <5 | 1500 | 0.24 | 1393 | 4.78 | 69 | 23 |
| | | 27-Jan-09 | N | 1917.29 | 1920.9 | 12 | <5 | 1500 | 0.11 | 1397 | 4.86 | 64 | 21 |
| | | 3-Feb-09 | N | 1917.29 | 1920.9 | 11 | <5 | 1500 | 0.16 | 1215 | 4.95 | 61 | 20 |
| | | 10-Feb-09 | N | 1917.29 | 1920.9 | 13 | <5 | 1500 | 0.29 | 1461 | 4.9 | 65 | 20 |
| | | 17-Feb-09 | N | 1917.29 | 1920.9 | 12 | <5 | 1500 | 0.34 | 1388 | 4.82 | 78 | 28 |
| RES-005J | TEST 26 | 26-Aug-08 | N | 1660.4 | 1686.47 | <20 | 23.7 | 4000 | <0.05 | 2786 | 7.25 | 422 | 122 |
| | | 2-Sep-08 | N | 1660.4 | 1686.47 | <20 | 14 | 4000 | <0.05 | 3948 | 7.32 | 284 | 96 |
| | | 9-Sep-08 | N | 1660.4 | 1686.47 | <20 | 9 | 4000 | <0.05 | 3858 | 7.39 | 195 | 63 |
| | | 16-Sep-08 | N | 1660.4 | 1686.47 | <20 | 9.48 | 4000 | <0.05 | 3840 | 7.61 | 128 | 36 |
| | | 23-Sep-08 | N | 1660.4 | 1686.47 | 7 | 11 | 4000 | <0.05 | 3905 | 7.71 | 122 | 37 |
| | | 30-Sep-08 | N | 1660.4 | 1686.47 | 7 | 11 | 4000 | <0.05 | 3806 | 7.71 | 92 | 28 |
| | | 7-Oct-08 | N | 1660.4 | 1686.47 | <20 | 7 | 4000 | <0.05 | 3789 | 7.78 | 68 | 20 |
| | | 14-Oct-08 | N | 1660.4 | 1686.47 | <20 | <20 | 4000 | <0.05 | 3558 | 7.51 | 61 | 21 |
| | | 21-Oct-08 | N | 1660.4 | 1686.47 | <20 | 8 | 4000 | <0.05 | 3750 | 7.48 | 50 | 14 |
| | | 28-Oct-08 | N | 1660.4 | 1686.47 | <20 | 6 | 4000 | <0.05 | 3841 | 6.4 | 42 | 11 |
| | | 4-Nov-08 | N | 1660.4 | 1686.47 | <20 | <20 | 4000 | <0.05 | 3841 | 7.72 | 42 | 11 |
| | | 11-Nov-08 | N | 1660.4 | 1686.47 | <20 | 9 | 4000 | <0.05 | 3613 | 7.3 | 52 | 16 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005J | TEST 26 | 18-Nov-08 | N | 1660.4 | 1686.47 | 15 | <20 | 4000 | <0.05 | 3818 | 7.28 | 34 | <10 |
| | | 25-Nov-08 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3922 | 7.08 | 32 | <10 |
| | | 2-Dec-08 | N | 1660.4 | 1686.47 | <5 | 9 | 4000 | <0.05 | 3780 | 7.4 | 36 | 11 |
| | | 9-Dec-08 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3772 | 7 | 34 | 30 |
| | | 16-Dec-08 | N | 1660.4 | 1686.47 | <5 | 6 | 4000 | <0.05 | 3823 | 6.94 | 32 | <10 |
| | | 23-Dec-08 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3843 | 6.97 | 24 | <10 |
| | | 30-Dec-08 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3861 | 6.71 | 24 | <10 |
| | | 6-Jan-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3811 | 6.82 | 24 | <10 |
| | | 13-Jan-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3761 | 6.65 | 24 | <10 |
| | | 20-Jan-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3789 | 6.6 | 22 | <10 |
| | | 27-Jan-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3885 | 6.72 | 22 | <10 |
| | | 3-Feb-09 | N | 1660.4 | 1686.47 | <5 | 6 | 4000 | <0.05 | 3713 | 6.66 | 19 | <10 |
| | | 10-Feb-09 | N | 1660.4 | 1686.47 | 5 | <5 | 4000 | <0.05 | 3851 | 6.53 | 21 | <10 |
| | | 17-Feb-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3816 | 6.72 | 22 | <10 |
| | | 24-Feb-09 | N | 1660.4 | 1686.47 | 8.505 | <5 | 4000 | <0.05 | 3712 | 6.64 | 26 | <10 |
| | | 3-Mar-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3836 | 6.5 | 22 | <10 |
| | | 10-Mar-09 | N | 1660.4 | 1686.47 | 6.2 | <5 | 4000 | <0.05 | 3641 | 6.63 | 26 | <10 |
| | | 17-Mar-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3826 | 6.65 | 23 | <10 |
| | | 24-Mar-09 | N | 1660.4 | 1686.47 | <5 | 7.11 | 4000 | <0.05 | 3787 | 6.53 | 24 | <10 |
| | | 31-Mar-09 | N | 1660.4 | 1686.47 | <5 | 5.925 | 4000 | <0.05 | 3730 | 6.56 | 23 | <10 |
| | | 7-Apr-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3836 | 6.51 | 21 | <10 |
| | | 14-Apr-09 | N | 1660.4 | 1686.47 | 5.145 | <5 | 4000 | <0.05 | 3819 | 6.43 | 22 | <10 |
| | | 21-Apr-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3818 | 6.11 | 24 | <10 |
| | | 28-Apr-09 | N | 1660.4 | 1686.47 | 6.2 | <5 | 4000 | <0.05 | 3873 | 6.31 | 20 | <10 |
| | | 5-May-09 | N | 1660.4 | 1686.47 | <5 | <5 | 4000 | <0.05 | 3788 | 6.16 | 24 | <10 |
| | | 12-May-09 | N | 1660.4 | 1686.47 | 6.2 | <5 | 4000 | <0.05 | 3609 | 6.33 | 23 | <10 |
| | | 19-May-09 | N | 1660.4 | 1686.47 | 8.505 | <5 | 4000 | <0.05 | 3595 | 6.34 | 26 | <10 |
| | | 26-May-09 | N | 1660.4 | 1686.47 | 6.4 | <5 | 4000 | <0.05 | 3720 | 6.36 | 28 | <10 |
| | | 2-Jun-09 | N | 1660.4 | 1686.47 | 5.32 | <5 | 4000 | <0.05 | 3840 | 6.29 | 25 | <10 |
| | | 9-Jun-09 | N | 1660.4 | 1686.47 | 7.56 | <5 | 4000 | <0.05 | 3867 | 6.36 | 28 | <10 |
| | | 16-Jun-09 | N | 1660.4 | 1686.47 | 7.56 | <5 | 4000 | <0.05 | 3881 | 6.29 | 30 | <10 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005J | TEST 26 | 23-Jun-09 | N | 1660.4 | 1686.47 | 7.56 | <5 | 4000 | <0.05 | 3643 | 6.23 | 32 | <10 |
| | | 30-Jun-09 | N | 1660.4 | 1686.47 | 7.56 | <5 | 4000 | <0.05 | 3785 | 6.3 | 29 | <10 |
| | | 7-Jul-09 | N | 1660.4 | 1686.47 | 8.64 | <5 | 4000 | <0.05 | 3362 | 6.15 | 31 | 10 |
| | | 14-Jul-09 | N | 1660.4 | 1686.47 | 9.8 | <5 | 4000 | <0.05 | 3761 | 6.05 | 33 | 11 |
| | | 21-Jul-09 | N | 1660.4 | 1686.47 | 9.72 | <5 | 4000 | <0.05 | 3625 | 6.11 | 39 | 12 |
| | | 28-Jul-09 | N | 1660.4 | 1686.47 | 9.64 | 5.8 | 4000 | <0.05 | 3665 | 6.22 | 43 | 14 |
| | | 4-Aug-09 | N | 1660.4 | 1686.47 | 16.48 | <5 | 4000 | <0.05 | 3690 | 6.15 | 52 | 17 |
| | | 11-Aug-09 | N | 1660.4 | 1686.47 | 18.64 | <5 | 4000 | <0.05 | 3705 | 5.74 | 53 | 19 |
| | | 18-Aug-09 | N | 1660.4 | 1686.47 | 15.28 | <5 | 4000 | <0.05 | 3646 | 6.07 | 46 | 14 |
| | | 25-Aug-09 | N | 1660.4 | 1686.47 | 19.76 | <5 | 4000 | -- | 3858 | 5.93 | 54 | 19 |
| | | 1-Sep-09 | N | 1660.4 | 1686.47 | 20 | <5 | 4000 | <0.05 | 3080 | 5.82 | 56 | 76 |
| | | 8-Sep-09 | N | 1660.4 | 1686.47 | 23.24 | <5 | 4000 | 0.13 | 3783 | 5.93 | 65 | 23 |
| | | 15-Sep-09 | N | 1660.4 | 1686.47 | 26.52 | <5 | 4000 | <0.05 | 3826 | 5.99 | 74 | 29 |
| | | 22-Sep-09 | N | 1660.4 | 1686.47 | 23.2 | <5 | 4000 | 0 | 3765 | 6.03 | 66 | 26 |
| | | 29-Sep-09 | N | 1660.4 | 1686.47 | 24.32 | <5 | 4000 | <0.05 | 3747 | 5.89 | 66 | 27 |
| | | 6-Oct-09 | N | 1660.4 | 1686.47 | 28.84 | <5 | 4000 | <0.05 | 3823 | 5.93 | 73 | 31 |
| | | 13-Oct-09 | N | 1660.4 | 1686.47 | 29.96 | <5 | 4000 | <0.05 | 3824 | 6.02 | 77 | 30 |
| | | 20-Oct-09 | N | 1660.4 | 1686.47 | 23.24 | <5 | 4000 | <0.05 | 3885 | 6.08 | 76 | 30 |
| | | 27-Oct-09 | N | 1660.4 | 1686.47 | 30 | <2.5 | 4000 | <0.025 | 3872 | 6.02 | 82 | 37 |
| | | 3-Nov-09 | N | 1660.4 | 1686.47 | 18.8 | <2.5 | 4000 | <0.025 | 3849 | -- | 68 | 24 |
| | | 10-Nov-09 | N | 1660.4 | 1686.47 | 24.4 | <2.5 | 4000 | <0.025 | 3786 | 5.85 | 78 | 30 |
| | | 17-Nov-09 | N | 1660.4 | 1686.47 | 27.72 | <5 | 4000 | <0.05 | 3855 | -- | 79 | 31 |
| | | 24-Nov-09 | N | 1660.4 | 1686.47 | 28 | <5 | 4000 | <0.05 | 3661 | 6 | 85 | 33 |
| | | 1-Dec-09 | N | 1660.4 | 1686.47 | 35.56 | <5 | 4000 | <0.05 | 3838 | 5.88 | 98 | 38 |
| | | 8-Dec-09 | N | 1660.4 | 1686.47 | 28.84 | <5 | 4000 | <0.05 | 3789 | 5.86 | 82 | 33 |
| | | 15-Dec-09 | N | 1660.4 | 1686.47 | 37.8 | <5 | 4000 | <0.05 | 3815 | 5.85 | 112 | 48 |
| | | 22-Dec-09 | N | 1660.4 | 1686.47 | 52.36 | <5 | 4000 | <0.05 | 3816 | 5.88 | 151 | 63 |
| | | 29-Dec-09 | N | 1660.4 | 1686.47 | 47.88 | <5 | 4000 | <0.05 | 3804 | 5.86 | 131 | 58 |
| | | 5-Jan-10 | N | 1660.4 | 1686.47 | 45.64 | <5 | 4000 | <0.05 | 3869 | 5.75 | 134 | 55 |
| | | 12-Jan-10 | N | 1660.4 | 1686.47 | 44.56 | <5 | 4000 | <0.05 | 3892 | 5.55 | 123 | 43 |
| | | 19-Jan-10 | N | 1660.4 | 1686.47 | 53.6 | <5 | 4000 | <0.05 | 3861 | 5.88 | 134 | 62 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005J | TEST 26 | 26-Jan-10 | N | 1660.4 | 1686.47 | 74.76 | <5 | 4000 | <0.05 | 3835 | 5.73 | 208 | 91 |
| RES-006D | TEST 27 | 26-Aug-08 | N | 1750.4 | 1753.4 | 2640 | <20 | 1800 | 4.52 | 1086 | 3.88 | 5200 | 4610 |
| | | 2-Sep-08 | N | 1750.4 | 1753.4 | 179 | <20 | 1800 | 4.16 | 1537 | 4.38 | 519 | 233 |
| | | 9-Sep-08 | N | 1750.4 | 1753.4 | 87 | <20 | 1800 | 2.54 | 1728 | 4.32 | 238 | 93 |
| | | 16-Sep-08 | N | 1750.4 | 1753.4 | 109.83 | <20 | 1800 | 3.92 | 1698 | 4.17 | 300 | 129 |
| | | 23-Sep-08 | N | 1750.4 | 1753.4 | 133 | <20 | 1800 | 7.44 | 1700 | 3.97 | 347 | 144 |
| | | 30-Sep-08 | N | 1750.4 | 1753.4 | 133 | <20 | 1800 | 9 | 1648 | 3.97 | 359 | 150 |
| | | 7-Oct-08 | N | 1750.4 | 1753.4 | 217 | <20 | 1800 | 13.7 | 1530 | 3.92 | 545 | 233 |
| | | 14-Oct-08 | N | 1750.4 | 1753.4 | 193 | <20 | 1800 | 15.2 | 1644 | 3.67 | 490 | 197 |
| | | 21-Oct-08 | N | 1750.4 | 1753.4 | 147 | <20 | 1800 | 15 | 1690 | 3.55 | 399 | 166 |
| | | 28-Oct-08 | N | 1750.4 | 1753.4 | 119 | <20 | 1800 | 13.9 | 1711 | 3.75 | 376 | 169 |
| | | 4-Nov-08 | N | 1750.4 | 1753.4 | 124 | <20 | 1800 | 17 | 1700 | 3.58 | 385 | 144 |
| | | 11-Nov-08 | N | 1750.4 | 1753.4 | 351 | <20 | 1800 | 23.7 | 1476 | 3.68 | 914 | 480 |
| | | 18-Nov-08 | N | 1750.4 | 1753.4 | 760 | <20 | 1800 | 46.3 | 1450 | 3.53 | 1610 | 1120 |
| | | 25-Nov-08 | N | 1750.4 | 1753.4 | 131 | <5 | 1800 | 12.8 | 1649 | 3.74 | 537 | 246 |
| | | 2-Dec-08 | N | 1750.4 | 1753.4 | 87 | <5 | 1800 | 18.9 | 1744 | 3.71 | 351 | 123 |
| | | 9-Dec-08 | N | 1750.4 | 1753.4 | 76 | <5 | 1800 | 14.9 | 1706 | 3.59 | 299 | 86 |
| | | 16-Dec-08 | N | 1750.4 | 1753.4 | 86 | <5 | 1800 | 19.6 | 1695 | 3.56 | 322 | 106 |
| | | 23-Dec-08 | N | 1750.4 | 1753.4 | 78 | <5 | 1800 | 15.8 | 1707 | 3.61 | 289 | 86 |
| | | 30-Dec-08 | N | 1750.4 | 1753.4 | 92 | <5 | 1800 | 21.9 | 1734 | 3.53 | 335 | 103 |
| | | 6-Jan-09 | N | 1750.4 | 1753.4 | 94 | <5 | 1800 | 24.4 | 1653 | 3.56 | 341 | 97 |
| | | 13-Jan-09 | N | 1750.4 | 1753.4 | 78 | <5 | 1800 | 18.1 | 1684 | 3.55 | 301 | 91 |
| | | 20-Jan-09 | N | 1750.4 | 1753.4 | 232 | <5 | 1800 | 42.5 | 1582 | 3.34 | 667 | 251 |
| | | 27-Jan-09 | N | 1750.4 | 1753.4 | 142 | <5 | 1800 | 24.6 | 1713 | 3.55 | 440 | 166 |
| | | 3-Feb-09 | N | 1750.4 | 1753.4 | 421 | <5 | 1800 | 45.6 | 1446 | 3.44 | 1050 | 501 |
| | | 10-Feb-09 | N | 1750.4 | 1753.4 | 68 | <5 | 1800 | 13.3 | 1712 | 3.83 | 249 | 84 |
| | | 17-Feb-09 | N | 1750.4 | 1753.4 | 58 | <5 | 1800 | 14 | 1761 | 3.81 | 210 | 63 |
| | TEST 28 | 26-Aug-08 | N | 1898.21 | 1901.09 | 1650 | <20 | 1800 | 0.75 | 859 | 4.41 | 5110 | 3480 |
| | | 2-Sep-08 | N | 1898.21 | 1901.09 | 268 | <20 | 1800 | 4.33 | 1691 | 4.42 | 1000 | 500 |
| | | 9-Sep-08 | N | 1898.21 | 1901.09 | 27 | <20 | 1800 | 0.13 | 1698 | 5.1 | 89 | 37 |
| | | 16-Sep-08 | N | 1898.21 | 1901.09 | 20.475 | <20 | 1800 | 0.05 | 1706 | 5.11 | 134 | 50 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-006D | TEST 28 | 23-Sep-08 | N | 1898.21 | 1901.09 | 40 | <20 | 1800 | 0.13 | 1708 | 4.95 | 10 | 39 |
| | | 30-Sep-08 | N | 1898.21 | 1901.09 | 40 | <20 | 1800 | 0.24 | 1656 | 4.95 | 220 | 80 |
| | | 7-Oct-08 | N | 1898.21 | 1901.09 | 229 | <20 | 1800 | 0.14 | 1585 | 4.6 | 577 | 278 |
| | | 14-Oct-08 | N | 1898.21 | 1901.09 | 125 | <20 | 1800 | 0.45 | 1652 | 4.58 | 282 | 130 |
| | | 21-Oct-08 | N | 1898.21 | 1901.09 | 97 | <20 | 1800 | 0.63 | 1652 | 4.37 | 277 | 118 |
| | | 28-Oct-08 | N | 1898.21 | 1901.09 | 106 | <20 | 1800 | 0.45 | 1677 | 4.49 | 311 | 140 |
| | | 4-Nov-08 | N | 1898.21 | 1901.09 | 133 | <20 | 1800 | 0.39 | 1687 | 4.34 | 379 | 167 |
| | | 11-Nov-08 | N | 1898.21 | 1901.09 | 149 | <20 | 1800 | 0.45 | 1641 | 4.2 | 405 | 194 |
| | | 18-Nov-08 | N | 1898.21 | 1901.09 | 156 | <20 | 1800 | 0.23 | 1626 | 4.13 | 468 | 240 |
| | | 25-Nov-08 | N | 1898.21 | 1901.09 | 154 | <5 | 1800 | 0.37 | 1661 | 4.09 | 417 | 204 |
| | | 2-Dec-08 | N | 1898.21 | 1901.09 | 125 | <5 | 1800 | 0.72 | 1781 | 4.06 | 368 | 149 |
| | | 9-Dec-08 | N | 1898.21 | 1901.09 | 114 | <5 | 1800 | 0.74 | 1693 | 4.05 | 331 | 151 |
| | | 16-Dec-08 | N | 1898.21 | 1901.09 | 118 | <5 | 1800 | 2.06 | 1683 | 4.06 | 319 | 137 |
| | | 23-Dec-08 | N | 1898.21 | 1901.09 | 141 | <5 | 1800 | 2.69 | 1641 | 3.96 | 382 | 166 |
| | | 30-Dec-08 | N | 1898.21 | 1901.09 | 88 | <5 | 1800 | 2.19 | 1728 | 4.05 | 273 | 120 |
| | | 6-Jan-09 | N | 1898.21 | 1901.09 | 103 | <5 | 1800 | 2.73 | 1678 | 3.99 | 303 | 109 |
| | | 13-Jan-09 | N | 1898.21 | 1901.09 | 152 | <5 | 1800 | 2.99 | 1626 | 3.98 | 406 | 185 |
| | | 20-Jan-09 | N | 1898.21 | 1901.09 | 181 | <5 | 1800 | 3.2 | 1603 | 3.96 | 474 | 202 |
| | | 27-Jan-09 | N | 1898.21 | 1901.09 | 158 | <5 | 1800 | 3.93 | 1648 | 3.86 | 408 | 174 |
| | | 3-Feb-09 | N | 1898.21 | 1901.09 | 336 | <5 | 1800 | 1.19 | 1640 | 3.86 | 826 | 370 |
| | | 10-Feb-09 | N | 1898.21 | 1901.09 | 404 | <5 | 1800 | 4.41 | 1619 | 3.96 | 991 | 472 |
| | | 17-Feb-09 | N | 1898.21 | 1901.09 | 614 | <5 | 1800 | 1.81 | 1363 | 3.82 | 1430 | 1010 |
| | | 24-Feb-09 | N | 1898.21 | 1901.09 | 514.08 | <5 | 1800 | 11.8 | 1591 | 3.86 | 1160 | 694 |
| | | 3-Mar-09 | N | 1898.21 | 1901.09 | 61.405 | <5 | 1800 | 1.45 | 1673 | 4.25 | 246 | 97 |
| | | 10-Mar-09 | N | 1898.21 | 1901.09 | 528.64 | <5 | 1800 | 10.3 | 1538 | 3.88 | 1210 | 747 |
| | | 17-Mar-09 | N | 1898.21 | 1901.09 | 21.085 | <5 | 1800 | 0.68 | 1724 | 4.31 | 140 | 49 |
| | | 24-Mar-09 | N | 1898.21 | 1901.09 | 630.56 | <5 | 1800 | 16.6 | 1414 | 3.89 | 1370 | 910 |
| | | 31-Mar-09 | N | 1898.21 | 1901.09 | 366.24 | <5 | 1800 | 7.95 | 1527 | 3.85 | 851 | 435 |
| | | 7-Apr-09 | N | 1898.21 | 1901.09 | 181.44 | <5 | 1800 | 5.7 | 1640 | 3.92 | 443 | 195 |
| | | 14-Apr-09 | N | 1898.21 | 1901.09 | 33.34 | <5 | 1800 | 0.98 | 1711 | 4.24 | 105 | 38 |
| | | 21-Apr-09 | N | 1898.21 | 1901.09 | 549.92 | <5 | 1800 | 16.6 | 1497 | 3.75 | 1230 | 740 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-006D | TEST 28 | 28-Apr-09 | N | 1898.21 | 1901.09 | 445.76 | <5 | 1800 | 14.7 | 1495 | 3.72 | 1020 | 539 |
| | | 5-May-09 | N | 1898.21 | 1901.09 | 53.76 | <5 | 1800 | 3.12 | 1613 | 3.99 | 182 | 60 |
| | | 12-May-09 | N | 1898.21 | 1901.09 | 610.4 | <5 | 1800 | 14.8 | 1442 | 3.65 | 1280 | 795 |
| | | 19-May-09 | N | 1898.21 | 1901.09 | 467.04 | <5 | 1800 | 25.3 | 1447 | 3.64 | 1050 | 549 |
| | | 26-May-09 | N | 1898.21 | 1901.09 | 627.2 | <5 | 1800 | 24.5 | 1375 | 3.68 | 1410 | 817 |
| | | 2-Jun-09 | N | 1898.21 | 1901.09 | 627.2 | <5 | 1800 | 46.8 | 1453 | 3.57 | 1320 | 748 |
| | | 9-Jun-09 | N | 1898.21 | 1901.09 | 217.28 | <5 | 1800 | 14.8 | 1643 | 3.73 | 531 | 235 |
| | | 16-Jun-09 | N | 1898.21 | 1901.09 | 480.48 | <5 | 1800 | 33.2 | 1447 | 3.59 | 1110 | 697 |
| | | 23-Jun-09 | N | 1898.21 | 1901.09 | 544.32 | <5 | 1800 | 38.5 | 1432 | 3.53 | 1270 | 955 |
| | | 30-Jun-09 | N | 1898.21 | 1901.09 | 665.28 | <5 | 1800 | 56.8 | 1473 | 3.47 | 1360 | 735 |
| | | 7-Jul-09 | N | 1898.21 | 1901.09 | 1030 | <5 | 1800 | 95.3 | 1205 | 3.4 | 1860 | 1140 |
| | | 14-Jul-09 | N | 1898.21 | 1901.09 | 815.36 | <5 | 1800 | 90.6 | 1309 | 3.33 | 1580 | 895 |
| | | 21-Jul-09 | N | 1898.21 | 1901.09 | 694.4 | <5 | 1800 | 89.9 | 1425 | 3.4 | 1450 | 748 |
| | | 28-Jul-09 | N | 1898.21 | 1901.09 | 609.28 | <5 | 1800 | 77.4 | 1531 | 3.43 | 1290 | 657 |
| | | 4-Aug-09 | N | 1898.21 | 1901.09 | 627.2 | <5 | 1800 | 103 | 1478 | 3.38 | 1320 | 686 |
| | | 11-Aug-09 | N | 1898.21 | 1901.09 | 306.88 | <5 | 1800 | 42.4 | 1417 | 3.57 | 748 | 296 |
| | | 18-Aug-09 | N | 1898.21 | 1901.09 | 633.92 | <5 | 1800 | 42.6 | 1446 | 3.64 | 730 | 307 |
| | | 25-Aug-09 | N | 1898.21 | 1901.09 | 237.44 | <5 | 1800 | -- | 1440 | 3.76 | 541 | 225 |
| | TEST 29 | 26-Aug-08 | N | 1952.56 | 1954.83 | 86.56 | <20 | 1500 | 3.31 | 1202 | 4.74 | 616 | 240 |
| | | 2-Sep-08 | N | 1952.56 | 1954.83 | 77 | <20 | 1500 | 0.17 | 1396 | 5.43 | 248 | 97 |
| | | 9-Sep-08 | N | 1952.56 | 1954.83 | 23 | <20 | 1500 | 0.11 | 1449 | 5.47 | 826 | 32 |
| | | 16-Sep-08 | N | 1952.56 | 1954.83 | 79.79 | <20 | 1500 | 0.11 | 1402 | 5.34 | 243 | 96 |
| | | 23-Sep-08 | N | 1952.56 | 1954.83 | 110 | <20 | 1500 | 0.26 | 1337 | 4.84 | 283 | 132 |
| | | 30-Sep-08 | N | 1952.56 | 1954.83 | 110 | <20 | 1500 | 0.29 | 1343 | 4.84 | 354 | 156 |
| | | 7-Oct-08 | N | 1952.56 | 1954.83 | 104 | <20 | 1500 | 0.44 | 1387 | 4.75 | 199 | 82 |
| | | 14-Oct-08 | N | 1952.56 | 1954.83 | 76 | <20 | 1500 | 0.36 | 1376 | 4.47 | 198 | 82 |
| | | 21-Oct-08 | N | 1952.56 | 1954.83 | 61 | <20 | 1500 | 0.42 | 1358 | 4.85 | 153 | 64 |
| | | 28-Oct-08 | N | 1952.56 | 1954.83 | 56 | <20 | 1500 | 0.65 | 1370 | 4.45 | 158 | 66 |
| | | 4-Nov-08 | N | 1952.56 | 1954.83 | 75 | <20 | 1500 | 1.47 | 1395 | 4.07 | 206 | 74 |
| | TEST 29S | 11-Nov-08 | N | 1952.56 | 1954.83 | 19 | <20 | 1500 | 1.21 | 1233 | 4.12 | 72 | 21 |
| | | 18-Nov-08 | N | 1952.56 | 1954.83 | 13 | <20 | 1500 | 0.76 | 1468 | 4.19 | 60 | 13 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-006D | TEST 29S | 25-Nov-08 | N | 1952.56 | 1954.83 | 9 | <5 | 1500 | 0.45 | 1311 | 4.4 | 34 | <10 |
| | | 2-Dec-08 | N | 1952.56 | 1954.83 | 22 | <5 | 1500 | 0.72 | 1399 | 4.02 | 72 | 15 |
| | | 9-Dec-08 | N | 1952.56 | 1954.83 | 21 | <5 | 1500 | 0.08 | 1471 | 4.03 | 76 | 19 |
| | | 16-Dec-08 | N | 1952.56 | 1954.83 | 11 | <5 | 1500 | 0.47 | 1422 | 4.32 | 49 | 11 |
| | | 23-Dec-08 | N | 1952.56 | 1954.83 | 14 | <5 | 1500 | 0.56 | 1459 | 4.17 | 55 | 14 |
| | | 30-Dec-08 | N | 1952.56 | 1954.83 | 16 | <5 | 1500 | 0.58 | 1464 | 4.11 | 56 | 12 |
| | | 6-Jan-09 | N | 1952.56 | 1954.83 | 19 | <5 | 1500 | 0.64 | 1411 | 4.24 | 53 | 11 |
| | | 13-Jan-09 | N | 1952.56 | 1954.83 | 13 | <5 | 1500 | 0.57 | 1415 | 4.22 | 53 | 12 |
| | | 20-Jan-09 | N | 1952.56 | 1954.83 | 17 | <5 | 1500 | 0.63 | 1310 | 4.19 | 57 | 13 |
| | | 27-Jan-09 | N | 1952.56 | 1954.83 | 17 | <5 | 1500 | 0.62 | 1419 | 4.2 | 56 | 13 |
| | | 3-Feb-09 | N | 1952.56 | 1954.83 | 21 | <5 | 1500 | 0.72 | 1386 | 4.18 | 69 | 18 |
| | | 10-Feb-09 | N | 1952.56 | 1954.83 | 18 | <5 | 1500 | 0.83 | 1457 | 4.11 | 71 | 18 |
| | | 17-Feb-09 | N | 1952.56 | 1954.83 | 22 | <5 | 1500 | 1.23 | 1397 | 4.19 | 71 | 17 |
| | TEST 30 | 26-Aug-08 | N | 1954.83 | 1972 | <20 | 10.665 | 4000 | <0.05 | 2849 | 6.51 | 316 | 113 |
| | | 2-Sep-08 | N | 1954.83 | 1972 | <20 | <20 | 4000 | <0.05 | 3757 | 6.4 | 260 | 91 |
| | | 9-Sep-08 | N | 1954.83 | 1972 | 5 | <20 | 4000 | 0.12 | 3753 | 6.05 | 228 | 85 |
| | | 16-Sep-08 | N | 1954.83 | 1972 | 17.175 | <20 | 4000 | <0.05 | 3804 | 5.49 | 209 | 84 |
| | | 23-Sep-08 | N | 1954.83 | 1972 | 47 | <20 | 4000 | <0.05 | 3752 | 5.28 | 275 | 99 |
| | | 30-Sep-08 | N | 1954.83 | 1972 | 47 | <20 | 4000 | <0.05 | 3728 | 5.28 | 330 | 140 |
| | | 7-Oct-08 | N | 1954.83 | 1972 | 108 | <20 | 4000 | <0.05 | 3630 | 5.49 | 358 | 166 |
| | | 14-Oct-08 | N | 1954.83 | 1972 | 77 | 7 | 4000 | <0.05 | 3649 | 5.37 | 301 | 149 |
| | | 21-Oct-08 | N | 1954.83 | 1972 | 91 | <20 | 4000 | <0.05 | 3712 | 5.21 | 351 | 188 |
| | | 28-Oct-08 | N | 1954.83 | 1972 | 87 | <20 | 4000 | <0.05 | 3801 | 5.56 | 310 | 144 |
| | | 4-Nov-08 | N | 1954.83 | 1972 | 109 | <20 | 4000 | <0.05 | 3794 | 5.15 | 388 | 208 |
| | | 11-Nov-08 | N | 1954.83 | 1972 | 94 | <20 | 4000 | <0.05 | 3784 | 5.49 | 342 | 167 |
| | | 18-Nov-08 | N | 1954.83 | 1972 | 98 | <20 | 4000 | <0.05 | 3751 | 5.57 | 347 | 175 |
| | | 25-Nov-08 | N | 1954.83 | 1972 | 107 | <5 | 4000 | <0.05 | 3867 | 5.4 | 370 | 168 |
| | | 2-Dec-08 | N | 1954.83 | 1972 | 99 | <5 | 4000 | <0.05 | 3807 | 5.6 | 315 | 137 |
| | | 9-Dec-08 | N | 1954.83 | 1972 | 104 | <5 | 4000 | <0.05 | 3813 | 5.67 | 332 | 80 |
| | | 16-Dec-08 | N | 1954.83 | 1972 | 99 | <5 | 4000 | <0.05 | 3853 | 5.62 | 326 | 157 |
| | | 23-Dec-08 | N | 1954.83 | 1972 | 113 | <5 | 4000 | <0.05 | 3775 | 5.57 | 342 | 166 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-006D | TEST 30 | 30-Dec-08 | N | 1954.83 | 1972 | 100 | <5 | 4000 | <0.05 | 3816 | 5.59 | 308 | 136 |
| | | 6-Jan-09 | N | 1954.83 | 1972 | 105 | <5 | 4000 | <0.05 | 3736 | 5.44 | 322 | 142 |
| | | 13-Jan-09 | N | 1954.83 | 1972 | 103 | <5 | 4000 | <0.05 | 3723 | 5.26 | 307 | 162 |
| | | 20-Jan-09 | N | 1954.83 | 1972 | 103 | <5 | 4000 | <0.05 | 3750 | 5.42 | 297 | 145 |
| | | 27-Jan-09 | N | 1954.83 | 1972 | 95 | <5 | 4000 | <0.05 | 3895 | 5.11 | 293 | 137 |
| | | 3-Feb-09 | N | 1954.83 | 1972 | 103 | <5 | 4000 | <0.05 | 3754 | 5.28 | 297 | 143 |
| | | 10-Feb-09 | N | 1954.83 | 1972 | 96 | <5 | 4000 | <0.05 | 3775 | 5.46 | 302 | 136 |
| | | 17-Feb-09 | N | 1954.83 | 1972 | 96 | <5 | 4000 | <0.05 | 3815 | 5.26 | 303 | 146 |
| | | 24-Feb-09 | N | 1954.83 | 1972 | 114.97 | <5 | 4000 | <0.05 | 3662 | 5.06 | 347 | 141 |
| | | 3-Mar-09 | N | 1954.83 | 1972 | 111.545 | <5 | 4000 | <0.05 | 3653 | 5.23 | 329 | 141 |
| | | 10-Mar-09 | N | 1954.83 | 1972 | 102.585 | <5 | 4000 | <0.05 | 3711 | 5.17 | 289 | 150 |
| | | 17-Mar-09 | N | 1954.83 | 1972 | 111.61 | <5 | 4000 | <0.05 | 3777 | 5.09 | 299 | 150 |
| | | 24-Mar-09 | N | 1954.83 | 1972 | 101.53 | <5 | 4000 | <0.05 | 3727 | 5.13 | 285 | 147 |
| | | 31-Mar-09 | N | 1954.83 | 1972 | 94.81 | <5 | 4000 | 0.06 | 3783 | 5.27 | 280 | 132 |
| | | 7-Apr-09 | N | 1954.83 | 1972 | 92.505 | <5 | 4000 | 0.1 | 3808 | 5.33 | 267 | 130 |
| | | 14-Apr-09 | N | 1954.83 | 1972 | 104.89 | <5 | 4000 | <0.05 | 3894 | 5.07 | 282 | 146 |
| | | 21-Apr-09 | N | 1954.83 | 1972 | 90.3835 | <5 | 4000 | <0.05 | 3745 | 5.41 | 267 | 125 |
| | | 28-Apr-09 | N | 1954.83 | 1972 | 99.225 | <5 | 4000 | <0.05 | 3719 | 5.19 | 279 | 131 |
| | | 5-May-09 | N | 1954.83 | 1972 | 114.97 | <5 | 4000 | 0.18 | 3850 | 4.98 | 347 | 161 |
| | | 12-May-09 | N | 1954.83 | 1972 | 114.905 | <5 | 4000 | 0.19 | 3697 | 5.29 | 331 | 154 |
| | | 19-May-09 | N | 1954.83 | 1972 | 122.745 | <5 | 4000 | 0.1 | 3574 | 5.22 | 346 | 154 |
| | | 26-May-09 | N | 1954.83 | 1972 | 114 | <5 | 4000 | 0.14 | 3730 | 5.3 | 341 | 155 |
| | | 2-Jun-09 | N | 1954.83 | 1972 | 135.24 | <5 | 4000 | 0.09 | 3766 | 5.31 | 383 | 179 |
| | | 9-Jun-09 | N | 1954.83 | 1972 | 117.32 | <5 | 4000 | <0.05 | 3750 | 5.03 | 336 | 158 |
| | | 16-Jun-09 | N | 1954.83 | 1972 | 131.88 | <5 | 4000 | 0.15 | 3784 | 5.16 | 376 | 185 |
| | | 23-Jun-09 | N | 1954.83 | 1972 | 146.44 | <5 | 4000 | 0.09 | 3767 | 5.11 | 403 | 104 |
| | | 30-Jun-09 | N | 1954.83 | 1972 | 148.68 | <5 | 4000 | <0.05 | 3750 | 5.32 | 388 | 190 |
| | | 7-Jul-09 | N | 1954.83 | 1972 | 205.84 | <5 | 4000 | <0.05 | 3509 | 4.93 | 539 | 290 |
| | | 14-Jul-09 | N | 1954.83 | 1972 | 158.8 | <5 | 4000 | <0.05 | 3770 | 4.91 | 410 | 176 |
| | | 21-Jul-09 | N | 1954.83 | 1972 | 205.8 | <5 | 4000 | 0.1 | 3652 | 4.81 | 551 | 274 |
| | | 28-Jul-09 | N | 1954.83 | 1972 | 180.04 | <5 | 4000 | 0.15 | 3722 | 4.83 | 459 | 237 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-006D | TEST 30 | 4-Aug-09 | N | 1954.83 | 1972 | 180.04 | <5 | 4000 | 0.12 | 3763 | 4.79 | 461 | 222 |
| | | 11-Aug-09 | N | 1954.83 | 1972 | 178.92 | <5 | 4000 | 0.06 | 3702 | 4.76 | 478 | 230 |
| | | 18-Aug-09 | N | 1954.83 | 1972 | 191.24 | <5 | 4000 | 0.17 | 3692 | 4.7 | 485 | 249 |
| | | 25-Aug-09 | N | 1954.83 | 1972 | 172.24 | <5 | 4000 | -- | 3851 | 4.6 | 440 | 214 |
| | TEST 31 | 26-Aug-08 | N | 1980.6 | 1983.6 | 2560 | <20 | 2000 | 1.76 | 1455 | 3.64 | 3740 | 3330 |
| | | 2-Sep-08 | N | 1980.6 | 1983.6 | 128 | <20 | 2000 | 8.26 | 1961 | 4.1 | 323 | 136 |
| | | 9-Sep-08 | N | 1980.6 | 1983.6 | 202 | <20 | 2000 | 15.9 | 1884 | 3.8 | 512 | 202 |
| | | 16-Sep-08 | N | 1980.6 | 1983.6 | 145 | <20 | 2000 | 15.1 | 1910 | 3.92 | 359 | 137 |
| | | 23-Sep-08 | N | 1980.6 | 1983.6 | 220 | <20 | 2000 | 14.2 | 1856 | 3.94 | 464 | 201 |
| | | 30-Sep-08 | N | 1980.6 | 1983.6 | 220 | <20 | 2000 | 31.1 | 1839 | 3.94 | 758 | 386 |
| | | 7-Oct-08 | N | 1980.6 | 1983.6 | 366 | <20 | 2000 | 29.4M3 | 1780 | 3.83 | 793 | 370 |
| | | 14-Oct-08 | N | 1980.6 | 1983.6 | 120 | <20 | 2000 | 21.8 | 1897 | 3.93 | 360 | 159 |
| | | 21-Oct-08 | N | 1980.6 | 1983.6 | 161 | <20 | 2000 | 25 | 1825 | 3.99 | 464 | 201 |
| | | 28-Oct-08 | N | 1980.6 | 1983.6 | 196 | <20 | 2000 | 28.5 | 1861 | 3.95 | 480 | 235 |
| | | 4-Nov-08 | N | 1980.6 | 1983.6 | 62 | <20 | 2000 | 9.05 | 1859 | 4.16 | 176 | 59 |
| | TEST 31S | 11-Nov-08 | N | 1980.6 | 1983.6 | 206 | <20 | 2000 | 23.5 | 1540 | 3.77 | 579 | 265 |
| | | 18-Nov-08 | N | 1980.6 | 1983.6 | 71 | <20 | 2000 | 9.77 | 1931 | 3.79 | 235 | 80 |
| | | 25-Nov-08 | N | 1980.6 | 1983.6 | 48 | <5 | 2000 | 9.13 | 1947 | 4 | 168 | 49 |
| | | 2-Dec-08 | N | 1980.6 | 1983.6 | 62 | <5 | 2000 | 9.63 | 1883 | 3.59 | 221 | 66 |
| | | 9-Dec-08 | N | 1980.6 | 1983.6 | 87 | <5 | 2000 | 8.07 | 1911 | 3.74 | 173 | 50 |
| | | 16-Dec-08 | N | 1980.6 | 1983.6 | 47 | <5 | 2000 | 7.82 | 1878 | 3.67 | 170 | 45 |
| | | 23-Dec-08 | N | 1980.6 | 1983.6 | 63 | <5 | 2000 | 9.33 | 1941 | 3.73 | 168 | 56 |
| | TEST 32 | 26-Aug-08 | N | 2091.13 | 2094.13 | <20 | 199.08 | 1800 | 0.11 | 863 | 7.49 | 4430 | 2970 |
| | | 2-Sep-08 | N | 2091.13 | 2094.13 | <20 | 56 | 1800 | <0.05 | 1766 | 7.8 | 231 | <10 |
| | | 9-Sep-08 | N | 2091.13 | 2094.13 | 12 | 25 | 1800 | <0.05 | 1716 | 7.7 | 116 | 19 |
| | | 16-Sep-08 | N | 2091.13 | 2094.13 | <20 | 14.22 | 1800 | <0.05 | 1753 | 7.93 | 71 | 13 |
| | | 23-Sep-08 | N | 2091.13 | 2094.13 | <20 | 20 | 1800 | <0.05 | 1511 | 7.44 | 345 | 123 |
| | | 30-Sep-08 | N | 2091.13 | 2094.13 | <20 | 20 | 1800 | <0.05 | 1589 | 7.44 | 293 | 115 |
| | | 7-Oct-08 | N | 2091.13 | 2094.13 | 11 | <20 | 1800 | <0.05 | 1541 | 7.82 | 368 | 143 |
| | | 14-Oct-08 | N | 2091.13 | 2094.13 | <20 | 18 | 1800 | <0.05 | 1708 | 7.75 | 332 | 145 |
| | | 21-Oct-08 | N | 2091.13 | 2094.13 | <20 | 19 | 1800 | <0.05 | 1713 | 7.75 | 227 | 77 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-006D | TEST 32 | 28-Oct-08 | N | 2091.13 | 2094.13 | <20 | 19 | 1800 | <0.05 | 1613 | 7.8 | 257 | 95 |
| | | 4-Nov-08 | N | 2091.13 | 2094.13 | <20 | 20 | 1800 | <0.05 | 1663 | 7.64 | 358 | 146 |
| | TEST 32S | 11-Nov-08 | N | 2091.13 | 2094.13 | <20 | 15 | 1800 | <0.05 | 1059 | 7.47 | 593 | 277 |
| | | 18-Nov-08 | N | 2091.13 | 2094.13 | <20 | 8 | 1800 | <0.05 | 1803 | 7.7 | 145 | 60 |
| | | 25-Nov-08 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1769 | 6.77 | 114 | 47 |
| | | 2-Dec-08 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1748 | 7.05 | 119 | 45 |
| | | 9-Dec-08 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1695 | 6.99 | 132 | <10 |
| | | 16-Dec-08 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1722 | 6.85 | 158 | 61 |
| | | 23-Dec-08 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1723 | 6.68 | 154 | 59 |
| | | 30-Dec-08 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1735 | 6.65 | 151 | 54 |
| | | 6-Jan-09 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1685 | 6.74 | 205 | 81 |
| | | 13-Jan-09 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1681 | 6.6 | 202 | 87 |
| | | 20-Jan-09 | N | 2091.13 | 2094.13 | 7 | <5 | 1800 | <0.05 | 1656 | 6.38 | 228 | 99 |
| | | 27-Jan-09 | N | 2091.13 | 2094.13 | 5 | <5 | 1800 | <0.05 | 1705 | 6.58 | 205 | 90 |
| | | 3-Feb-09 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1675 | 6.35 | 218 | 95 |
| | | 10-Feb-09 | N | 2091.13 | 2094.13 | 5 | <5 | 1800 | <0.05 | 1706 | 6.52 | 217 | 92 |
| | | 17-Feb-09 | N | 2091.13 | 2094.13 | <5 | <5 | 1800 | <0.05 | 1723 | 6.36 | 219 | 93 |
| RES-008A | TEST 33 | 26-Aug-08 | N | 1597 | 1600 | <20 | 52.14 | 3333 | 0.29 | 2542 | 7.88 | 206 | <10 |
| | | 2-Sep-08 | N | 1597 | 1600 | <20 | 39 | 3333 | <0.05 | 2996 | 8.08 | 150 | 15 |
| | | 9-Sep-08 | N | 1597 | 1600 | <20 | 38 | 3333 | <0.05 | 2898 | 8.72 | 105 | <10 |
| | | 16-Sep-08 | N | 1597 | 1600 | <20 | 41.475 | 3333 | <0.05 | 2792 | 8.48 | 92 | <10 |
| | | 23-Sep-08 | N | 1597 | 1600 | <20 | 36 | 3333 | <0.05 | 2948 | 8.39 | 72 | <10 |
| | | 30-Sep-08 | N | 1597 | 1600 | <20 | 36 | 3333 | <0.05 | 3020 | 8.39 | 80 | <10 |
| | | 7-Oct-08 | N | 1597 | 1600 | <20 | 32 | 3333 | <0.05 | 2809 | 8.67 | 68 | <10 |
| | | 14-Oct-08 | N | 1597 | 1600 | <20 | 32 | 3333 | <0.05 | 2885 | 8.13 | 69 | <10 |
| | | 21-Oct-08 | N | 1597 | 1600 | <20 | 31 | 3333 | <0.05 | 2817 | 7.84 | 65 | <10 |
| | | 28-Oct-08 | N | 1597 | 1600 | <20 | 32 | 3333 | <0.05 | 3082 | 8.7 | 67 | <10 |
| | | 4-Nov-08 | N | 1597 | 1600 | <20 | 33 | 3333 | <0.05 | 2821 | 8.6 | 67 | <10 |
| | | 11-Nov-08 | N | 1597 | 1600 | <20 | 25 | 3333 | <0.05 | 3047 | 8.47 | 62 | <10 |
| | | 18-Nov-08 | N | 1597 | 1600 | <20 | 32 | 3333 | <0.05 | 3244 | 8.48 | 67 | <10 |
| | | 25-Nov-08 | N | 1597 | 1600 | <5 | 28 | 3333 | <0.05 | 2963 | 8.54 | 56 | <10 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-008A | TEST 33 | 2-Dec-08 | N | 1597 | 1600 | <5 | 31 | 3333 | <0.05 | 3313 | 8.02 | 64 | <10 |
| | | 9-Dec-08 | N | 1597 | 1600 | <5 | 30 | 3333 | <0.05 | 2996 | 8.04 | 58 | 40 |
| | | 16-Dec-08 | N | 1597 | 1600 | <5 | 27 | 3333 | <0.05 | 3130 | 8.4 | 53 | <10 |
| | | 23-Dec-08 | N | 1597 | 1600 | <5 | 30 | 3333 | <0.05 | 3194 | 7.69 | 60 | <10 |
| | | 30-Dec-08 | N | 1597 | 1600 | <5 | 30 | 3333 | <0.05 | 3062 | 8.19 | 58 | <10 |
| | | 6-Jan-09 | N | 1597 | 1600 | <5 | 28 | 3333 | <0.05 | 3001 | 8.26 | 58 | <10 |
| | | 13-Jan-09 | N | 1597 | 1600 | <5 | 30 | 3333 | <0.05 | 3098 | 8.25 | 61 | <10 |
| | | 20-Jan-09 | N | 1597 | 1600 | <5 | 31 | 3333 | <0.05 | 2862 | 8.17 | 60 | <10 |
| | | 27-Jan-09 | N | 1597 | 1600 | <5 | 27 | 3333 | <0.05 | 2955 | 8.45 | 49 | <10 |
| | | 3-Feb-09 | N | 1597 | 1600 | <5 | 28 | 3333 | <0.05 | 2871 | 8.22 | 60 | <10 |
| | | 10-Feb-09 | N | 1597 | 1600 | <5 | 26 | 3333 | <0.05 | 3022 | 8.3 | 54 | <10 |
| | | 17-Feb-09 | N | 1597 | 1600 | <5 | 27 | 3333 | <0.05 | 3055 | 8.14 | 56 | <10 |
| | TEST 34 | 26-Aug-08 | N | 1717 | 1720 | <20 | 59.25 | 3333 | 0.16 | 2542 | 7.69 | 707 | 267 |
| | | 2-Sep-08 | N | 1717 | 1720 | <20 | 13 | 3333 | <0.05 | 3143 | 7.21 | 518 | 224 |
| | | 9-Sep-08 | N | 1717 | 1720 | <20 | 14 | 3333 | <0.05 | 3226 | 7.53 | 417 | 144 |
| | | 16-Sep-08 | N | 1717 | 1720 | <20 | 17.775 | 3333 | <0.05 | 3172 | 7.51 | 449 | 195 |
| | | 23-Sep-08 | N | 1717 | 1720 | 5 | 17 | 3333 | <0.05 | 3211 | 7.59 | 291 | 112 |
| | | 30-Sep-08 | N | 1717 | 1720 | 5 | 17 | 3333 | <0.05 | 3151 | 7.59 | 293 | 116 |
| | | 7-Oct-08 | N | 1717 | 1720 | <20 | 15 | 3333 | <0.05 | 3144 | 7.89 | 254 | 101 |
| | | 14-Oct-08 | N | 1717 | 1720 | <20 | 12 | 3333 | <0.05 | 3177 | 7.7 | 216 | 86 |
| | | 21-Oct-08 | N | 1717 | 1720 | <20 | 14 | 3333 | <0.05 | 3087 | 8.07 | 182 | 62 |
| | | 28-Oct-08 | N | 1717 | 1720 | <20 | 13 | 3333 | <0.05 | 3235 | 7.81 | 151 | 62 |
| | | 4-Nov-08 | N | 1717 | 1720 | <20 | 14 | 3333 | <0.05 | 3257 | 7.84 | 183 | 64 |
| | | 11-Nov-08 | N | 1717 | 1720 | <20 | 7 | 3333 | <0.05 | 3251 | 7.77 | 137 | 47 |
| | | 18-Nov-08 | N | 1717 | 1720 | <20 | 11 | 3333 | <0.05 | 3186 | 7.85 | 140 | 50 |
| | | 25-Nov-08 | N | 1717 | 1720 | <5 | 11 | 3333 | <0.05 | 3116 | 7.73 | 115 | 40 |
| | | 2-Dec-08 | N | 1717 | 1720 | <5 | 12 | 3333 | <0.05 | 3309 | 7.91 | 139 | 49 |
| | | 9-Dec-08 | N | 1717 | 1720 | <5 | 8 | 3333 | <0.05 | 3261 | 6.65 | 112 | 34 |
| | | 16-Dec-08 | N | 1717 | 1720 | <5 | 11 | 3333 | <0.05 | 3280 | 7.87 | 115 | 40 |
| | | 23-Dec-08 | N | 1717 | 1720 | <5 | 9 | 3333 | <0.05 | 3273 | 7.92 | 104 | 35 |
| | | 30-Dec-08 | N | 1717 | 1720 | <5 | 9 | 3333 | <0.05 | 3279 | 7.99 | 100 | 31 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-008A | TEST 34 | 6-Jan-09 | N | 1717 | 1720 | <5 | 11 | 3333 | <0.05 | 3222 | 7.77 | 105 | 34 |
| | | 13-Jan-09 | N | 1717 | 1720 | <5 | 11 | 3333 | <0.05 | 3187 | 7.82 | 100 | 34 |
| | | 20-Jan-09 | N | 1717 | 1720 | <5 | 9 | 3333 | <0.05 | 3100 | 7.94 | 111 | 36 |
| | | 27-Jan-09 | N | 1717 | 1720 | <5 | 12 | 3333 | <0.05 | 3274 | 7.9 | 96 | 31 |
| | | 3-Feb-09 | N | 1717 | 1720 | <5 | 11 | 3333 | <0.05 | 3146 | 8.13 | 96 | 29 |
| | | 10-Feb-09 | N | 1717 | 1720 | <5 | 13 | 3333 | <0.05 | 3272 | 7.93 | 104 | 32 |
| | | 17-Feb-09 | N | 1717 | 1720 | <5 | 11 | 3333 | <0.05 | 3330 | 7.5 | 99 | 30 |
| | | 24-Feb-09 | N | 1717 | 1720 | <5 | 13.035 | 3333 | <0.05 | 3274 | 7.65 | 106 | 32 |
| | | 3-Mar-09 | N | 1717 | 1720 | <5 | 13.035 | 3333 | <0.05 | 3071 | 7.85 | 110 | 36 |
| | | 10-Mar-09 | N | 1717 | 1720 | <5 | 15.405 | 3333 | <0.05 | 3100 | 7.94 | 96 | 32 |
| | | 17-Mar-09 | N | 1717 | 1720 | <5 | 13.035 | 3333 | <0.05 | 3090 | 7.78 | 92 | 29 |
| | | 24-Mar-09 | N | 1717 | 1720 | <5 | 13.035 | 3333 | <0.05 | 2876 | 7.81 | 104 | 34 |
| | | 31-Mar-09 | N | 1717 | 1720 | <5 | 14.22 | 3333 | <0.05 | 3185 | 7.82 | 92 | 28 |
| | | 7-Apr-09 | N | 1717 | 1720 | <5 | 10.665 | 3333 | <0.05 | 3206 | 7.6 | 76 | 22 |
| | | 14-Apr-09 | N | 1717 | 1720 | <5 | 11.85 | 3333 | <0.05 | 3046 | 7.81 | 86 | 28 |
| | | 21-Apr-09 | N | 1717 | 1720 | <5 | 11.85 | 3333 | <0.05 | 3117 | 7.81 | 94 | 29 |
| | | 28-Apr-09 | N | 1717 | 1720 | <5 | 11.85 | 3333 | <0.05 | 3158 | 7.81 | 85 | 27 |
| | | 5-May-09 | N | 1717 | 1720 | <5 | 13.035 | 3333 | <0.05 | 3025 | 7.54 | 101 | 33 |
| | | 12-May-09 | N | 1717 | 1720 | <5 | 13.035 | 3333 | <0.05 | 3022 | 7.56 | 110 | 36 |
| | | 19-May-09 | N | 1717 | 1720 | <5 | 14.22 | 3333 | <0.05 | 3115 | 7.69 | 102 | 34 |
| | | 26-May-09 | N | 1717 | 1720 | <5 | 10.44 | 3333 | <0.05 | 3041 | 7.58 | 122 | 39 |
| | | 2-Jun-09 | N | 1717 | 1720 | <5 | 11.6 | 3333 | <0.05 | 3140 | 7.64 | 121 | 41 |
| | | 9-Jun-09 | N | 1717 | 1720 | <5 | 11.6 | 3333 | <0.05 | 2999 | 7.71 | 113 | 40 |
| | | 16-Jun-09 | N | 1717 | 1720 | <5 | 11.6 | 3333 | <0.05 | 3059 | 7.75 | 116 | 38 |
| | | 23-Jun-09 | N | 1717 | 1720 | <5 | 10.44 | 3333 | <0.05 | 3136 | 7.76 | 113 | 42 |
| | | 30-Jun-09 | N | 1717 | 1720 | <5 | 10.44 | 3333 | <0.05 | 3158 | 7.61 | 145 | 50 |
| | | 7-Jul-09 | N | 1717 | 1720 | <5 | 10.44 | 3333 | <0.05 | 2965 | 7.71 | 177 | 69 |
| | | 14-Jul-09 | N | 1717 | 1720 | <5 | 9.28 | 3333 | <0.05 | 2988 | 7.28 | 149 | 57 |
| | | 21-Jul-09 | N | 1717 | 1720 | <5 | 11.6 | 3333 | <0.05 | 2966 | 7.53 | 184 | 70 |
| | | 28-Jul-09 | N | 1717 | 1720 | <5 | 8.12 | 3333 | <0.05 | 2834 | 7.51 | 177 | 67 |
| | | 4-Aug-09 | N | 1717 | 1720 | <5 | 9.28 | 3333 | <0.05 | 3070 | 7.87 | 153 | 55 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-008A | TEST 34 | 11-Aug-09 | N | 1717 | 1720 | <5 | 10.44 | 3333 | <0.05 | 3017 | 7.4 | 171 | 61 |
| | | 18-Aug-09 | N | 1717 | 1720 | <5 | 11.6 | 3333 | <0.05 | 3114 | 7.4 | 159 | 58 |
| | | 25-Aug-09 | N | 1717 | 1720 | <5 | 10.44 | 3333 | -- | 3140 | 7.57 | 171 | 66 |
| | | 1-Sep-09 | N | 1717 | 1720 | <5 | 5.8 | 3333 | <0.05 | 3705 | 7.13 | 181 | 20 |
| | | 8-Sep-09 | N | 1717 | 1720 | <5 | 8.12 | 3333 | <0.05 | 3023 | 7.15 | 178 | 62 |
| | | 15-Sep-09 | N | 1717 | 1720 | <5 | 8.12 | 3333 | <0.05 | 3151 | 6.67 | 155 | 60 |
| | | 22-Sep-09 | N | 1717 | 1720 | <5 | 5.8 | 3333 | 0 | 3122 | 6.91 | 142 | 55 |
| | | 29-Sep-09 | N | 1717 | 1720 | <5 | <5 | 3333 | <0.05 | 3161 | 6.79 | 124 | 40 |
| | | 6-Oct-09 | N | 1717 | 1720 | <5 | <5 | 3333 | <0.05 | 3187 | 6.63 | 125 | 49 |
| | | 13-Oct-09 | N | 1717 | 1720 | <5 | 5.8 | 3333 | <0.05 | 3226 | 7.38 | 108 | 41 |
| | | 20-Oct-09 | N | 1717 | 1720 | <5 | 6.96 | 3333 | <0.05 | 3202 | 7.32 | 106 | 39 |
| | | 27-Oct-09 | N | 1717 | 1720 | <2.5 | 6.96 | 3333 | <0.025 | 3183 | 7.13 | 100 | 37 |
| | | 3-Nov-09 | N | 1717 | 1720 | <2.5 | 9.28 | 3333 | <0.025 | 3222 | 7.2 | 93 | 33 |
| | | 10-Nov-09 | N | 1717 | 1720 | <2.5 | 6.96 | 3333 | <0.025 | 3142 | 7.08 | 91 | 33 |
| | | 17-Nov-09 | N | 1717 | 1720 | <5 | 8.12 | 3333 | <0.05 | 3182 | -- | 92 | 33 |
| | | 24-Nov-09 | N | 1717 | 1720 | <5 | 7 | 3333 | <0.05 | 3054 | 7.1 | 105 | 35 |
| | TEST 35 | 26-Aug-08 | N | 1844.1 | 1846.6 | <20 | 95.985 | 2667 | <0.05 | 2003 | 7.63 | 1540 | 769 |
| | | 2-Sep-08 | N | 1844.1 | 1846.6 | <20 | 27 | 2667 | <0.05 | 2571 | 7.38 | 896 | 389 |
| | | 9-Sep-08 | N | 1844.1 | 1846.6 | <20 | 26 | 2667 | <0.05 | 2601 | 7.62 | 750 | 255 |
| | | 16-Sep-08 | N | 1844.1 | 1846.6 | <20 | 28.44 | 2667 | <0.05 | 2611 | 7.69 | 643 | 295 |
| | | 23-Sep-08 | N | 1844.1 | 1846.6 | <20 | 21 | 2667 | <0.05 | 2575 | 7.98 | 532 | 225 |
| | | 30-Sep-08 | N | 1844.1 | 1846.6 | <20 | 21 | 2667 | <0.05 | 2477 | 7.98 | 575 | 262 |
| | | 7-Oct-08 | N | 1844.1 | 1846.6 | <20 | 24 | 2667 | <0.05 | 2489 | 7.93 | 469 | 205 |
| | | 14-Oct-08 | N | 1844.1 | 1846.6 | <20 | 23 | 2667 | <0.05 | 2477 | 7.65 | 467 | 203 |
| | | 21-Oct-08 | N | 1844.1 | 1846.6 | <20 | 23 | 2667 | <0.05 | 2493 | 7.67 | 387 | 162 |
| | | 28-Oct-08 | N | 1844.1 | 1846.6 | <20 | 24 | 2667 | <0.05 | 2561 | 7.72 | 387 | 165 |
| | | 4-Nov-08 | N | 1844.1 | 1846.6 | <20 | 24 | 2667 | <0.05 | 2496 | 7.83 | 357 | 153 |
| | | 11-Nov-08 | N | 1844.1 | 1846.6 | <20 | 18 | 2667 | <0.05 | 2341 | 7.82 | 395 | 178 |
| | | 18-Nov-08 | N | 1844.1 | 1846.6 | <20 | 23 | 2667 | <0.05 | 2493 | 7.77 | 326 | 122 |
| | | 25-Nov-08 | N | 1844.1 | 1846.6 | <5 | 20 | 2667 | <0.05 | 2552 | 7.74 | 289 | 116 |
| | | 2-Dec-08 | N | 1844.1 | 1846.6 | <5 | 21 | 2667 | <0.05 | 2550 | 7.74 | 300 | 109 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-008A | TEST 35 | 9-Dec-08 | N | 1844.1 | 1846.6 | <5 | 24 | 2667 | <0.05 | 2575 | 7.8 | 259 | 127 |
| | | 16-Dec-08 | N | 1844.1 | 1846.6 | <5 | 20 | 2667 | <0.05 | 2555 | 7.68 | 233 | 85 |
| | | 23-Dec-08 | N | 1844.1 | 1846.6 | <5 | 21 | 2667 | <0.05 | 2575 | 7.71 | 234 | 87 |
| | | 30-Dec-08 | N | 1844.1 | 1846.6 | <5 | 25 | 2667 | <0.05 | 2583 | 7.8 | 252 | 91 |
| | | 6-Jan-09 | N | 1844.1 | 1846.6 | <5 | 24 | 2667 | <0.05 | 2576 | 7.71 | 240 | 83 |
| | | 13-Jan-09 | N | 1844.1 | 1846.6 | <5 | 21 | 2667 | <0.05 | 2501 | 8.11 | 198 | 74 |
| | | 20-Jan-09 | N | 1844.1 | 1846.6 | <5 | 21 | 2667 | <0.05 | 2500 | 8 | 202 | 68 |
| | | 27-Jan-09 | N | 1844.1 | 1846.6 | <5 | 21 | 2667 | <0.05 | 2523 | 7.86 | 194 | 66 |
| | | 3-Feb-09 | N | 1844.1 | 1846.6 | <5 | 20 | 2667 | <0.05 | 2395 | 7.74 | 218 | 76 |
| | | 10-Feb-09 | N | 1844.1 | 1846.6 | <5 | 19 | 2667 | <0.05 | 2490 | 8.23 | 183 | 58 |
| | | 17-Feb-09 | N | 1844.1 | 1846.6 | <5 | 19 | 2667 | <0.05 | 2560 | 7.74 | 188 | 61 |
| | | 24-Feb-09 | N | 1844.1 | 1846.6 | <5 | 18.96 | 2667 | <0.05 | 2461 | 7.9 | 197 | 67 |
| | | 3-Mar-09 | N | 1844.1 | 1846.6 | <5 | 21.33 | 2667 | <0.05 | 2456 | 7.88 | 195 | 59 |
| | | 10-Mar-09 | N | 1844.1 | 1846.6 | <5 | 20.145 | 2667 | <0.05 | 2427 | 7.64 | 200 | 65 |
| | | 17-Mar-09 | N | 1844.1 | 1846.6 | <5 | 18.96 | 2667 | <0.05 | 2472 | 7.68 | 183 | 63 |
| | | 24-Mar-09 | N | 1844.1 | 1846.6 | <5 | 18.96 | 2667 | <0.05 | 2487 | 7.83 | 191 | 66 |
| | | 31-Mar-09 | N | 1844.1 | 1846.6 | <5 | 23.7 | 2667 | <0.05 | 2436 | 7.63 | 190 | 62 |
| | | 7-Apr-09 | N | 1844.1 | 1846.6 | <5 | 17.775 | 2667 | <0.05 | 2537 | 7.67 | 160 | 46 |
| | | 14-Apr-09 | N | 1844.1 | 1846.6 | <5 | 18.96 | 2667 | <0.05 | 2482 | 7.82 | 166 | 54 |
| | | 21-Apr-09 | N | 1844.1 | 1846.6 | <5 | 23.7 | 2667 | <0.05 | 2465 | 7.83 | 173 | 51 |
| | | 28-Apr-09 | N | 1844.1 | 1846.6 | <5 | 21.33 | 2667 | <0.05 | 2491 | 7.64 | 181 | 57 |
| | | 5-May-09 | N | 1844.1 | 1846.6 | <5 | 17.775 | 2667 | <0.05 | 2452 | 7.71 | 173 | 52 |
| | | 12-May-09 | N | 1844.1 | 1846.6 | <5 | 21.33 | 2667 | <0.05 | 2379 | 7.79 | 190 | 60 |
| | | 19-May-09 | N | 1844.1 | 1846.6 | <5 | 17.775 | 2667 | <0.05 | 2394 | 7.6 | 185 | 61 |
| | | 26-May-09 | N | 1844.1 | 1846.6 | <5 | 24.36 | 2667 | <0.05 | 2407 | 7.8 | 228 | 77 |
| | | 2-Jun-09 | N | 1844.1 | 1846.6 | <5 | 17.4 | 2667 | <0.05 | 2461 | 7.84 | 194 | 66 |
| | | 9-Jun-09 | N | 1844.1 | 1846.6 | <5 | 20.88 | 2667 | <0.05 | 2494 | 7.84 | 195 | 67 |
| | | 16-Jun-09 | N | 1844.1 | 1846.6 | <5 | 23.2 | 2667 | <0.05 | 2506 | 7.8 | 211 | 66 |
| | | 23-Jun-09 | N | 1844.1 | 1846.6 | <5 | 22.04 | 2667 | <0.05 | 2406 | 7.7 | 228 | 74 |
| | | 30-Jun-09 | N | 1844.1 | 1846.6 | <5 | 18.56 | 2667 | <0.05 | 2453 | 7.61 | 216 | 80 |
| | | 7-Jul-09 | N | 1844.1 | 1846.6 | <5 | 19.72 | 2667 | <0.05 | 2323 | 7.93 | 284 | 104 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-008A | TEST 35 | 14-Jul-09 | N | 1844.1 | 1846.6 | <5 | 20.88 | 2667 | <0.05 | 2423 | 8.08 | 257 | 91 |
| | | 21-Jul-09 | N | 1844.1 | 1846.6 | <5 | 20.88 | 2667 | <0.05 | 2382 | 7.56 | 318 | 110 |
| | | 28-Jul-09 | N | 1844.1 | 1846.6 | <5 | 18.56 | 2667 | <0.05 | 2314 | 7.81 | 287 | 117 |
| | | 4-Aug-09 | N | 1844.1 | 1846.6 | <5 | 20.88 | 2667 | <0.05 | 2494 | 7.77 | 283 | 99 |
| | | 11-Aug-09 | N | 1844.1 | 1846.6 | <5 | 19.72 | 2667 | <0.05 | 2396 | 7.25 | 308 | 111 |
| | | 18-Aug-09 | N | 1844.1 | 1846.6 | <5 | 19.72 | 2667 | <0.05 | 2372 | 7.72 | 303 | 99 |
| | | 25-Aug-09 | N | 1844.1 | 1846.6 | <5 | 23.2 | 2667 | -- | 2474 | 7.85 | 304 | 105 |
| | TEST 36 | 26-Aug-08 | N | 1979.95 | 1982.94 | <20 | 87.69 | 3333 | <0.05 | 2355 | 6.99 | 1330 | 664 |
| | | 2-Sep-08 | N | 1979.95 | 1982.94 | <20 | 23 | 3333 | <0.05 | 3085 | 7.21 | 1030 | 486 |
| | | 9-Sep-08 | N | 1979.95 | 1982.94 | <20 | 14 | 3333 | <0.05 | 3034 | 7.25 | 955 | 392 |
| | | 16-Sep-08 | N | 1979.95 | 1982.94 | <20 | 11.85 | 3333 | <0.05 | 2972 | 7.01 | 828 | 387 |
| | | 23-Sep-08 | N | 1979.95 | 1982.94 | <20 | 7 | 3333 | <0.05 | 3092 | 7 | 690 | 319 |
| | | 30-Sep-08 | N | 1979.95 | 1982.94 | <20 | 7 | 3333 | <0.05 | 3049 | 7 | 814 | 418 |
| | | 7-Oct-08 | N | 1979.95 | 1982.94 | 5 | <20 | 3333 | <0.05 | 3038 | 8 | 746 | 390 |
| | | 14-Oct-08 | N | 1979.95 | 1982.94 | <20 | 15 | 3333 | <0.05 | 3068 | 7.26 | 685 | 358 |
| | | 21-Oct-08 | N | 1979.95 | 1982.94 | <20 | 12 | 3333 | <0.05 | 2913 | 7.62 | 674 | 331 |
| | | 28-Oct-08 | N | 1979.95 | 1982.94 | <20 | 18 | 3333 | <0.05 | 3070 | 7.85 | 653 | 318 |
| | | 4-Nov-08 | N | 1979.95 | 1982.94 | <20 | 17 | 3333 | <0.05 | 3097 | 7.68 | 710 | 348 |
| | | 11-Nov-08 | N | 1979.95 | 1982.94 | <20 | 15 | 3333 | <0.05 | 3170 | 7.76 | 543 | 249 |
| | | 18-Nov-08 | N | 1979.95 | 1982.94 | <20 | 23 | 3333 | <0.05 | 3071 | 7.57 | 602 | 281 |
| | | 25-Nov-08 | N | 1979.95 | 1982.94 | <5 | 18 | 3333 | <0.05 | 3036 | 7.57 | 629 | 321 |
| | | 2-Dec-08 | N | 1979.95 | 1982.94 | <5 | 21 | 3333 | <0.05 | 3124 | 7.61 | 590 | 273 |
| | | 9-Dec-08 | N | 1979.95 | 1982.94 | <5 | 17 | 3333 | <0.05 | 3046 | 7.58 | 507 | 246 |
| | | 16-Dec-08 | N | 1979.95 | 1982.94 | <5 | 15 | 3333 | <0.05 | 3221 | 7.48 | 435 | 184 |
| | | 23-Dec-08 | N | 1979.95 | 1982.94 | <5 | 15 | 3333 | <0.05 | 3122 | 7.62 | 458 | 208 |
| | | 30-Dec-08 | N | 1979.95 | 1982.94 | <5 | 18 | 3333 | <0.05 | 3161 | 7.45 | 433 | 200 |
| | | 6-Jan-09 | N | 1979.95 | 1982.94 | <5 | 17 | 3333 | <0.05 | 3156 | 7.38 | 477 | 213 |
| | | 13-Jan-09 | N | 1979.95 | 1982.94 | <5 | 15 | 3333 | <0.05 | 3091 | 7.4 | 424 | 198 |
| | | 20-Jan-09 | N | 1979.95 | 1982.94 | <5 | 14 | 3333 | <0.05 | 3035 | 7.57 | 438 | 191 |
| | | 27-Jan-09 | N | 1979.95 | 1982.94 | <5 | 17 | 3333 | <0.05 | 3130 | 7.41 | 432 | 211 |
| | | 3-Feb-09 | N | 1979.95 | 1982.94 | <5 | 14 | 3333 | <0.05 | 2985 | 7.64 | 423 | 190 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-008A | TEST 36 | 10-Feb-09 | N | 1979.95 | 1982.94 | <5 | 17 | 3333 | <0.05 | 3030 | 7.51 | 439 | 191 |
| | | 17-Feb-09 | N | 1979.95 | 1982.94 | <5 | 15 | 3333 | <0.05 | 3159 | 7.41 | 393 | 163 |
| | | 24-Feb-09 | N | 1979.95 | 1982.94 | <5 | 17.775 | 3333 | <0.05 | 3125 | 7.75 | 408 | 171 |
| | | 3-Mar-09 | N | 1979.95 | 1982.94 | <5 | 18.96 | 3333 | <0.05 | 3204 | 7.62 | 423 | 182 |
| | | 10-Mar-09 | N | 1979.95 | 1982.94 | <5 | 21.33 | 3333 | <0.05 | 3146 | 7.92 | 422 | 199 |
| | | 17-Mar-09 | N | 1979.95 | 1982.94 | <5 | 18.96 | 3333 | <0.05 | 3152 | 7.84 | 442 | 188 |
| | | 24-Mar-09 | N | 1979.95 | 1982.94 | <5 | 14.22 | 3333 | <0.05 | 2944 | 7.73 | 457 | 211 |
| | | 31-Mar-09 | N | 1979.95 | 1982.94 | <5 | 16.59 | 3333 | <0.05 | 3248 | 7.84 | 341 | 147 |
| | | 7-Apr-09 | N | 1979.95 | 1982.94 | <5 | 14.22 | 3333 | <0.05 | 3047 | 7.55 | 384 | 177 |
| | | 14-Apr-09 | N | 1979.95 | 1982.94 | <5 | 14.22 | 3333 | <0.05 | 3057 | 7.95 | 394 | 187 |
| | | 21-Apr-09 | N | 1979.95 | 1982.94 | <5 | 11.85 | 3333 | <0.05 | 3129 | 7.73 | 325 | 131 |
| | | 28-Apr-09 | N | 1979.95 | 1982.94 | <5 | 13.035 | 3333 | <0.05 | 2992 | 7.79 | 370 | 157 |
| | | 5-May-09 | N | 1979.95 | 1982.94 | <5 | 13.035 | 3333 | <0.05 | 2951 | 7.85 | 442 | 184 |
| | | 12-May-09 | N | 1979.95 | 1982.94 | <5 | 14.22 | 3333 | <0.05 | 2818 | 7.53 | 485 | 210 |
| | | 19-May-09 | N | 1979.95 | 1982.94 | <5 | 14.22 | 3333 | <0.05 | 2870 | 7.71 | 427 | 196 |
| | | 26-May-09 | N | 1979.95 | 1982.94 | <5 | 12.76 | 3333 | <0.05 | 2979 | 7.69 | 486 | 216 |
| | | 2-Jun-09 | N | 1979.95 | 1982.94 | <5 | 12.76 | 3333 | <0.05 | 2840 | 7.59 | 525 | 235 |
| | | 9-Jun-09 | N | 1979.95 | 1982.94 | <5 | 16.24 | 3333 | <0.05 | 2857 | 7.57 | 490 | 233 |
| | | 16-Jun-09 | N | 1979.95 | 1982.94 | <5 | 13.92 | 3333 | <0.05 | 3111 | 7.83 | 396 | 153 |
| | | 23-Jun-09 | N | 1979.95 | 1982.94 | <5 | 15.08 | 3333 | <0.05 | 3055 | 7.7 | 526 | 238 |
| | | 30-Jun-09 | N | 1979.95 | 1982.94 | <5 | 13.92 | 3333 | <0.05 | 2954 | 7.52 | 464 | 142 |
| | | 7-Jul-09 | N | 1979.95 | 1982.94 | <5 | 11.6 | 3333 | <0.05 | 2900 | 7.64 | 547 | 255 |
| | | 14-Jul-09 | N | 1979.95 | 1982.94 | <5 | 12.76 | 3333 | <0.05 | 2992 | 7.65 | 606 | 279 |
| | | 21-Jul-09 | N | 1979.95 | 1982.94 | <5 | 17.4 | 3333 | <0.05 | 3115 | 7.5 | 597 | 255 |
| | | 28-Jul-09 | N | 1979.95 | 1982.94 | <5 | 12.76 | 3333 | <0.05 | 3040 | 7.73 | 564 | 274 |
| | | 4-Aug-09 | N | 1979.95 | 1982.94 | <5 | 10.44 | 3333 | <0.05 | 2862 | 7.5 | 566 | 247 |
| | | 11-Aug-09 | N | 1979.95 | 1982.94 | <5 | 9.28 | 3333 | <0.05 | 2860 | 7.28 | 542 | 205 |
| | | 18-Aug-09 | N | 1979.95 | 1982.94 | <5 | 10.44 | 3333 | <0.05 | 2893 | 7.84 | 623 | 269 |
| | | 25-Aug-09 | N | 1979.95 | 1982.94 | <5 | 10.44 | 3333 | -- | 3043 | 7.62 | 608 | 263 |
| | TEST 37 | 26-Aug-08 | N | 2053.81 | 2056.81 | <20 | 74.655 | 1800 | <0.05 | 1347 | 7.4 | 1600 | 849 |
| | | 2-Sep-08 | N | 2053.81 | 2056.81 | <20 | 14 | 1800 | <0.05 | 1649 | 6.62 | 1310 | 654 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-008A | TEST 37 | 9-Sep-08 | N | 2053.81 | 2056.81 | <20 | 14 | 1800 | <0.05 | 1716 | 7.22 | 1220 | 547 |
| | | 16-Sep-08 | N | 2053.81 | 2056.81 | <20 | 10.665 | 1800 | <0.05 | 1680 | 7.13 | 674 | 321 |
| | | 23-Sep-08 | N | 2053.81 | 2056.81 | <20 | 17 | 1800 | <0.05 | 1730 | 7.65 | 953 | 492 |
| | | 30-Sep-08 | N | 2053.81 | 2056.81 | <20 | 17 | 1800 | <0.05 | 1603 | 7.65 | 732 | 372 |
| | | 7-Oct-08 | N | 2053.81 | 2056.81 | <20 | 12 | 1800 | <0.05 | 1646 | 7.88 | 553 | 271 |
| | | 14-Oct-08 | N | 2053.81 | 2056.81 | <20 | 9 | 1800 | <0.05 | 1651 | 7.3 | 455 | 208 |
| | | 21-Oct-08 | N | 2053.81 | 2056.81 | <20 | 12 | 1800 | <0.05 | 1674 | 7.5 | 500 | 243 |
| | | 28-Oct-08 | N | 2053.81 | 2056.81 | <20 | 12 | 1800 | <0.05 | 1590 | 7.25 | 402 | 198 |
| | | 4-Nov-08 | N | 2053.81 | 2056.81 | <20 | 11 | 1800 | <0.05 | 1764 | 6.7 | 419 | 198 |
| | | 11-Nov-08 | N | 2053.81 | 2056.81 | <20 | 8 | 1800 | <0.05 | 1612 | 7.77 | 425 | 204 |
| | | 18-Nov-08 | N | 2053.81 | 2056.81 | <20 | 13 | 1800 | <0.05 | 1591 | 7.56 | 496 | 228 |
| | | 25-Nov-08 | N | 2053.81 | 2056.81 | <5 | 9 | 1800 | <0.05 | 1633 | 7.58 | 355 | 152 |
| | | 2-Dec-08 | N | 2053.81 | 2056.81 | <5 | 14 | 1800 | <0.05 | 1704 | 7.57 | 375 | 151 |
| | | 9-Dec-08 | N | 2053.81 | 2056.81 | <5 | 9 | 1800 | <0.05 | 1698 | 7.87 | 431 | 211 |
| | | 16-Dec-08 | N | 2053.81 | 2056.81 | <5 | 6 | 1800 | <0.05 | 1644 | 7.73 | 308 | 136 |
| | | 23-Dec-08 | N | 2053.81 | 2056.81 | <5 | 11 | 1800 | <0.05 | 1583 | 7.69 | 375 | 159 |
| | | 30-Dec-08 | N | 2053.81 | 2056.81 | <5 | 8 | 1800 | <0.05 | 1688 | 7.5 | 287 | 117 |
| | | 6-Jan-09 | N | 2053.81 | 2056.81 | <5 | 9 | 1800 | <0.05 | 1653 | 7.61 | 354 | 150 |
| | | 13-Jan-09 | N | 2053.81 | 2056.81 | <5 | 7 | 1800 | <0.05 | 1643 | 7.83 | 255 | 118 |
| | | 20-Jan-09 | N | 2053.81 | 2056.81 | <5 | 9 | 1800 | <0.05 | 1589 | 7.55 | 337 | 152 |
| | | 27-Jan-09 | N | 2053.81 | 2056.81 | <5 | 8 | 1800 | <0.05 | 1673 | 7.77 | 235 | 99 |
| | | 3-Feb-09 | N | 2053.81 | 2056.81 | <5 | 7 | 1800 | <0.05 | 1667 | 7.72 | 257 | 107 |
| | | 10-Feb-09 | N | 2053.81 | 2056.81 | <5 | 6 | 1800 | <0.05 | 1650 | 7.7 | 245 | 103 |
| | | 17-Feb-09 | N | 2053.81 | 2056.81 | <5 | 7 | 1800 | <0.05 | 1751 | 7.45 | 221 | 89 |
| | | 24-Feb-09 | N | 2053.81 | 2056.81 | <5 | 7.11 | 1800 | <0.05 | 1686 | 7.62 | 254 | 104 |
| | | 3-Mar-09 | N | 2053.81 | 2056.81 | <5 | 8.295 | 1800 | <0.05 | 1635 | 7.6 | 288 | 112 |
| | | 10-Mar-09 | N | 2053.81 | 2056.81 | <5 | 7.11 | 1800 | <0.05 | 1679 | 7.68 | 239 | 98 |
| | | 17-Mar-09 | N | 2053.81 | 2056.81 | <5 | 7.11 | 1800 | <0.05 | 1593 | 7.92 | 281 | 114 |
| | | 24-Mar-09 | N | 2053.81 | 2056.81 | <5 | 8.295 | 1800 | <0.05 | 1634 | 7.98 | 210 | 87 |
| | | 31-Mar-09 | N | 2053.81 | 2056.81 | <5 | 5.925 | 1800 | <0.05 | 1642 | 7.67 | 220 | 97 |
| | | 7-Apr-09 | N | 2053.81 | 2056.81 | <5 | 7.11 | 1800 | <0.05 | 1667 | 7.61 | 221 | 89 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-008A | TEST 37 | 14-Apr-09 | N | 2053.81 | 2056.81 | <5 | 8.295 | 1800 | <0.05 | 1644 | 7.84 | 197 | 86 |
| | | 21-Apr-09 | N | 2053.81 | 2056.81 | <5 | 9.48 | 1800 | <0.05 | 1685 | 7.65 | 238 | 98 |
| | | 28-Apr-09 | N | 2053.81 | 2056.81 | <5 | 9.48 | 1800 | <0.05 | 1748 | 8.02 | 215 | 93 |
| | | 5-May-09 | N | 2053.81 | 2056.81 | <5 | 9.48 | 1800 | <0.05 | 1645 | 8.08 | 235 | 90 |
| | | 12-May-09 | N | 2053.81 | 2056.81 | <5 | 7.11 | 1800 | <0.05 | 1594 | 7.5 | 246 | 97 |
| | | 19-May-09 | N | 2053.81 | 2056.81 | <5 | 7.11 | 1800 | <0.05 | 1429 | 7.74 | 277 | 115 |
| | | 26-May-09 | N | 2053.81 | 2056.81 | <5 | 8.12 | 1800 | <0.05 | 1729 | 7.86 | 203 | 79 |
| | | 2-Jun-09 | N | 2053.81 | 2056.81 | <5 | 8.12 | 1800 | <0.05 | 1602 | 7.9 | 325 | 140 |
| | | 9-Jun-09 | N | 2053.81 | 2056.81 | <5 | 6.96 | 1800 | <0.05 | 1622 | 7.85 | 250 | 104 |
| | | 16-Jun-09 | N | 2053.81 | 2056.81 | <5 | 6.96 | 1800 | <0.05 | 1545 | 7.89 | 279 | 113 |
| | | 23-Jun-09 | N | 2053.81 | 2056.81 | <5 | 6.96 | 1800 | <0.05 | 1582 | 7.4 | 240 | 99 |
| | | 30-Jun-09 | N | 2053.81 | 2056.81 | <5 | <5 | 1800 | <0.05 | 1712 | 7.48 | 213 | 123 |
| | | 7-Jul-09 | N | 2053.81 | 2056.81 | <5 | 6.96 | 1800 | <0.05 | 1404 | 7.65 | 375 | 162 |
| | | 14-Jul-09 | N | 2053.81 | 2056.81 | <5 | <5 | 1800 | <0.05 | 1498 | 7.68 | 339 | 152 |
| | | 21-Jul-09 | N | 2053.81 | 2056.81 | <5 | 8.12 | 1800 | <0.05 | 1422 | 7.72 | 398 | 160 |
| | | 28-Jul-09 | N | 2053.81 | 2056.81 | <5 | 6.96 | 1800 | <0.05 | 1500 | 7.88 | 372 | 173 |
| | | 4-Aug-09 | N | 2053.81 | 2056.81 | <5 | 5.8 | 1800 | <0.05 | 1508 | 7.61 | 283 | 119 |
| | | 11-Aug-09 | N | 2053.81 | 2056.81 | <5 | <5 | 1800 | <0.05 | 1530 | 6.89 | 331 | 145 |
| | | 18-Aug-09 | N | 2053.81 | 2056.81 | <5 | <5 | 1800 | <0.05 | 1552 | 7.05 | 304 | 110 |
| | | 25-Aug-09 | N | 2053.81 | 2056.81 | <5 | <5 | 1800 | -- | 1667 | 6.95 | 314 | 131 |
| RES-009 | TEST 38 | 26-Aug-08 | N | 278.9 | 281.09 | <20 | 46.215 | 4000 | <0.05 | 2577 | 8.77 | 132 | <10 |
| | | 2-Sep-08 | N | 278.9 | 281.09 | <20 | 40 | 4000 | <0.05 | 3912 | 8.93 | 101 | <10 |
| | | 9-Sep-08 | N | 278.9 | 281.09 | <20 | 43 | 4000 | <0.05 | 3826 | 9.08 | 95 | <10 |
| | | 16-Sep-08 | N | 278.9 | 281.09 | <20 | 37.92 | 4000 | <0.05 | 3905 | 8.72 | 81 | <10 |
| | | 23-Sep-08 | N | 278.9 | 281.09 | <20 | 32 | 4000 | <0.05 | 3889 | 8.77 | 66 | <10 |
| | | 30-Sep-08 | N | 278.9 | 281.09 | <20 | 32 | 4000 | <0.05 | 3962 | 8.77 | 74 | <10 |
| | | 7-Oct-08 | N | 278.9 | 281.09 | <20 | 36 | 4000 | <0.05 | 3819 | 8.92 | 70 | <10 |
| | | 14-Oct-08 | N | 278.9 | 281.09 | <20 | 34 | 4000 | <0.05 | 4030 | 8.67 | 63 | <10 |
| | | 21-Oct-08 | N | 278.9 | 281.09 | <20 | 32 | 4000 | <0.05 | 3849 | 8.76 | 64 | <10 |
| | | 28-Oct-08 | N | 278.9 | 281.09 | <20 | 34 | 4000 | <0.05 | 3866 | 8.58 | 62 | <10 |
| | | 4-Nov-08 | N | 278.9 | 281.09 | <20 | 31 | 4000 | <0.05 | 3796 | 8.85 | 60 | <10 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009 | TEST 38 | 11-Nov-08 | N | 278.9 | 281.09 | <20 | 31 | 4000 | <0.05 | 3873 | 8.65 | 58 | <10 |
| | | 18-Nov-08 | N | 278.9 | 281.09 | <20 | 24 | 4000 | <0.05 | 3797 | 8.73 | 57 | <10 |
| | | 25-Nov-08 | N | 278.9 | 281.09 | <5 | 25 | 4000 | <0.05 | 3900 | 8.76 | 48 | <10 |
| | | 2-Dec-08 | N | 278.9 | 281.09 | <5 | 28 | 4000 | <0.05 | 3837 | 8.4 | 49 | <10 |
| | | 9-Dec-08 | N | 278.9 | 281.09 | <5 | 23 | 4000 | <0.05 | 3803 | 8.58 | 47 | <10 |
| | | 16-Dec-08 | N | 278.9 | 281.09 | <5 | 27 | 4000 | <0.05 | 3895 | 8.54 | 49 | <10 |
| | | 23-Dec-08 | N | 278.9 | 281.09 | <5 | 26 | 4000 | <0.05 | 3892 | 8.07 | 51 | <10 |
| | TEST 39 | 26-Aug-08 | N | 645.59 | 647.52 | <20 | 103 | 3833 | <0.05 | 2738 | 9.48 | 317 | 27 |
| | | 2-Sep-08 | N | 645.59 | 647.52 | <20 | 90 | 3833 | 0.05 | 3760 | 9.53 | 26 | 20 |
| | | 9-Sep-08 | N | 645.59 | 647.52 | <20 | 83 | 3833 | <0.05 | 3695 | 9.33 | 232 | <10 |
| | | 16-Sep-08 | N | 645.59 | 647.52 | <20 | 79.395 | 3833 | <0.05 | 3731 | 9.23 | 208 | 11 |
| | | 23-Sep-08 | N | 645.59 | 647.52 | <20 | 75 | 3833 | 0.05 | 3212 | 9.2 | 192 | 14 |
| | | 30-Sep-08 | N | 645.59 | 647.52 | <20 | 75 | 3833 | 0.08 | 3704 | 9.2 | 177 | <10 |
| | | 7-Oct-08 | N | 645.59 | 647.52 | <20 | 77 | 3833 | 0.07 | 3557 | 9.53 | 163 | <10 |
| | | 14-Oct-08 | N | 645.59 | 647.52 | <20 | 71 | 3833 | 0.14 | 3827 | 9.24 | 160 | <10 |
| | | 21-Oct-08 | N | 645.59 | 647.52 | <20 | 65 | 3833 | 0.08 | 3626 | 9.28 | 131 | <10 |
| | | 28-Oct-08 | N | 645.59 | 647.52 | <20 | 58 | 3833 | 0.09 | 3708 | 9.29 | 118 | <10 |
| | | 4-Nov-08 | N | 645.59 | 647.52 | <20 | 56 | 3833 | 0.1 | 3709 | 9.26 | 122 | <10 |
| | | 11-Nov-08 | N | 645.59 | 647.52 | <20 | 55 | 3833 | 0.13 | 3716 | 9.14 | 114 | <10 |
| | | 18-Nov-08 | N | 645.59 | 647.52 | <20 | 55 | 3833 | 0.08 | 3588 | 9.12 | 117 | <10 |
| | | 25-Nov-08 | N | 645.59 | 647.52 | <5 | 47 | 3833 | 0.05 | 3731 | 9.1 | 102 | <10 |
| | | 2-Dec-08 | N | 645.59 | 647.52 | <5 | 52 | 3833 | 0.09 | 3742 | 8.81 | 109 | <10 |
| | | 9-Dec-08 | N | 645.59 | 647.52 | <5 | 57 | 3833 | <0.05 | 3577 | 8.78 | 112 | <10 |
| | | 16-Dec-08 | N | 645.59 | 647.52 | <5 | 47 | 3833 | 0.12 | 3740 | 8.96 | 96 | <10 |
| | | 23-Dec-08 | N | 645.59 | 647.52 | <5 | 43 | 3833 | 0.07 | 3708 | 8.72 | 89 | <10 |
| | TEST 40 | 26-Aug-08 | N | 804.84 | 807 | <20 | 41.475 | 1800 | <0.05 | 1296 | 8.64 | 1250 | 430 |
| | | 2-Sep-08 | N | 804.84 | 807 | <20 | 36 | 1800 | <0.05 | 1822 | 7.92 | 1810 | 787 |
| | | 9-Sep-08 | N | 804.84 | 807 | <20 | 31 | 1800 | <0.05 | 1609 | 8.09 | 1800 | 700 |
| | | 16-Sep-08 | N | 804.84 | 807 | <20 | 29.625 | 1800 | <0.05 | 1739 | 7.97 | 988 | 388 |
| | | 23-Sep-08 | N | 804.84 | 807 | <20 | 29 | 1800 | <0.05 | 1373 | 7.84 | 1360 | 638 |
| | | 30-Sep-08 | N | 804.84 | 807 | <20 | 29 | 1800 | <0.05 | 1361 | 7.84 | 1100 | 535 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009 | TEST 40 | 7-Oct-08 | N | 804.84 | 807 | <20 | 27 | 1800 | <0.05 | 1397 | 7.66 | 1110 | 510 |
| | | 14-Oct-08 | N | 804.84 | 807 | <20 | 26 | 1800 | <0.05 | 1464 | 7.89 | 893 | 417 |
| | | 21-Oct-08 | N | 804.84 | 807 | <20 | 23 | 1800 | <0.05 | 1622 | 7.76 | 704 | 309 |
| | | 28-Oct-08 | N | 804.84 | 807 | <20 | 21 | 1800 | <0.05 | 1575 | 8.14 | 622 | 287 |
| | | 4-Nov-08 | N | 804.84 | 807 | <20 | 20 | 1800 | <0.05 | 1554 | 8.15 | 687 | 310 |
| | | 11-Nov-08 | N | 804.84 | 807 | <20 | 24 | 1800 | <0.05 | 1584 | 7.38 | 617 | 300 |
| | | 18-Nov-08 | N | 804.84 | 807 | <20 | 27 | 1800 | <0.05 | 1605 | 7.88 | 704 | 303 |
| | | 25-Nov-08 | N | 804.84 | 807 | <5 | 23 | 1800 | <0.05 | 1551 | 7.95 | 551 | 229 |
| | | 2-Dec-08 | N | 804.84 | 807 | <5 | 20 | 1800 | <0.05 | 1789 | 7.66 | 486 | 170 |
| | | 9-Dec-08 | N | 804.84 | 807 | <5 | 32 | 1800 | <0.05 | 1526 | 7.87 | 780 | 366 |
| | | 16-Dec-08 | N | 804.84 | 807 | <5 | 26 | 1800 | <0.05 | 1639 | 7.73 | 478 | 206 |
| | | 23-Dec-08 | N | 804.84 | 807 | <5 | 24 | 1800 | <0.05 | 1602 | 7.75 | 497 | 220 |
| | TEST 41 | 26-Aug-08 | FD | 804.84 | 807 | <20 | 46.215 | 1800 | <0.05 | 1383 | 7.74 | 1230 | 661 |
| | | 2-Sep-08 | FD | 804.84 | 807 | <20 | 36 | 1800 | <0.05 | 1804 | 7.59 | 1940 | 860 |
| | | 9-Sep-08 | FD | 804.84 | 807 | <20 | 36 | 1800 | <0.05 | 1625 | 8.26 | 1760 | 878 |
| | | 16-Sep-08 | FD | 804.84 | 807 | <20 | 32 | 1800 | <0.05 | 1783 | 8.24 | 1100 | 508 |
| | | 23-Sep-08 | FD | 804.84 | 807 | <20 | 32 | 1800 | <0.05 | 1468 | 7.95 | 1280 | 604 |
| | | 30-Sep-08 | FD | 804.84 | 807 | <20 | 32 | 1800 | <0.05 | 1443 | 7.95 | 997 | 514 |
| | | 7-Oct-08 | FD | 804.84 | 807 | <20 | 31 | 1800 | <0.05 | 1484 | 8.14 | 866 | 364 |
| | | 14-Oct-08 | FD | 804.84 | 807 | <20 | 27 | 1800 | <0.05 | 1581 | 7.98 | 697 | 340 |
| | | 21-Oct-08 | FD | 804.84 | 807 | <20 | 25 | 1800 | <0.05 | 1671 | 7.92 | 614 | 262 |
| | | 28-Oct-08 | FD | 804.84 | 807 | <20 | 24 | 1800 | <0.05 | 1652 | 8.18 | 582 | 292 |
| | | 4-Nov-08 | FD | 804.84 | 807 | <20 | 24 | 1800 | <0.05 | 1661 | 7.86 | 609 | 249 |
| | | 11-Nov-08 | FD | 804.84 | 807 | <20 | 19 | 1800 | <0.05 | 1593 | 6.82 | 555 | 231 |
| | | 18-Nov-08 | FD | 804.84 | 807 | <20 | 25 | 1800 | <0.05 | 1635 | 7.9 | 573 | 220 |
| | | 25-Nov-08 | FD | 804.84 | 807 | <5 | 24 | 1800 | <0.05 | 1675 | 7.95 | 479 | 202 |
| | | 2-Dec-08 | FD | 804.84 | 807 | <5 | 25 | 1800 | <0.05 | 1775 | 7.79 | 424 | 167 |
| | | 9-Dec-08 | FD | 804.84 | 807 | <5 | 24 | 1800 | <0.05 | 1666 | 7.72 | 475 | 220 |
| | | 16-Dec-08 | FD | 804.84 | 807 | <5 | 23 | 1800 | <0.05 | 1707 | 7.79 | 377 | 159 |
| | | 23-Dec-08 | FD | 804.84 | 807 | <5 | 23 | 1800 | <0.05 | 1685 | 7.58 | 386 | 165 |
| | TEST 42 | 26-Aug-08 | N | 994.67 | 997.67 | <20 | 137.46 | 2333 | 0.06 | 853 | 7.8 | 4520 | 2260 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009 | TEST 42 | 2-Sep-08 | N | 994.67 | 997.67 | <20 | 57 | 2333 | <0.05 | 2202 | 7.43 | 938 | 356 |
| | | 9-Sep-08 | N | 994.67 | 997.67 | <20 | 82 | 2333 | <0.05 | 2282 | 8.36 | 475 | 131 |
| | | 16-Sep-08 | N | 994.67 | 997.67 | <20 | 29.625 | 2333 | <0.05 | 2178 | 8.13 | 112 | 18 |
| | | 23-Sep-08 | N | 994.67 | 997.67 | <20 | 30 | 2333 | <0.05 | 2201 | 8.94 | 88 | 14 |
| | | 30-Sep-08 | N | 994.67 | 997.67 | <20 | 30 | 2333 | <0.05 | 2156 | 8.94 | 67 | <10 |
| | | 7-Oct-08 | N | 994.67 | 997.67 | <20 | 25 | 2333 | <0.05 | 2133 | 8.63 | 51 | <10 |
| | | 14-Oct-08 | N | 994.67 | 997.67 | <20 | 24 | 2333 | <0.05 | 2363 | 7.25 | 55 | <10 |
| | | 21-Oct-08 | N | 994.67 | 997.67 | <20 | 24 | 2333 | <0.05 | 2126 | 8.35 | 68 | <10 |
| | | 28-Oct-08 | N | 994.67 | 997.67 | <20 | 24 | 2333 | <0.05 | 2222 | 8.16 | 60 | <10 |
| | | 4-Nov-08 | N | 994.67 | 997.67 | <20 | 26 | 2333 | <0.05 | 2255 | 8.3 | 70 | <10 |
| | | 11-Nov-08 | N | 994.67 | 997.67 | <20 | 20 | 2333 | <0.05 | 2248 | 7.73 | 50 | <10 |
| | | 18-Nov-08 | N | 994.67 | 997.67 | <20 | 30 | 2333 | <0.05 | 1975 | 8.21 | 82 | 12 |
| | | 25-Nov-08 | N | 994.67 | 997.67 | <5 | 52 | 2333 | 0.05 | 1782 | 8.18 | 179 | 23 |
| | | 2-Dec-08 | N | 994.67 | 997.67 | <5 | 27 | 2333 | <0.05 | 2165 | 7.97 | 67 | <10 |
| | | 9-Dec-08 | N | 994.67 | 997.67 | <5 | 24 | 2333 | <0.05 | 2258 | 8.12 | 54 | <10 |
| | | 16-Dec-08 | N | 994.67 | 997.67 | <5 | 27 | 2333 | <0.05 | 2213 | 7.98 | 67 | <10 |
| | | 23-Dec-08 | N | 994.67 | 997.67 | <5 | 30 | 2333 | <0.05 | 2100 | 6.94 | 79 | <10 |
| RES-009E | TEST 43 | 26-Aug-08 | N | 1351.03 | 1354.03 | 305.88 | <20 | 3333 | 0.12 | 1715 | 4.62 | 4120 | 2190 |
| | | 2-Sep-08 | N | 1351.03 | 1354.03 | 48 | <20 | 3333 | 0.67 | 3372 | 4.94 | 492 | 180 |
| | | 9-Sep-08 | N | 1351.03 | 1354.03 | 55 | <20 | 3333 | 0.35 | 3223 | 4.48 | 302 | 115 |
| | | 16-Sep-08 | N | 1351.03 | 1354.03 | 54.49 | <20 | 3333 | 0.55 | 3302 | 4.74 | 260 | 125 |
| | | 23-Sep-08 | N | 1351.03 | 1354.03 | 84 | <20 | 3333 | 0.21 | 3124 | 4.44 | 260 | 119 |
| | | 30-Sep-08 | N | 1351.03 | 1354.03 | 84 | <20 | 3333 | 0.12 | 3142 | 4.44 | 245 | 95 |
| | | 7-Oct-08 | N | 1351.03 | 1354.03 | 73 | <20 | 3333 | 0.3 | 3130 | 4.44 | 225 | 89 |
| | | 14-Oct-08 | N | 1351.03 | 1354.03 | 65 | <20 | 3333 | 0.25 | 3195 | 4.24 | 234 | 99 |
| | | 21-Oct-08 | N | 1351.03 | 1354.03 | 65 | <20 | 3333 | 0.2 | 3145 | 4.12 | 235 | 95 |
| | | 28-Oct-08 | N | 1351.03 | 1354.03 | 59 | <20 | 3333 | 0.26 | 3182 | 4.36 | 216 | 83 |
| | | 4-Nov-08 | N | 1351.03 | 1354.03 | 67 | <20 | 3333 | 0.52 | 3160 | 4.15 | 250 | 111 |
| | | 11-Nov-08 | N | 1351.03 | 1354.03 | 66 | <20 | 3333 | 0.3 | 3169 | 4.16 | 236 | 103 |
| | | 18-Nov-08 | N | 1351.03 | 1354.03 | 59 | <20 | 3333 | 0.66 | 3151 | 4.12 | 221 | 80 |
| | | 25-Nov-08 | N | 1351.03 | 1354.03 | 55 | <5 | 3333 | 0.41 | 3123 | 4.19 | 199 | 81 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 43 | 2-Dec-08 | N | 1351.03 | 1354.03 | 74 | <5 | 3333 | 0.2 | 3034 | 4.04 | 257 | 109 |
| | | 9-Dec-08 | N | 1351.03 | 1354.03 | 74 | <5 | 3333 | 0.35 | 3068 | 4.03 | 266 | 115 |
| | | 16-Dec-08 | N | 1351.03 | 1354.03 | 66 | <5 | 3333 | 0.23 | 3215 | 4.09 | 236 | 106 |
| | | 23-Dec-08 | N | 1351.03 | 1354.03 | 62 | <5 | 3333 | 0.25 | 3046 | 4.03 | 208 | 88 |
| | | 30-Dec-08 | N | 1351.03 | 1354.03 | 57 | <5 | 3333 | 0.28 | 3242 | 4.12 | 200 | 80 |
| | | 6-Jan-09 | N | 1351.03 | 1354.03 | 70 | <5 | 3333 | 2.09 | 3198 | 4.03 | 247 | 99 |
| | | 13-Jan-09 | N | 1351.03 | 1354.03 | 56 | <5 | 3333 | 1.79 | 3155 | 4.03 | 200 | 78 |
| | | 20-Jan-09 | N | 1351.03 | 1354.03 | 63 | <5 | 3333 | 1.56 | 3124 | 3.99 | 209 | 80 |
| | | 27-Jan-09 | N | 1351.03 | 1354.03 | 67 | <5 | 3333 | 1.92 | 3168 | 3.99 | 227 | 92 |
| | | 3-Feb-09 | N | 1351.03 | 1354.03 | 80 | <5 | 3333 | 2.49 | 3180 | 3.95 | 248 | 99 |
| | | 10-Feb-09 | N | 1351.03 | 1354.03 | 67 | <5 | 3333 | 2.42 | 3204 | 3.97 | 235 | 84 |
| | | 17-Feb-09 | N | 1351.03 | 1354.03 | 50 | <5 | 3333 | 1.68 | 3149 | 3.99 | 194 | 66 |
| | | 24-Feb-09 | N | 1351.03 | 1354.03 | 75.04 | <5 | 3333 | 1.58 | 3213 | 4 | 260 | 106 |
| | | 3-Mar-09 | N | 1351.03 | 1354.03 | 59.295 | <5 | 3333 | 1.6 | 3151 | 4.05 | 204 | 63 |
| | | 10-Mar-09 | N | 1351.03 | 1354.03 | 64.96 | <5 | 3333 | 1.86 | 3124 | 3.99 | 210 | 88 |
| | | 17-Mar-09 | N | 1351.03 | 1354.03 | 82.88 | <5 | 3333 | 2.73 | 3219 | 3.87 | 271 | 107 |
| | | 24-Mar-09 | N | 1351.03 | 1354.03 | 82.88 | <5 | 3333 | 4.32 | 3171 | 3.86 | 272 | 108 |
| | | 31-Mar-09 | N | 1351.03 | 1354.03 | 67.2 | <5 | 3333 | 3 | 3247 | 3.95 | 220 | 86 |
| | | 7-Apr-09 | N | 1351.03 | 1354.03 | 50.4 | <5 | 3333 | 2.34 | 3126 | 3.98 | 174 | 65 |
| | | 14-Apr-09 | N | 1351.03 | 1354.03 | 73.92 | <5 | 3333 | 2.78 | 3231 | 3.84 | 294 | 89 |
| | | 21-Apr-09 | N | 1351.03 | 1354.03 | 60.48 | <5 | 3333 | 2.67 | 3163 | 3.89 | 219 | 74 |
| | | 28-Apr-09 | N | 1351.03 | 1354.03 | 61.6 | <5 | 3333 | 2.27 | 3140 | 3.85 | 210 | 74 |
| | | 5-May-09 | N | 1351.03 | 1354.03 | 74.975 | <5 | 3333 | 2.08 | 3111 | 4.03 | 244 | 97 |
| | | 12-May-09 | N | 1351.03 | 1354.03 | 88.48 | <5 | 3333 | 3.19 | 3132 | 3.85 | 280 | 109 |
| | | 19-May-09 | N | 1351.03 | 1354.03 | 77.28 | <5 | 3333 | 3.36 | 3082 | 3.77 | 254 | 100 |
| | | 26-May-09 | N | 1351.03 | 1354.03 | 89.6 | <5 | 3333 | 4.34 | 3161 | 3.76 | 311 | 109 |
| | | 2-Jun-09 | N | 1351.03 | 1354.03 | 64.96 | <5 | 3333 | 3.39 | 3150 | 3.84 | 235 | 81 |
| | | 9-Jun-09 | N | 1351.03 | 1354.03 | 88.48 | <5 | 3333 | 4.14 | 3174 | 3.72 | 281 | 111 |
| | | 16-Jun-09 | N | 1351.03 | 1354.03 | 82.88 | <5 | 3333 | 3.43 | 3136 | 3.85 | 271 | 97 |
| | | 23-Jun-09 | N | 1351.03 | 1354.03 | 72.8 | <5 | 3333 | 3.83 | 3200 | 3.8 | 251 | 89 |
| | | 30-Jun-09 | N | 1351.03 | 1354.03 | 105.28 | <5 | 3333 | 5.68 | 3133 | 3.67 | 338 | 112 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 43 | 7-Jul-09 | N | 1351.03 | 1354.03 | 146.72 | <5 | 3333 | 4.92 | 3013 | 3.85 | 399 | 181 |
| | | 14-Jul-09 | N | 1351.03 | 1354.03 | 100.8 | <5 | 3333 | 4.63 | 3077 | 3.69 | 319 | 105 |
| | | 21-Jul-09 | N | 1351.03 | 1354.03 | 145.6 | <5 | 3333 | 7.76 | 3130 | 3.59 | 468 | 174 |
| | | 28-Jul-09 | N | 1351.03 | 1354.03 | 127.68 | <5 | 3333 | 6.18 | 3098 | 3.72 | 380 | 148 |
| | | 4-Aug-09 | N | 1351.03 | 1354.03 | 156.8 | <5 | 3333 | 5.98 | 3041 | 3.71 | 430 | 173 |
| | | 11-Aug-09 | N | 1351.03 | 1354.03 | 159.04 | <5 | 3333 | 7.99 | 3105 | 3.64 | 455 | 180 |
| | | 18-Aug-09 | N | 1351.03 | 1354.03 | 115.36 | <5 | 3333 | 3.31 | 3125 | 3.65 | 374 | 131 |
| | | 25-Aug-09 | N | 1351.03 | 1354.03 | 137.76 | <5 | 3333 | -- | 3163 | 3.59 | 433 | 138 |
| | TEST 44 | 26-Aug-08 | N | 1510.74 | 1527.19 | 101.79 | <20 | 4000 | 0.35 | 2849 | 4.56 | 886 | 473 |
| | | 2-Sep-08 | N | 1510.74 | 1527.19 | 221 | <20 | 4000 | <0.05 | 3933 | 4.26 | 1030 | 487 |
| | | 9-Sep-08 | N | 1510.74 | 1527.19 | 255 | <20 | 4000 | <0.05 | 3782 | 4.25 | 875 | 507 |
| | | 16-Sep-08 | N | 1510.74 | 1527.19 | 252.66 | <20 | 4000 | <0.05 | 3883 | 4.34 | 397 | 437 |
| | | 23-Sep-08 | N | 1510.74 | 1527.19 | 265 | <20 | 4000 | <0.05 | 3803 | 4.01 | 709 | 389 |
| | | 30-Sep-08 | N | 1510.74 | 1527.19 | 265 | <20 | 4000 | <0.05 | 3814 | 4.01 | 758 | 338 |
| | | 7-Oct-08 | N | 1510.74 | 1527.19 | 340 | <20 | 4000 | <0.05 | 3788 | 3.92 | 717 | 359 |
| | | 14-Oct-08 | N | 1510.74 | 1527.19 | 227 | <20 | 4000 | <0.05 | 3882 | 3.85 | 557 | 300 |
| | | 21-Oct-08 | N | 1510.74 | 1527.19 | 265 | <20 | 4000 | 0.12 | 3769 | 3.66 | 678 | 347 |
| | | 28-Oct-08 | N | 1510.74 | 1527.19 | 223 | <20 | 4000 | 0.19 | 3903 | 3.89 | 551 | 250 |
| | | 4-Nov-08 | N | 1510.74 | 1527.19 | 233 | <20 | 4000 | 0.16 | 3793 | 3.64 | 619 | 296 |
| | | 11-Nov-08 | N | 1510.74 | 1527.19 | 215 | <20 | 4000 | 0.15 | 3836 | 3.62 | 595 | 284 |
| | | 18-Nov-08 | N | 1510.74 | 1527.19 | 228 | <20 | 4000 | 0.17 | 3753 | 3.58 | 604 | 264 |
| | | 25-Nov-08 | N | 1510.74 | 1527.19 | 236 | <5 | 4000 | 0.09 | 3846 | 3.58 | 601 | 292 |
| | | 2-Dec-08 | N | 1510.74 | 1527.19 | 233 | <5 | 4000 | 0.2 | 3738 | 3.47 | 531 | 248 |
| | | 9-Dec-08 | N | 1510.74 | 1527.19 | 202 | <5 | 4000 | 0.13 | 3891 | 3.43 | 566 | 259 |
| | | 16-Dec-08 | N | 1510.74 | 1527.19 | 212 | <5 | 4000 | 0.28 | 3809 | 3.5 | 547 | 245 |
| | | 23-Dec-08 | N | 1510.74 | 1527.19 | 215 | <5 | 4000 | 0.14 | 3867 | 3.4 | 593 | 263 |
| | | 30-Dec-08 | N | 1510.74 | 1527.19 | 218 | <5 | 4000 | 1.01 | 3889 | 3.42 | 599 | 259 |
| | | 6-Jan-09 | N | 1510.74 | 1527.19 | 237 | <5 | 4000 | 19.6 | 3811 | 3.41 | 612 | 247 |
| | | 13-Jan-09 | N | 1510.74 | 1527.19 | 220 | <5 | 4000 | 16.1 | 3847 | 3.38 | 603 | 266 |
| | | 20-Jan-09 | N | 1510.74 | 1527.19 | 260 | <5 | 4000 | 24.4 | 3816 | 3.31 | 694 | 294 |
| | | 27-Jan-09 | N | 1510.74 | 1527.19 | 241 | <5 | 4000 | 26.1 | 3830 | 3.28 | 667 | 276 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 44 | 3-Feb-09 | N | 1510.74 | 1527.19 | 234 | <5 | 4000 | 25.4 | 3929 | 3.24 | 673 | 244 |
| | | 10-Feb-09 | N | 1510.74 | 1527.19 | 279 | <5 | 4000 | 36.1 | 3831 | 3.17 | 831 | 333 |
| | | 17-Feb-09 | N | 1510.74 | 1527.19 | 284 | <5 | 4000 | 36.8 | 3900 | 3.12 | 865 | 289 |
| | | 24-Feb-09 | N | 1510.74 | 1527.19 | 336 | <5 | 4000 | 49.8 | 3736 | 3.07 | 1020 | 369 |
| | | 3-Mar-09 | N | 1510.74 | 1527.19 | 374.08 | <5 | 4000 | 61.9 | 3747 | 3.04 | 1110 | 411 |
| | | 10-Mar-09 | N | 1510.74 | 1527.19 | 404.32 | <5 | 4000 | 73 | 3814 | 2.95 | 1150 | 503 |
| | | 17-Mar-09 | N | 1510.74 | 1527.19 | 468.16 | <5 | 4000 | 92.1 | 3861 | 2.92 | 1360 | 478 |
| | | 24-Mar-09 | N | 1510.74 | 1527.19 | 591.36 | <5 | 4000 | 135 | 3804 | 2.87 | 1520 | 634 |
| | | 31-Mar-09 | N | 1510.74 | 1527.19 | 613.76 | <5 | 4000 | 142 | 3848 | 2.79 | 1550 | 660 |
| | | 7-Apr-09 | N | 1510.74 | 1527.19 | 647.36 | <5 | 4000 | 163 | 3809 | 2.73 | 1700 | 743 |
| | | 14-Apr-09 | N | 1510.74 | 1527.19 | 329.28 | <5 | 4000 | 174 | 3656 | 2.76 | 1700 | 786 |
| | | 21-Apr-09 | N | 1510.74 | 1527.19 | 370.72 | <5 | 4000 | 202 | 3973 | 2.77 | 1910 | 860 |
| | | 28-Apr-09 | N | 1510.74 | 1527.19 | 773 | <5 | 4000 | 216 | 3861 | 2.74 | 1870 | 873 |
| | | 5-May-09 | N | 1510.74 | 1527.19 | 750.4 | <5 | 4000 | 208 | 3789 | 2.77 | 1960 | 905 |
| | | 12-May-09 | N | 1510.74 | 1527.19 | 799.68 | <5 | 4000 | 226 | 3797 | 2.72 | 1980 | 990 |
| | | 19-May-09 | N | 1510.74 | 1527.19 | 840 | <5 | 4000 | 249 | 3792 | 2.64 | 2130 | 943 |
| | | 26-May-09 | N | 1510.74 | 1527.19 | 732.48 | <5 | 4000 | 238 | 3727 | 2.72 | 2020 | 881 |
| | | 2-Jun-09 | N | 1510.74 | 1527.19 | 750.4 | <5 | 4000 | 233 | 3748 | 2.72 | 2000 | 779 |
| | | 9-Jun-09 | N | 1510.74 | 1527.19 | 672 | <5 | 4000 | 178 | 3787 | 2.71 | 1820 | 784 |
| | | 16-Jun-09 | N | 1510.74 | 1527.19 | 725.76 | <5 | 4000 | 230 | 3870 | 2.7 | 2060 | 771 |
| | | 23-Jun-09 | N | 1510.74 | 1527.19 | 790.72 | <5 | 4000 | 234 | 3756 | 2.68 | 2190 | 980 |
| | | 30-Jun-09 | N | 1510.74 | 1527.19 | 904.96 | <5 | 4000 | 284 | 3783 | 2.66 | 2290 | 990 |
| | | 7-Jul-09 | N | 1510.74 | 1527.19 | 1060 | <5 | 4000 | 321 | 3741 | 2.6 | 2560 | 1190 |
| | | 14-Jul-09 | N | 1510.74 | 1527.19 | 1070 | <5 | 4000 | 333 | 3694 | 2.56 | 2540 | 1250 |
| | | 21-Jul-09 | N | 1510.74 | 1527.19 | 981.12 | <5 | 4000 | 297 | 3689 | 2.6 | 2570 | 1150 |
| | | 28-Jul-09 | N | 1510.74 | 1527.19 | 945.28 | <5 | 4000 | 281 | 3707 | 2.65 | 2500 | 1080 |
| | | 4-Aug-09 | N | 1510.74 | 1527.19 | 1010 | <5 | 4000 | 302 | 3543 | 2.58 | 2410 | 1090 |
| | | 11-Aug-09 | N | 1510.74 | 1527.19 | 898.24 | <5 | 4000 | 265 | 3689 | 2.67 | 2420 | 1050 |
| | | 18-Aug-09 | N | 1510.74 | 1527.19 | 936.32 | <5 | 4000 | 269 | 3922 | 2.62 | 2510 | 992 |
| | | 25-Aug-09 | N | 1510.74 | 1527.19 | 853.44 | <5 | 4000 | -- | 3863 | 2.66 | 2440 | 917 |
| | | 1-Sep-09 | N | 1510.74 | 1527.19 | 824 | <5 | 4000 | 263 | 3786 | 2.66 | 2190 | 929 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 44 | 8-Sep-09 | N | 1510.74 | 1527.19 | 797.44 | <5 | 4000 | 230 | 3709 | 2.75 | 2230 | 899 |
| | | 15-Sep-09 | N | 1510.74 | 1527.19 | 763.84 | <5 | 4000 | 302 | 3766 | 2.82 | 2210 | 840 |
| | | 22-Sep-09 | N | 1510.74 | 1527.19 | 676.48 | <5 | 4000 | 0 | 3810 | 2.77 | 2080 | 723 |
| | | 29-Sep-09 | N | 1510.74 | 1527.19 | 593.6 | <5 | 4000 | 172 | 3653 | 2.8 | 1820 | 668 |
| | | 6-Oct-09 | N | 1510.74 | 1527.19 | 515.2 | <5 | 4000 | 152 | 3763 | 2.96 | 1750 | 562 |
| | | 13-Oct-09 | N | 1510.74 | 1527.19 | 387.52 | <5 | 4000 | 115 | 3736 | 2.63 | 1520 | 429 |
| | | 20-Oct-09 | N | 1510.74 | 1527.19 | 396.48 | <5 | 4000 | 123 | 3864 | 2.7 | 1560 | 438 |
| | | 27-Oct-09 | N | 1510.74 | 1527.19 | 396.48 | <2.5 | 4000 | 116 | 3857 | 2.71 | 1540 | 475 |
| | | 3-Nov-09 | N | 1510.74 | 1527.19 | 407.68 | <2.5 | 4000 | 122 | 3925 | -- | 1600 | 457 |
| | | 10-Nov-09 | N | 1510.74 | 1527.19 | 416.64 | <2.5 | 4000 | 137 | 3828 | 2.71 | 1580 | 434 |
| | | 17-Nov-09 | N | 1510.74 | 1527.19 | 481.6 | <5 | 4000 | 149 | 3805 | -- | 1750 | 567 |
| | | 24-Nov-09 | N | 1510.74 | 1527.19 | 488 | <5 | 4000 | 153 | 3810 | 2.7 | 1730 | 510 |
| | TEST 45 | 26-Aug-08 | FD | 1510.74 | 1527.19 | 71.245 | <20 | 1800 | 0.51 | 1475 | 4.37 | 602 | 597 |
| | | 2-Sep-08 | FD | 1510.74 | 1527.19 | 149 | <20 | 1800 | <0.05 | 1791 | 4.24 | 676 | 314 |
| | | 9-Sep-08 | FD | 1510.74 | 1527.19 | 171 | <20 | 1800 | <0.05 | 1530 | 4.25 | 575 | 303 |
| | | 16-Sep-08 | FD | 1510.74 | 1527.19 | 130.56 | <20 | 1800 | 0.11 | 1747 | 4.47 | 354 | 182 |
| | | 23-Sep-08 | FD | 1510.74 | 1527.19 | 148 | <20 | 1800 | 0.13 | 1519 | 4.14 | 403 | 197 |
| | | 30-Sep-08 | FD | 1510.74 | 1527.19 | 148 | <20 | 1800 | 0.08 | 1507 | 4.14 | 436 | 184 |
| | | 7-Oct-08 | FD | 1510.74 | 1527.19 | 163 | <20 | 1800 | 0.13 | 1543 | 4.18 | 364 | 156 |
| | | 14-Oct-08 | FD | 1510.74 | 1527.19 | 138 | <20 | 1800 | 0.07 | 1528 | 3.88 | 376 | 172 |
| | | 21-Oct-08 | FD | 1510.74 | 1527.19 | 128 | <20 | 1800 | 0.26 | 1632 | 3.75 | 348 | 153 |
| | | 28-Oct-08 | FD | 1510.74 | 1527.19 | 106 | <20 | 1800 | 0.38 | 1655 | 4.05 | 294 | 140 |
| | | 4-Nov-08 | FD | 1510.74 | 1527.19 | 138 | <20 | 1800 | 0.19 | 1605 | 3.81 | 404 | 143 |
| | | 11-Nov-08 | FD | 1510.74 | 1527.19 | 124 | <20 | 1800 | 0.26 | 1575 | 3.85 | 353 | 197 |
| | | 18-Nov-08 | FD | 1510.74 | 1527.19 | 215 | <20 | 1800 | 0.35 | 1584 | 3.78 | 357 | 150 |
| | | 25-Nov-08 | FD | 1510.74 | 1527.19 | 100 | <5 | 1800 | 0.41 | 1602 | 3.82 | 301 | 120 |
| | | 2-Dec-08 | FD | 1510.74 | 1527.19 | 113 | <5 | 1800 | 0.23 | 1489 | 3.66 | 341 | 130 |
| | | 9-Dec-08 | FD | 1510.74 | 1527.19 | 86 | <5 | 1800 | 0.41 | 1622 | 3.69 | 271 | 115 |
| | | 16-Dec-08 | FD | 1510.74 | 1527.19 | 83 | <5 | 1800 | 0.49 | 1686 | 3.79 | 247 | 94 |
| | | 23-Dec-08 | FD | 1510.74 | 1527.19 | 88 | <5 | 1800 | 0.41 | 1649 | 3.74 | 270 | 109 |
| | | 30-Dec-08 | FD | 1510.74 | 1527.19 | 97 | <5 | 1800 | 8.09 | 1642 | 3.74 | 303 | 111 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 45 | 6-Jan-09 | FD | 1510.74 | 1527.19 | 103 | <5 | 1800 | 8.76 | 1500 | 3.7 | 325 | 127 |
| | | 13-Jan-09 | FD | 1510.74 | 1527.19 | 84 | <5 | 1800 | 7.79 | 1702 | 3.75 | 265 | 106 |
| | | 20-Jan-09 | FD | 1510.74 | 1527.19 | 120 | <5 | 1800 | 9.97 | 1544 | 3.72 | 359 | 133 |
| | | 27-Jan-09 | FD | 1510.74 | 1527.19 | 91 | <5 | 1800 | 9.93 | 1614 | 3.73 | 270 | 103 |
| | | 3-Feb-09 | FD | 1510.74 | 1527.19 | 148 | <5 | 1800 | 17.6 | 1526 | 3.61 | 430 | 159 |
| | | 10-Feb-09 | FD | 1510.74 | 1527.19 | 97 | <5 | 1800 | 11.2 | 1514 | 3.65 | 318 | 108 |
| | | 17-Feb-09 | FD | 1510.74 | 1527.19 | 96 | <5 | 1800 | 11.8 | 1503 | 3.64 | 314 | 116 |
| | TEST 46 | 26-Aug-08 | FD | 1510.74 | 1527.19 | 37.06 | <20 | 1500 | 1.09 | 1068 | 4.65 | 324 | 138 |
| | | 2-Sep-08 | FD | 1510.74 | 1527.19 | 63 | <20 | 1500 | 0.16 | 1437 | 4.49 | 321 | 126 |
| | | 9-Sep-08 | FD | 1510.74 | 1527.19 | 72 | <20 | 1500 | <0.05 | 1446 | 4.42 | 263 | 124 |
| | | 30-Sep-08 | FD | 1510.74 | 1527.19 | 113 | <20 | 1500 | 0.16 | 1364 | 4.25 | 237 | 92 |
| | | 7-Oct-08 | FD | 1510.74 | 1527.19 | 97 | <20 | 1500 | 0.32 | 1351 | 4.23 | 219 | 87 |
| | | 14-Oct-08 | FD | 1510.74 | 1527.19 | 67 | <20 | 1500 | 0.52 | 1329 | 4.17 | 166 | 64 |
| | | 21-Oct-08 | FD | 1510.74 | 1527.19 | 66 | <20 | 1500 | 0.42 | 1359 | 4 | 190 | 71 |
| | | 28-Oct-08 | FD | 1510.74 | 1527.19 | 36 | <20 | 1500 | 1.22 | 1331 | 4.31 | 128 | 51 |
| | | 4-Nov-08 | FD | 1510.74 | 1527.19 | 46 | <20 | 1500 | 1.07 | 1387 | 4.04 | 154 | 49 |
| | | 11-Nov-08 | FD | 1510.74 | 1527.19 | 55 | <20 | 1500 | 0.82 | 1315 | 4.03 | 184 | 74 |
| | | 18-Nov-08 | FD | 1510.74 | 1527.19 | 46 | <20 | 1500 | 0.94 | 1333 | 4.05 | 147 | 49 |
| | | 25-Nov-08 | FD | 1510.74 | 1527.19 | 36 | <5 | 1500 | 1.65 | 1336 | 4.04 | 119 | 41 |
| | | 2-Dec-08 | FD | 1510.74 | 1527.19 | 28 | <5 | 1500 | 2.06 | 1330 | 4.43 | 112 | 31 |
| | | 9-Dec-08 | FD | 1510.74 | 1527.19 | 30 | <5 | 1500 | 1.96 | 1325 | 4 | 107 | 35 |
| | | 16-Dec-08 | FD | 1510.74 | 1527.19 | 32 | <5 | 1500 | 1.3 | 1365 | 4.06 | 111 | 37 |
| | | 23-Dec-08 | FD | 1510.74 | 1527.19 | 31 | <5 | 1500 | 2.04 | 1328 | 4.09 | 106 | 37 |
| | | 30-Dec-08 | FD | 1510.74 | 1527.19 | 25 | <5 | 1500 | 2.08 | 1330 | 4.13 | 101 | 28 |
| | | 6-Jan-09 | FD | 1510.74 | 1527.19 | 26 | <5 | 1500 | 2.28 | 1326 | 4.11 | 96 | 25 |
| | | 13-Jan-09 | FD | 1510.74 | 1527.19 | 23 | <5 | 1500 | 2.06 | 1330 | 4.15 | 89 | 27 |
| | | 20-Jan-09 | FD | 1510.74 | 1527.19 | 26 | <5 | 1500 | 2.17 | 1330 | 4.13 | 91 | 23 |
| | | 27-Jan-09 | FD | 1510.74 | 1527.19 | 27 | <5 | 1500 | 2.46 | 1330 | 4.05 | 96 | 28 |
| | | 3-Feb-09 | FD | 1510.74 | 1527.19 | 27 | <5 | 1500 | 2.17 | 1329 | 4.07 | 101 | 29 |
| | | 10-Feb-09 | FD | 1510.74 | 1527.19 | 38 | <5 | 1500 | 3.06 | 1327 | 4.07 | 125 | 40 |
| | | 23-Sep-08 | FD | 1510.74 | 1527.19 | 113 | <20 | 1500 | 0.19 | 1342 | 4.25 | 309 | 139 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 46 | 17-Feb-09 | FD | 1510.74 | 1527.19 | 27 | <5 | 1500 | 2.51 | 1331 | 4.11 | 105 | 30 |
| | TEST 47 | 26-Aug-08 | N | 1597.32 | 1599.88 | 3580 | <20 | 2000 | 0.38 | 1380 | 3.6 | 4280 | 4330 |
| | | 2-Sep-08 | N | 1597.32 | 1599.88 | 284 | <20 | 2000 | 2.76 | 1952 | 3.8 | 656 | 307 |
| | | 9-Sep-08 | N | 1597.32 | 1599.88 | 77 | <20 | 2000 | 2.93 | 1967 | 3.83 | 479 | 251 |
| | | 16-Sep-08 | N | 1597.32 | 1599.88 | 578 | <20 | 2000 | 1.26 | 1897 | 3.87 | 1090 | 535 |
| | | 23-Sep-08 | N | 1597.32 | 1599.88 | 383 | <20 | 2000 | 2.63 | 1878 | 3.63 | 685 | 394 |
| | | 30-Sep-08 | N | 1597.32 | 1599.88 | 383 | <20 | 2000 | 1.95 | 1914 | 3.63 | 539 | 258 |
| | | 7-Oct-08 | N | 1597.32 | 1599.88 | 1800 | <20 | 2000 | 0.15 | 1789 | 3.57 | 2590 | 1850 |
| | | 14-Oct-08 | N | 1597.32 | 1599.88 | 270 | <20 | 2000 | 1.02 | 1896 | 3.66 | 638 | 286 |
| | | 21-Oct-08 | N | 1597.32 | 1599.88 | 245 | <20 | 2000 | 1.39 | 1824 | 3.85 | 595 | 281 |
| | | 28-Oct-08 | N | 1597.32 | 1599.88 | 446 | <20 | 2000 | 2.12 | 1946 | 3.62 | 911 | 459 |
| | | 4-Nov-08 | N | 1597.32 | 1599.88 | 293 | <20 | 2000 | 1.47 | 1808 | 3.58 | 692 | 305 |
| | TEST 47S | 11-Nov-08 | N | 1597.32 | 1599.88 | 368 | <20 | 2000 | 0.51 | 1522 | 3.63 | 838 | 454 |
| | | 18-Nov-08 | N | 1597.32 | 1599.88 | 130 | <20 | 2000 | 3.53 | 1941 | 3.64 | 374 | 133 |
| | | 25-Nov-08 | N | 1597.32 | 1599.88 | 93 | <5 | 2000 | 5.01 | 1949 | 3.72 | 278 | 96 |
| | | 2-Dec-08 | N | 1597.32 | 1599.88 | 105 | <5 | 2000 | 19.1 | 1945 | 3.72 | 298 | 108 |
| | | 9-Dec-08 | N | 1597.32 | 1599.88 | 111 | <5 | 2000 | 20.2 | 1873 | 3.53 | 362 | 124 |
| | | 16-Dec-08 | N | 1597.32 | 1599.88 | 111 | <5 | 2000 | 21.4 | 1913 | 3.54 | 345 | 120 |
| | | 23-Dec-08 | N | 1597.32 | 1599.88 | 123 | <5 | 2000 | 23.5 | 1896 | 3.55 | 369 | 132 |
| | | 30-Dec-08 | N | 1597.32 | 1599.88 | 123 | <5 | 2000 | 25.5 | 1932 | 3.53 | 368 | 127 |
| | | 6-Jan-09 | N | 1597.32 | 1599.88 | 130 | <5 | 2000 | 32.7 | 1949 | 3.52 | 409 | 136 |
| | | 13-Jan-09 | N | 1597.32 | 1599.88 | 108 | <5 | 2000 | 24.8 | 1885 | 3.52 | 338 | 119 |
| | | 20-Jan-09 | N | 1597.32 | 1599.88 | 130 | <5 | 2000 | 26.9 | 1854 | 3.43 | 399 | 137 |
| | | 27-Jan-09 | N | 1597.32 | 1599.88 | 131 | <5 | 2000 | 29.7 | 1883 | 3.52 | 394 | 143 |
| | | 3-Feb-09 | N | 1597.32 | 1599.88 | 141 | <5 | 2000 | 34.1 | 1858 | 3.44 | 449 | 150 |
| | | 10-Feb-09 | N | 1597.32 | 1599.88 | 149 | <5 | 2000 | 31.3 | 1848 | 3.44 | 455 | 158 |
| | | 17-Feb-09 | N | 1597.32 | 1599.88 | 133 | <5 | 2000 | 34.9 | 1850 | 3.48 | 452 | 140 |
| | TEST 48 | 26-Aug-08 | N | 1634.46 | 1637.47 | 924.335 | <20 | 2000 | <0.05 | 1301 | 4.37 | 3580 | 2250 |
| | | 2-Sep-08 | N | 1634.46 | 1637.47 | 230 | <20 | 2000 | 0.15 | 1801 | 4.58 | 775 | 335 |
| | | 9-Sep-08 | N | 1634.46 | 1637.47 | 52 | <20 | 2000 | 0.31 | 1914 | 4.76 | 179 | 81 |
| | | 16-Sep-08 | N | 1634.46 | 1637.47 | 114.82 | <20 | 2000 | 0.73 | 1926 | 4.78 | 350 | 147 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 48 | 23-Sep-08 | N | 1634.46 | 1637.47 | 100 | <20 | 2000 | 0.64 | 1891 | 4.44 | 339 | 129 |
| | | 30-Sep-08 | N | 1634.46 | 1637.47 | 100 | <20 | 2000 | 0.08 | 1857 | 4.44 | 830 | 417 |
| | | 7-Oct-08 | N | 1634.46 | 1637.47 | 436 | <20 | 2000 | 0.12 | 1783 | 4.37 | 926 | 531 |
| | | 14-Oct-08 | N | 1634.46 | 1637.47 | 275 | <20 | 2000 | 0.06 | 1863 | 4.29 | 717 | 390 |
| | | 21-Oct-08 | N | 1634.46 | 1637.47 | 112 | <20 | 2000 | 0.09 | 1843 | 4.64 | 284 | 118 |
| | | 28-Oct-08 | N | 1634.46 | 1637.47 | 219 | <20 | 2000 | 0.21 | 1905 | 4.19 | 570 | 275 |
| | | 4-Nov-08 | N | 1634.46 | 1637.47 | 307 | <20 | 2000 | <0.05 | 1724 | 4.11 | 730 | 403 |
| | TEST 48S | 11-Nov-08 | N | 1634.46 | 1637.47 | 334 | <20 | 2000 | <0.05 | 1365 | 4.25 | 803 | 466 |
| | | 18-Nov-08 | N | 1634.46 | 1637.47 | 39 | <20 | 2000 | <0.05 | 1976 | 5.04 | 112 | 45 |
| | | 25-Nov-08 | N | 1634.46 | 1637.47 | 68 | <5 | 2000 | <0.05 | 1963 | 4.23 | 200 | 88 |
| | | 2-Dec-08 | N | 1634.46 | 1637.47 | 76 | <5 | 2000 | 0.17 | 1869 | 4.25 | 221 | 91 |
| | | 9-Dec-08 | N | 1634.46 | 1637.47 | 76 | <5 | 2000 | 0.14 | 1923 | 4.18 | 215 | 96 |
| | | 16-Dec-08 | N | 1634.46 | 1637.47 | 82 | <5 | 2000 | <0.05 | 1912 | 4.15 | 233 | 104 |
| | | 23-Dec-08 | N | 1634.46 | 1637.47 | 85 | <5 | 2000 | <0.05 | 1908 | 4.13 | 241 | 110 |
| | TEST 49 | 26-Aug-08 | N | 1739.63 | 1742.63 | 795.72 | <20 | 2000 | 0.29 | 1278 | 4.39 | 1690 | 1150 |
| | | 2-Sep-08 | N | 1739.63 | 1742.63 | 214 | <20 | 2000 | 3.93 | 1914 | 4.02 | 540 | 240 |
| | | 9-Sep-08 | N | 1739.63 | 1742.63 | 58 | <20 | 2000 | 6.53 | 1944 | 4.92 | 136 | 58 |
| | | 16-Sep-08 | N | 1739.63 | 1742.63 | 172.105 | <20 | 2000 | <0.05 | 1802 | 4.87 | 413 | 163 |
| | | 23-Sep-08 | N | 1739.63 | 1742.63 | 107 | <20 | 2000 | <0.05 | 1894 | 4.88 | 223 | 89 |
| | | 30-Sep-08 | N | 1739.63 | 1742.63 | 107 | <20 | 2000 | <0.05 | 1871 | 4.88 | 532 | 265 |
| | | 7-Oct-08 | N | 1739.63 | 1742.63 | 457 | <20 | 2000 | <0.05 | 1809 | 5.06 | 883 | 493 |
| | | 14-Oct-08 | N | 1739.63 | 1742.63 | 126 | <20 | 2000 | <0.05 | 1910 | 4.75 | 300 | 146 |
| | | 21-Oct-08 | N | 1739.63 | 1742.63 | 85 | <20 | 2000 | <0.05 | 1878 | 4.92 | 189 | 75 |
| | | 28-Oct-08 | N | 1739.63 | 1742.63 | 109 | <20 | 2000 | <0.05 | 1888 | 4.82 | 268 | 145 |
| | | 4-Nov-08 | N | 1739.63 | 1742.63 | 544 | <20 | 2000 | <0.05 | 1564 | 4.31 | 1180 | 668 |
| | TEST 49S | 11-Nov-08 | N | 1739.63 | 1742.63 | 134 | <20 | 2000 | <0.05 | 1465 | 5.03 | 343 | 164 |
| | | 18-Nov-08 | N | 1739.63 | 1742.63 | 98 | <20 | 2000 | 0.14 | 1961 | 4.15 | 293 | 129 |
| | | 25-Nov-08 | N | 1739.63 | 1742.63 | 37 | <5 | 2000 | <0.05 | 1952 | 4.9 | 77 | 31 |
| | | 2-Dec-08 | N | 1739.63 | 1742.63 | 33 | <5 | 2000 | 0.13 | 1878 | 4.88 | 92 | 34 |
| | | 9-Dec-08 | N | 1739.63 | 1742.63 | 33 | <5 | 2000 | 0.05 | 1884 | 4.85 | 90 | 38 |
| | | 16-Dec-08 | N | 1739.63 | 1742.63 | 40 | <5 | 2000 | <0.05 | 1931 | 4.78 | 105 | 48 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 49S | 23-Dec-08 | N | 1739.63 | 1742.63 | 40 | <5 | 2000 | 0.15 | 1917 | 4.7 | 111 | 46 |
| | | 30-Dec-08 | N | 1739.63 | 1742.63 | 33 | <5 | 2000 | 0.27 | 1892 | 4.75 | 92 | 38 |
| | | 6-Jan-09 | N | 1739.63 | 1742.63 | 39 | <5 | 2000 | 0.37 | 1963 | 4.81 | 108 | 42 |
| | | 13-Jan-09 | N | 1739.63 | 1742.63 | 39 | <5 | 2000 | 0.22 | 1914 | 4.72 | 111 | 48 |
| | | 20-Jan-09 | N | 1739.63 | 1742.63 | 42 | <5 | 2000 | 0.19 | 1847 | 4.62 | 123 | 49 |
| | | 27-Jan-09 | N | 1739.63 | 1742.63 | 38 | <5 | 2000 | 0.3 | 1882 | 4.7 | 188 | 47 |
| | | 3-Feb-09 | N | 1739.63 | 1742.63 | 49 | <5 | 2000 | 0.4 | 1835 | 4.66 | 140 | 56 |
| | | 10-Feb-09 | N | 1739.63 | 1742.63 | 49 | <5 | 2000 | 1.9 | 1850 | 4.57 | 131 | 50 |
| | | 17-Feb-09 | N | 1739.63 | 1742.63 | 55 | <5 | 2000 | 1.8 | 1896 | 4.54 | 158 | 62 |
| | TEST 50 | 26-Aug-08 | N | 1829.95 | 1832.48 | 791.32 | <20 | 1000 | 80.8 | 731 | 4.34 | 4550 | 3450 |
| | | 2-Sep-08 | N | 1829.95 | 1832.48 | 590 | <20 | 1000 | <0.05 | 909 | 4.31 | 1640 | 1030 |
| | | 9-Sep-08 | N | 1829.95 | 1832.48 | 618 | <20 | 1000 | <0.05 | 866 | 4.42 | 1570 | 1090 |
| | | 16-Sep-08 | N | 1829.95 | 1832.48 | 586.215 | <20 | 1000 | <0.05 | 828 | 4.35 | 1450 | 879 |
| | | 23-Sep-08 | N | 1829.95 | 1832.48 | 789 | <20 | 1000 | <0.05 | 847 | 4.49 | 1620 | 1040 |
| | | 30-Sep-08 | N | 1829.95 | 1832.48 | 789 | <20 | 1000 | <0.05 | 883 | 4.49 | 1390 | 884 |
| | | 7-Oct-08 | N | 1829.95 | 1832.48 | 548 | <20 | 1000 | <0.05 | 872 | 4.54 | 1250 | 763 |
| | | 14-Oct-08 | N | 1829.95 | 1832.48 | 382 | <20 | 1000 | <0.05 | 833 | 4.47 | 1020 | 631 |
| | | 21-Oct-08 | N | 1829.95 | 1832.48 | 325 | <20 | 1000 | 0.07 | 883 | 4.31 | 842 | 464 |
| | | 28-Oct-08 | N | 1829.95 | 1832.48 | 232 | <20 | 1000 | <0.05 | 812 | 4.63 | 722 | 478 |
| | | 4-Nov-08 | N | 1829.95 | 1832.48 | 221 | <20 | 1000 | 0.18 | 932 | 4.35 | 635 | 318 |
| | | 11-Nov-08 | N | 1829.95 | 1832.48 | 292 | <20 | 1000 | 0.1 | 925 | 4.33 | 960 | 525 |
| | | 18-Nov-08 | N | 1829.95 | 1832.48 | 348 | <20 | 1000 | <0.05 | 842 | 4.36 | 1010 | 561 |
| | | 25-Nov-08 | N | 1829.95 | 1832.48 | 372 | <5 | 1000 | 0.07 | 857 | 4.29 | 1030 | 413 |
| | | 2-Dec-08 | N | 1829.95 | 1832.48 | 298 | <5 | 1000 | 0.05 | 848 | 4.29 | 889 | 434 |
| | | 9-Dec-08 | N | 1829.95 | 1832.48 | 328 | <5 | 1000 | <0.05 | 899 | 4.28 | 913 | 596 |
| | | 16-Dec-08 | N | 1829.95 | 1832.48 | 322 | <5 | 1000 | <0.05 | 794 | 4.31 | 885 | 506 |
| | | 23-Dec-08 | N | 1829.95 | 1832.48 | 310 | <5 | 1000 | <0.05 | 926 | 4.32 | 855 | 462 |
| | | 30-Dec-08 | N | 1829.95 | 1832.48 | 295 | <5 | 1000 | <0.05 | 897 | 4.24 | 797 | 432 |
| | | 6-Jan-09 | N | 1829.95 | 1832.48 | 291 | <5 | 1000 | <0.05 | 928 | 4.19 | 796 | 425 |
| | | 13-Jan-09 | N | 1829.95 | 1832.48 | 317 | <5 | 1000 | <0.05 | 834 | 4.21 | 860 | 507 |
| | | 20-Jan-09 | N | 1829.95 | 1832.48 | 353 | <5 | 1000 | <0.05 | 824 | 4.11 | 921 | 474 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 50 | 27-Jan-09 | N | 1829.95 | 1832.48 | 317 | <5 | 1000 | 1.07 | 791 | 4.21 | 847 | 496 |
| | | 3-Feb-09 | N | 1829.95 | 1832.48 | 330 | <5 | 1000 | 0.45 | 826 | 4.21 | 872 | 512 |
| | | 10-Feb-09 | N | 1829.95 | 1832.48 | 345 | <5 | 1000 | <0.05 | 828 | 4.21 | 919 | 496 |
| | | 17-Feb-09 | N | 1829.95 | 1832.48 | 317 | <5 | 1000 | 1.59 | 830 | 4.19 | 872 | 521 |
| | TEST 51 | 26-Aug-08 | N | 1867.87 | 1844.35 | 28.92 | 52.14 | 4000 | <0.05 | 1750 | 7.45 | 968 | 416 |
| | | 2-Sep-08 | N | 1867.87 | 1844.35 | <20 | 25 | 4000 | <0.05 | 3710 | 7.42 | 920 | 422 |
| | | 9-Sep-08 | N | 1867.87 | 1844.35 | <20 | 28 | 4000 | <0.05V1 | 3826 | 7.56 | 1150 | 601 |
| | | 16-Sep-08 | N | 1867.87 | 1844.35 | <20 | 28.44 | 4000 | <0.05 | 3824 | 7.9 | 820 | 348 |
| | | 23-Sep-08 | N | 1867.87 | 1844.35 | <20 | 27 | 4000 | <0.05 | 3779 | 7.7 | 1130 | 519 |
| | | 30-Sep-08 | N | 1867.87 | 1844.35 | <20 | 27 | 4000 | <0.05 | 3729 | 7.7 | 864 | 432 |
| | | 7-Oct-08 | N | 1867.87 | 1844.35 | <20 | 33 | 4000 | <0.05 | 3788 | 8 | 867 | 432 |
| | | 14-Oct-08 | N | 1867.87 | 1844.35 | <20 | 31 | 4000 | <0.05 | 3755 | 7.77 | 793 | 430 |
| | | 21-Oct-08 | N | 1867.87 | 1844.35 | <20 | 26 | 4000 | <0.05 | 3832 | 7.79 | 723 | 362 |
| | | 28-Oct-08 | N | 1867.87 | 1844.35 | <20 | 30 | 4000 | <0.05 | 3819 | 7.87 | 999 | 511 |
| | | 4-Nov-08 | N | 1867.87 | 1844.35 | <20 | 30 | 4000 | <0.05 | 3750 | 7.83 | 1020 | 551 |
| | | 11-Nov-08 | N | 1867.87 | 1844.35 | <20 | 30 | 4000 | <0.05 | 3823 | 7.99 | 539 | 244 |
| | | 18-Nov-08 | N | 1867.87 | 1844.35 | <20 | 30 | 4000 | <0.05 | 3751 | 7.93 | 695 | 342 |
| | | 25-Nov-08 | N | 1867.87 | 1844.35 | <5 | 31 | 4000 | <0.05 | 3805 | 7.78 | 680 | 339 |
| | | 2-Dec-08 | N | 1867.87 | 1844.35 | <5 | 41 | 4000 | <0.05 | 3782 | 8.04 | 736 | 358 |
| | | 9-Dec-08 | N | 1867.87 | 1844.35 | <5 | 32 | 4000 | <0.05 | 3651 | 7.91 | 728 | 388 |
| | | 16-Dec-08 | N | 1867.87 | 1844.35 | <5 | 30 | 4000 | <0.05 | 3767 | 8.04 | 471 | 207 |
| | | 23-Dec-08 | N | 1867.87 | 1844.35 | <5 | 28 | 4000 | <0.05 | 3656 | 7.8 | 596 | 300 |
| | | 30-Dec-08 | N | 1867.87 | 1844.35 | <5 | 31 | 4000 | <0.05 | 3840 | 7.83 | 553 | 281 |
| | | 6-Jan-09 | N | 1867.87 | 1844.35 | <5 | 26 | 4000 | <0.05 | 3834 | 7.84 | 610 | 295 |
| | | 13-Jan-09 | N | 1867.87 | 1844.35 | <5 | 30 | 4000 | <0.05 | 3790 | 7.97 | 489 | 225 |
| | | 20-Jan-09 | N | 1867.87 | 1844.35 | <5 | 34 | 4000 | <0.05 | 3792 | 7.94 | 649 | 303 |
| | | 27-Jan-09 | N | 1867.87 | 1844.35 | <5 | 28 | 4000 | <0.05 | 3770 | 7.92 | 479 | 191 |
| | | 3-Feb-09 | N | 1867.87 | 1844.35 | <5 | 32 | 4000 | <0.05 | 3838 | 7.89 | 676 | 334 |
| | | 10-Feb-09 | N | 1867.87 | 1844.35 | <5 | 30 | 4000 | <0.05 | 3759 | 8.02 | 444 | 188 |
| | | 17-Feb-09 | N | 1867.87 | 1844.35 | <5 | 31 | 4000 | <0.05 | 3858 | 7.96 | 468 | 201 |
| | | 24-Feb-09 | N | 1867.87 | 1844.35 | <5 | 30.81 | 4000 | <0.05 | 3737 | 7.81 | 648 | 278 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 51 | 3-Mar-09 | N | 1867.87 | 1844.35 | <5 | 33.18 | 4000 | <0.05 | 3561 | 7.76 | 659 | 302 |
| | | 10-Mar-09 | N | 1867.87 | 1844.35 | <5 | 33.18 | 4000 | <0.05 | 3656 | 7.72 | 645 | 316 |
| | | 17-Mar-09 | N | 1867.87 | 1844.35 | <5 | 37.92 | 4000 | <0.05 | 3686 | 7.83 | 606 | 279 |
| | | 24-Mar-09 | N | 1867.87 | 1844.35 | <5 | 30.81 | 4000 | <0.05 | 3821 | 7.9 | 512 | 234 |
| | | 31-Mar-09 | N | 1867.87 | 1844.35 | <5 | 33.18 | 4000 | <0.05 | 3733 | 7.58 | 464 | 201 |
| | | 7-Apr-09 | N | 1867.87 | 1844.35 | <5 | 35.55 | 4000 | <0.05 | 3733 | 7.75 | 525 | 243 |
| | | 14-Apr-09 | N | 1867.87 | 1844.35 | <5 | 33.18 | 4000 | <0.05 | 3728 | 7.72 | 505 | 256 |
| | | 21-Apr-09 | N | 1867.87 | 1844.35 | <5 | 33.18 | 4000 | <0.05 | 3764 | 7.76 | 476 | 192 |
| | | 28-Apr-09 | N | 1867.87 | 1844.35 | <5 | 34.365 | 4000 | <0.05 | 3770 | 7.69 | 465 | 205 |
| | | 5-May-09 | N | 1867.87 | 1844.35 | <5 | 35.55 | 4000 | <0.05 | 3804 | 7.78 | 588 | 252 |
| | | 12-May-09 | N | 1867.87 | 1844.35 | <5 | 37.92 | 4000 | <0.05 | 3667 | 7.68 | 616 | 237 |
| | | 19-May-09 | N | 1867.87 | 1844.35 | <5 | 34.365 | 4000 | <0.05 | 3683 | 7.67 | 505 | 220 |
| | | 26-May-09 | N | 1867.87 | 1844.35 | <5 | 31.32 | 4000 | <0.05 | 3769 | 7.69 | 454 | 172 |
| | | 2-Jun-09 | N | 1867.87 | 1844.35 | <5 | 30.16 | 4000 | <0.05 | 3777 | 7.63 | 596 | 273 |
| | | 9-Jun-09 | N | 1867.87 | 1844.35 | <5 | 33.64 | 4000 | <0.05 | 3637 | 7.54 | 591 | 267 |
| | | 16-Jun-09 | N | 1867.87 | 1844.35 | <5 | 32.48 | 4000 | <0.05 | 3681 | 7.73 | 558 | 247 |
| | | 23-Jun-09 | N | 1867.87 | 1844.35 | <5 | 32.48 | 4000 | <0.05 | 3736 | 7.75 | 629 | 255 |
| | | 30-Jun-09 | N | 1867.87 | 1844.35 | <5 | 27.84 | 4000 | <0.05 | 3791 | 7.56 | 514 | 227 |
| | | 7-Jul-09 | N | 1867.87 | 1844.35 | <5 | 32.48 | 4000 | <0.05 | 3496 | 7.53 | 862 | 424 |
| | | 14-Jul-09 | N | 1867.87 | 1844.35 | <5 | 30.16 | 4000 | <0.05 | 3650 | 7.61 | 616 | 267 |
| | | 21-Jul-09 | N | 1867.87 | 1844.35 | <5 | 29 | 4000 | <0.05 | 3683 | 7.68 | 686 | 303 |
| | | 28-Jul-09 | N | 1867.87 | 1844.35 | <5 | 27.84 | 4000 | <0.05 | 3845 | 7.74 | 574 | 244 |
| | | 4-Aug-09 | N | 1867.87 | 1844.35 | <5 | 29 | 4000 | <0.05 | 3859 | 7.47 | 568 | 221 |
| | | 11-Aug-09 | N | 1867.87 | 1844.35 | <5 | 30.16 | 4000 | <0.05 | 3826 | 7.58 | 615 | 270 |
| | | 18-Aug-09 | N | 1867.87 | 1844.35 | <5 | 26.68 | 4000 | <0.05 | 3742 | 7.52 | 782 | 346 |
| | | 25-Aug-09 | N | 1867.87 | 1844.35 | <5 | 27.84 | 4000 | -- | 3832 | 7.63 | 774 | 361 |
| | TEST 52 | 26-Aug-08 | N | 1899 | 1901.88 | <20 | 184.86 | 1500 | <0.05 | 1123 | 8.02 | 3410 | 2250 |
| | | 2-Sep-08 | N | 1899 | 1901.88 | <20 | 100 | 1500 | <0.05 | 1428 | 7.21 | 1580 | 835 |
| | | 9-Sep-08 | N | 1899 | 1901.88 | <20 | 95 | 1500 | <0.05V1 | 1471 | 7.97 | 727 | 226 |
| | | 16-Sep-08 | N | 1899 | 1901.88 | <20 | 56.88 | 1500 | <0.05 | 1381 | 7.98 | 1340 | 625 |
| | | 23-Sep-08 | N | 1899 | 1901.88 | <20 | 40 | 1500 | <0.05 | 1369 | 7.64 | 907 | 401 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 52 | 30-Sep-08 | N | 1899 | 1901.88 | <20 | 40 | 1500 | <0.05 | 1375 | 7.64 | 1240 | 591 |
| | | 7-Oct-08 | N | 1899 | 1901.88 | <20 | 97 | 1500 | <0.05 | 1395 | 8.35 | 896 | 366 |
| | | 14-Oct-08 | N | 1899 | 1901.88 | <20 | 89 | 1500 | <0.05 | 1405 | 8.09 | 926 | 427 |
| | | 21-Oct-08 | N | 1899 | 1901.88 | <20 | 77 | 1500 | <0.05 | 1300 | 7.96 | 1440 | 756 |
| | | 28-Oct-08 | N | 1899 | 1901.88 | <20 | 107 | 1500 | <0.05 | 1275 | 8.14 | 1630 | 1020 |
| | | 4-Nov-08 | N | 1899 | 1901.88 | <20 | 102 | 1500 | <0.05 | 1402 | 8.2 | 852 | 345 |
| | TEST 52S | 11-Nov-08 | N | 1899 | 1901.88 | <20 | 41 | 1500 | <0.05 | 1165 | 7.55 | 502 | 206 |
| | | 18-Nov-08 | N | 1899 | 1901.88 | <20 | 25 | 1500 | <0.05 | 1470 | 7.64 | 276 | 100 |
| | | 25-Nov-08 | N | 1899 | 1901.88 | <5 | 24 | 1500 | 0.13 | 1386 | 7.41 | 273 | 102 |
| | | 2-Dec-08 | N | 1899 | 1901.88 | <5 | 23 | 1500 | <0.05 | 1374 | 6.87 | 244 | 87 |
| | | 9-Dec-08 | N | 1899 | 1901.88 | <5 | 17 | 1500 | <0.05 | 1449 | 7.18 | 237 | 90 |
| | | 16-Dec-08 | N | 1899 | 1901.88 | <5 | 18 | 1500 | <0.05 | 1428 | 7.5 | 218 | 85 |
| | | 23-Dec-08 | N | 1899 | 1901.88 | <5 | 15 | 1500 | <0.05 | 1438 | 7.54 | 219 | 89 |
| | | 30-Dec-08 | N | 1899 | 1901.88 | <5 | 17 | 1500 | <0.05 | 1436 | 7.41 | 229 | 90 |
| | | 6-Jan-09 | N | 1899 | 1901.88 | <5 | 15 | 1500 | <0.05 | 1447 | 7.17 | 217 | 84 |
| | | 13-Jan-09 | N | 1899 | 1901.88 | <5 | 17 | 1500 | <0.05 | 1348 | 7.22 | 209 | 90 |
| | | 20-Jan-09 | N | 1899 | 1901.88 | <5 | 15 | 1500 | <0.05 | 1320 | 7.23 | 302 | 116 |
| | | 27-Jan-09 | N | 1899 | 1901.88 | <5 | 15 | 1500 | 0.09 | 1429 | 7.17 | 227 | 86 |
| | | 3-Feb-09 | N | 1899 | 1901.88 | <5 | 14 | 1500 | <0.05 | 1362 | 7.26 | 237 | 90 |
| | | 10-Feb-09 | N | 1899 | 1901.88 | <5 | 14 | 1500 | <0.05 | 1421 | 7.32 | 200 | 77 |
| | | 17-Feb-09 | N | 1899 | 1901.88 | <5 | 14 | 1500 | 0.11 | 1418 | 7.22 | 217 | 63 |
| | TEST 53 | 26-Aug-08 | N | 1984.74 | 1987.74 | 119.475 | <20 | 2000 | 38.8 | 1397 | 4.19 | 2790 | 2090 |
| | | 2-Sep-08 | N | 1984.74 | 1987.74 | 66 | <20 | 2000 | 0.57 | 2029 | 4.88 | 2380 | 1620 |
| | | 9-Sep-08 | N | 1984.74 | 1987.74 | 200 | <20 | 2000 | <0.05V1 | 1866 | 5.04 | 2550 | 1920 |
| | | 16-Sep-08 | N | 1984.74 | 1987.74 | 205.105 | <20 | 2000 | <0.05 | 1825 | 5.44 | 2680 | 1900 |
| | | 23-Sep-08 | N | 1984.74 | 1987.74 | 294 | <20 | 2000 | <0.05 | 1841 | 5.35 | 2550 | 1840 |
| | | 30-Sep-08 | N | 1984.74 | 1987.74 | 294 | <20 | 2000 | <0.05 | 2025 | 5.35 | 2350 | 1640 |
| | | 7-Oct-08 | N | 1984.74 | 1987.74 | 254 | 6 | 2000 | <0.05 | 1868 | 5.58 | 2510 | 1820 |
| | | 14-Oct-08 | N | 1984.74 | 1987.74 | 153 | <20 | 2000 | <0.05 | 1823 | 5.72 | 2360 | 1730 |
| | | 21-Oct-08 | N | 1984.74 | 1987.74 | 118 | <20 | 2000 | <0.05 | 1896 | 5.71 | 2300 | 1460 |
| | | 28-Oct-08 | N | 1984.74 | 1987.74 | 165 | <20 | 2000 | <0.05 | 1878 | 5.3 | 2420 | 2000 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 53 | 4-Nov-08 | N | 1984.74 | 1987.74 | 127 | 7 | 2000 | <0.05 | 1958 | 5.89 | 2380 | 1660 |
| | | 11-Nov-08 | N | 1984.74 | 1987.74 | 113 | <20 | 2000 | <0.05 | 1969 | 5.44 | 2230 | 1660 |
| | | 18-Nov-08 | N | 1984.74 | 1987.74 | 118 | 6 | 2000 | <0.05 | 1857 | 5.63 | 2440 | 1570 |
| | | 25-Nov-08 | N | 1984.74 | 1987.74 | 55 | <5 | 2000 | <0.05 | 2022 | 5.79 | 2240 | 1530 |
| | | 2-Dec-08 | N | 1984.74 | 1987.74 | 99 | <5 | 2000 | <0.05 | 1744 | 5.56 | 2130 | 1390 |
| | | 9-Dec-08 | N | 1984.74 | 1987.74 | 112 | <5 | 2000 | <0.05 | 1851 | 5.46 | 2100 | 1380 |
| | | 16-Dec-08 | N | 1984.74 | 1987.74 | 95 | <5 | 2000 | <0.05 | 1964 | 5.57 | 1740 | 1170 |
| | | 23-Dec-08 | N | 1984.74 | 1987.74 | 103 | <5 | 2000 | <0.05 | 1886 | 5.47 | 1670 | 1100 |
| | | 30-Dec-08 | N | 1984.74 | 1987.74 | 79 | <5 | 2000 | <0.05 | 1981 | 5.53 | 1500 | 891 |
| | | 6-Jan-09 | N | 1984.74 | 1987.74 | 97 | <5 | 2000 | <0.05 | 1836 | 5.81 | 1380 | 819 |
| | | 13-Jan-09 | N | 1984.74 | 1987.74 | 89 | <5 | 2000 | <0.05 | 1573 | 5.48 | 1140 | 626 |
| | | 20-Jan-09 | N | 1984.74 | 1987.74 | 102 | <5 | 2000 | <0.05 | 1737 | 5.42 | 1320 | 773 |
| | | 27-Jan-09 | N | 1984.74 | 1987.74 | 93 | <5 | 2000 | <0.05 | 1808 | 5.49 | 1390 | 882 |
| | | 3-Feb-09 | N | 1984.74 | 1987.74 | 99 | <5 | 2000 | <0.05 | 1801 | 5.53 | 1270 | 815 |
| | | 10-Feb-09 | N | 1984.74 | 1987.74 | 98 | <5 | 2000 | <0.05 | 1708 | 5.5 | 1270 | 805 |
| | | 17-Feb-09 | N | 1984.74 | 1987.74 | 97 | <5 | 2000 | <0.05 | 1956 | 5.37 | 1130 | 724 |
| | TEST 54 | 26-Aug-08 | N | 2056.38 | 2075 | <20 | 21.33 | 4000 | <0.05 | 3026 | 7.11 | 2670 | 1960 |
| | | 2-Sep-08 | N | 2056.38 | 2075 | <20 | <20 | 4000 | <0.05 | 3812 | 5.39 | 2400 | 1410 |
| | | 9-Sep-08 | N | 2056.38 | 2075 | <20 | 5 | 4000 | <0.05V1 | 3906 | 7.39 | 2400 | 1740 |
| | | 16-Sep-08 | N | 2056.38 | 2075 | <20 | 8.295 | 4000 | <0.05 | 3895 | 7.41 | 2480 | 1610 |
| | | 23-Sep-08 | N | 2056.38 | 2075 | <20 | 14 | 4000 | <0.05 | 3869 | 7.56 | 2000 | 1280 |
| | | 30-Sep-08 | N | 2056.38 | 2075 | <20 | 14 | 4000 | <0.05 | 3687 | 7.56 | 2350 | 1520 |
| | | 7-Oct-08 | N | 2056.38 | 2075 | 7 | <20 | 4000 | <0.05 | 3689 | 7.15 | 2050 | 1360 |
| | | 14-Oct-08 | N | 2056.38 | 2075 | <20 | 7 | 4000 | <0.05 | 3873 | 7.05 | 2140 | 1450 |
| | | 21-Oct-08 | N | 2056.38 | 2075 | <20 | <20 | 4000 | <0.05 | 3793 | 6.75 | 2000 | 1310 |
| | | 28-Oct-08 | N | 2056.38 | 2075 | <20 | 7 | 4000 | <0.05 | 3908 | 7.06 | 2230 | 1410 |
| | | 4-Nov-08 | N | 2056.38 | 2075 | <20 | 11 | 4000 | <0.05 | 3778 | 7.64 | 2200 | 1500 |
| | | 11-Nov-08 | N | 2056.38 | 2075 | <20 | <20 | 4000 | <0.05 | 3526 | 6.42 | 2030 | 1420 |
| | | 18-Nov-08 | N | 2056.38 | 2075 | 7 | <20 | 4000 | <0.05 | 3817 | 6.16 | 2010 | 1220 |
| | | 25-Nov-08 | N | 2056.38 | 2075 | 13 | <5 | 4000 | <0.05 | 3816 | 6.11 | 1840 | 1060 |
| | | 2-Dec-08 | N | 2056.38 | 2075 | 6 | <5 | 4000 | <0.05 | 3776 | 6.1 | 1970 | 1370 |

| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 54 | 9-Dec-08 | N | 2056.38 | 2075 | <5 | <5 | 4000 | <0.05 | 3667 | 5.85 | 1880 | 1290 |
| | | 16-Dec-08 | N | 2056.38 | 2075 | 5 | <5 | 4000 | <0.05 | 3917 | 5.98 | 1560 | 1050 |
| | | 23-Dec-08 | N | 2056.38 | 2075 | <5 | <5 | 4000 | <0.05 | 3784 | 6.16 | 1950 | 1350 |
| | | 30-Dec-08 | N | 2056.38 | 2075 | 9 | <5 | 4000 | <0.05 | 3854 | 5.97 | 1880 | 1200 |
| | | 6-Jan-09 | N | 2056.38 | 2075 | 11 | <5 | 4000 | <0.05 | 3889 | 6.1 | 1700 | 995 |
| | | 13-Jan-09 | N | 2056.38 | 2075 | 9 | <5 | 4000 | <0.05 | 3694 | 5.96 | 1810 | 943 |
| | | 20-Jan-09 | N | 2056.38 | 2075 | <5 | <5 | 4000 | <0.05 | 3846 | 5.97 | 1520 | 991 |
| | | 27-Jan-09 | N | 2056.38 | 2075 | 12 | <5 | 4000 | <0.05 | 3895 | 5.91 | 1840 | 1200 |
| | | 3-Feb-09 | N | 2056.38 | 2075 | 9 | <5 | 4000 | <0.05 | 3688 | 5.98 | 1890 | 1250 |
| | | 10-Feb-09 | N | 2056.38 | 2075 | 10 | <5 | 4000 | <0.05 | 3800 | 5.98 | 1930 | 1310 |
| | | 17-Feb-09 | N | 2056.38 | 2075 | 11 | <5 | 4000 | <0.05 | 3895 | 5.81 | 1900 | 1260 |
| | | 24-Feb-09 | N | 2056.38 | 2075 | 9.625 | <5 | 4000 | <0.05 | 3801 | 6.38 | 1980 | 1240 |
| | | 3-Mar-09 | N | 2056.38 | 2075 | 7.32 | <5 | 4000 | <0.05 | 3716 | 6.37 | 1920 | 1110 |
| | | 10-Mar-09 | N | 2056.38 | 2075 | 7.32 | <5 | 4000 | <0.05 | 3646 | 6.42 | 1900 | 1220 |
| | | 17-Mar-09 | N | 2056.38 | 2075 | 5.08 | <5 | 4000 | <0.05 | 3794 | 6.3 | 1920 | 1220 |
| | | 24-Mar-09 | N | 2056.38 | 2075 | 8.44 | <5 | 4000 | <0.05 | 3724 | 6.37 | 2030 | 1470 |
| | | 31-Mar-09 | N | 2056.38 | 2075 | 7.385 | <5 | 4000 | <0.05 | 3777 | 6.43 | 1960 | 1350 |
| | | 7-Apr-09 | N | 2056.38 | 2075 | 5.145 | <5 | 4000 | <0.05 | 3821 | 6.24 | 1850 | 1250 |
| | | 14-Apr-09 | N | 2056.38 | 2075 | 6.265 | <5 | 4000 | <0.05 | 3833 | 6.27 | 1890 | 1090 |
| | | 21-Apr-09 | N | 2056.38 | 2075 | 6.265 | <5 | 4000 | <0.05 | 3763 | 6.28 | 2000 | 1220 |
| | | 28-Apr-09 | N | 2056.38 | 2075 | 8.505 | <5 | 4000 | <0.05 | 3697 | 6.26 | 1830 | 1130 |
| | | 5-May-09 | N | 2056.38 | 2075 | 9.625 | <5 | 4000 | <0.05 | 3770 | 6.24 | 2120 | 1250 |
| | | 12-May-09 | N | 2056.38 | 2075 | 8.44 | <5 | 4000 | <0.05 | 3793 | 6.3 | 1960 | 1160 |
| | | 19-May-09 | N | 2056.38 | 2075 | 7.385 | <5 | 4000 | <0.05 | 3670 | 6.2 | 2080 | 1410 |
| | | 26-May-09 | N | 2056.38 | 2075 | 6.36 | <5 | 4000 | <0.05 | 3707 | 6.29 | 2100 | 1300 |
| | | 2-Jun-09 | N | 2056.38 | 2075 | 7.44 | 6.96 | 4000 | <0.05 | 3801 | 6.18 | 1970 | 1260 |
| | | 9-Jun-09 | N | 2056.38 | 2075 | 9.72 | 5.8 | 4000 | <0.05 | 3789 | 6.31 | 1780 | 1080 |
| | | 16-Jun-09 | N | 2056.38 | 2075 | 9.76 | <5 | 4000 | <0.05 | 3852 | 6.27 | 2070 | 1310 |
| | | 23-Jun-09 | N | 2056.38 | 2075 | 10.84 | 5.8 | 4000 | <0.05 | 3755 | 6.2 | 2160 | 1360 |
| | | 30-Jun-09 | N | 2056.38 | 2075 | 9.76 | <5 | 4000 | <0.05 | 3734 | 6.15 | 2090 | 1400 |
| | | 7-Jul-09 | N | 2056.38 | 2075 | 5.2 | <5 | 4000 | <0.05 | 3864 | 6.12 | 1710 | 1010 |

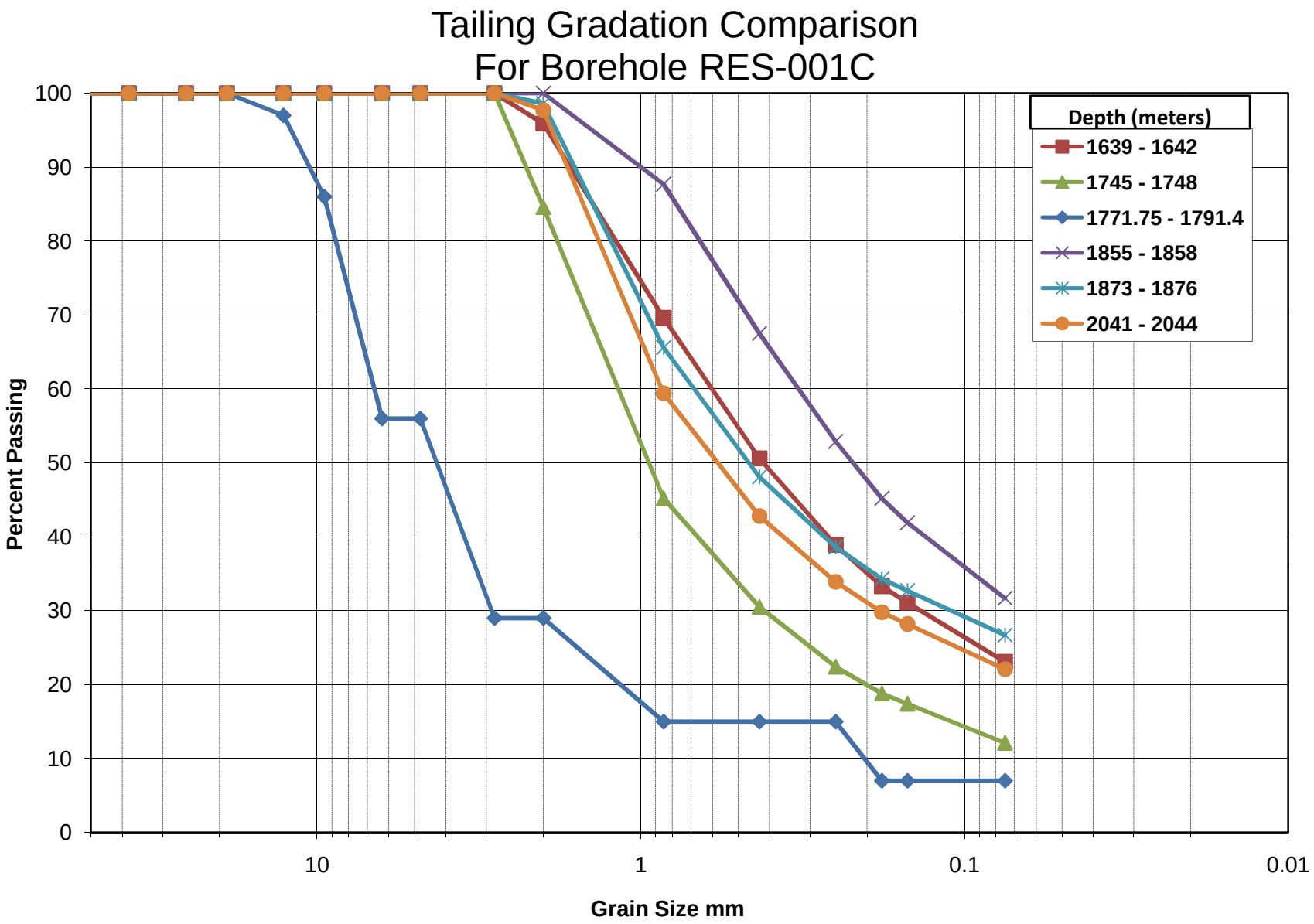
| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

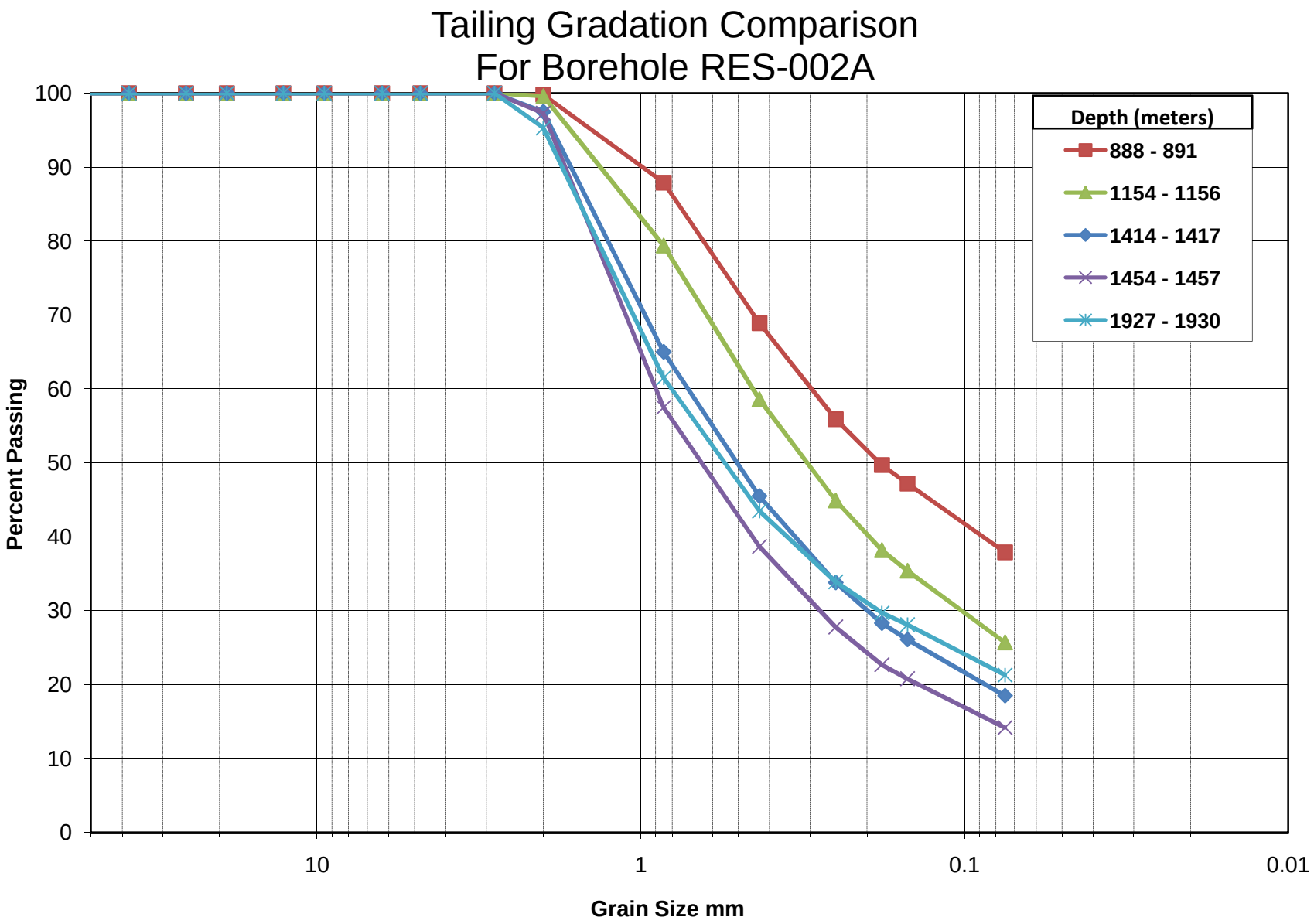
# APPENDIX F
# HUMIDITY CELL TESTING RESULTS

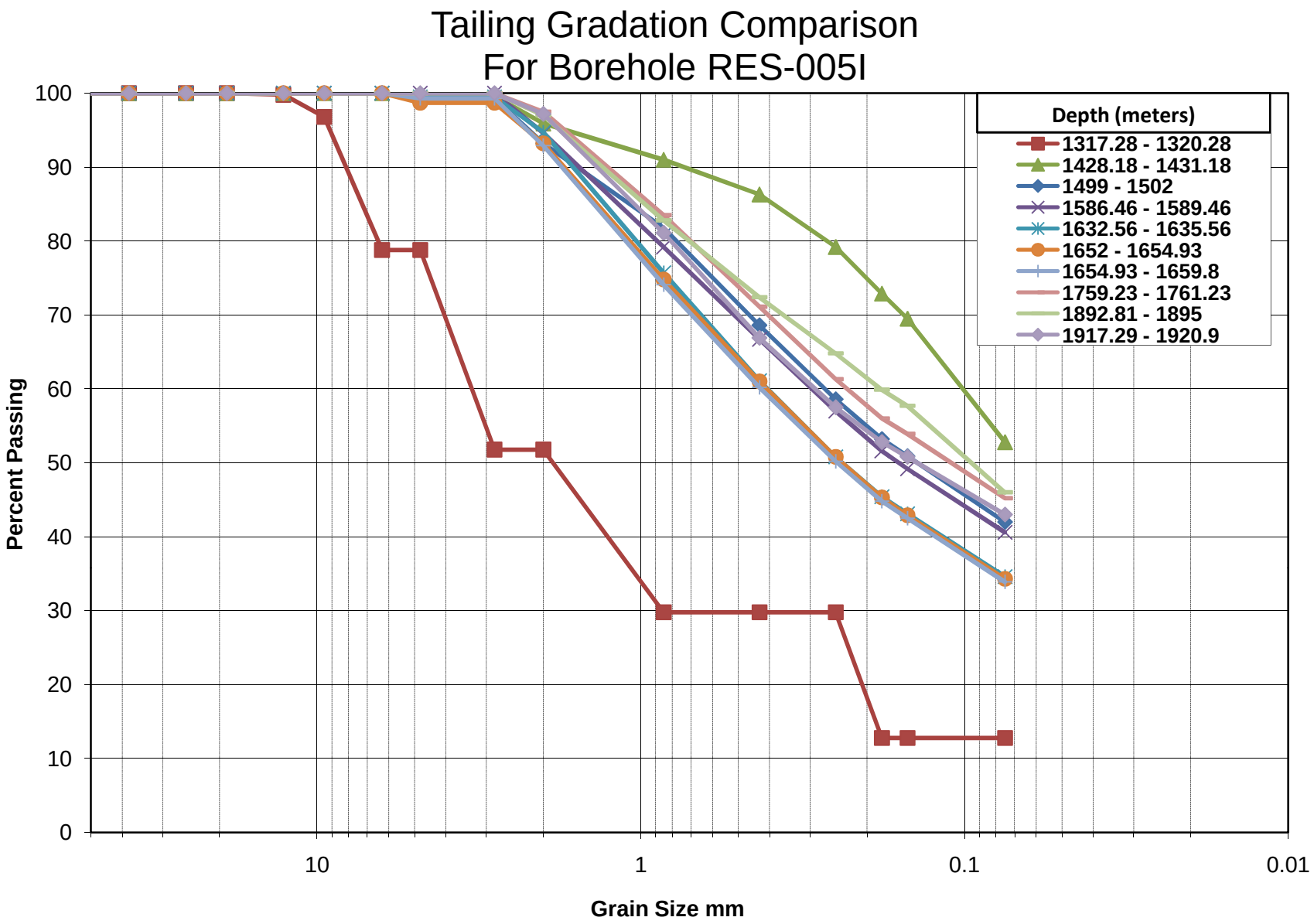
| | | | | Depth | | CES | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hole ID | Sample ID | Date Sampled | Type | Top | Bottom | HCT Acidity, Total (mg/l as CaCO3) | Alkalinity, Total (mg/l as CaCO3) | Water added to HCT MLS | Total Iron MG/L | Leachate Recovered MLS | pH pH Units | Specific conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | TEST 54 | 14-Jul-09 | N | 2056.38 | 2075 | 7.52 | <5 | 4000 | <0.05 | 3799 | 6.11 | 1760 | 1070 |
| | | 21-Jul-09 | N | 2056.38 | 2075 | 13 | 6.96 | 4000 | <0.05 | 3719 | 6.11 | 2330 | 1420 |
| | | 28-Jul-09 | N | 2056.38 | 2075 | 9.72 | <5 | 4000 | <0.05 | 3669 | 6.1 | 1800 | 1160 |
| | | 4-Aug-09 | N | 2056.38 | 2075 | 13.08 | <5 | 4000 | <0.05 | 3691 | 6 | 2150 | 1430 |
| | | 11-Aug-09 | N | 2056.38 | 2075 | 10.8 | <5 | 4000 | <0.05 | 3706 | 6.05 | 2110 | 1330 |
| | | 18-Aug-09 | N | 2056.38 | 2075 | 11.96 | <5 | 4000 | <0.05 | 3685 | 6.06 | 2160 | 1320 |
| | | 25-Aug-09 | N | 2056.38 | 2075 | 14.2 | <5 | 4000 | -- | 3847 | 6.22 | 1000 | 1240 |
| | | 1-Sep-09 | N | 2056.38 | 2075 | 26 | <5 | 4000 | <0.05 | 3816 | 5.45 | 1570 | 984 |
| | | 8-Sep-09 | N | 2056.38 | 2075 | 22.12 | <5 | 4000 | <0.05 | 3793 | 5.55 | 1990 | 1200 |
| | | 15-Sep-09 | N | 2056.38 | 2075 | 16.48 | <5 | 4000 | <0.05 | 3761 | 5.8 | 1960 | 1270 |
| | | 22-Sep-09 | N | 2056.38 | 2075 | 18.76 | <5 | 4000 | 0 | 3799 | 5.78 | 1750 | 1140 |
| | | 29-Sep-09 | N | 2056.38 | 2075 | 14.24 | <5 | 4000 | <0.05 | 3735 | 5.69 | 1520 | 936 |
| | | 6-Oct-09 | N | 2056.38 | 2075 | 13.12 | <5 | 4000 | <0.05 | 3582 | 5.76 | 1530 | 935 |
| | | 13-Oct-09 | N | 2056.38 | 2075 | 10.92 | <5 | 4000 | <0.05 | 3870 | 6.08 | 1530 | 818 |
| | | 20-Oct-09 | N | 2056.38 | 2075 | 10.88 | <5 | 4000 | <0.05 | 3872 | 5.9 | 1580 | 890 |
| | | 27-Oct-09 | N | 2056.38 | 2075 | 9.72 | <2.5 | 4000 | <0.025 | 3809 | 5.95 | 1390 | 807 |
| | | 3-Nov-09 | N | 2056.38 | 2075 | 9.76 | <2.5 | 4000 | <0.025 | 3878 | 5.89 | 1570 | 911 |
| | | 10-Nov-09 | N | 2056.38 | 2075 | 10.88 | <2.5 | 4000 | <0.025 | 3819 | 5.94 | 1760 | 1290 |
| | | 17-Nov-09 | N | 2056.38 | 2075 | 12.04 | <5 | 4000 | <0.05 | 3896 | -- | 1770 | 1060 |
| | | 24-Nov-09 | N | 2056.38 | 2075 | 9.72 | <5 | 4000 | <0.05 | 3848 | 6.1 | 1420 | 789 |
| | | 1-Dec-09 | N | 2056.38 | 2075 | 10.88 | <5 | 4000 | <0.05 | 3823 | 6.06 | 1590 | 974 |
| | | 8-Dec-09 | N | 2056.38 | 2075 | 14.24 | <5 | 4000 | <0.05 | 3732 | 6.22 | 1430 | 801 |
| | | 15-Dec-09 | N | 2056.38 | 2075 | 12 | <5 | 4000 | <0.05 | 3805 | 6.38 | 1410 | 759 |
| | | 22-Dec-09 | N | 2056.38 | 2075 | 9.72 | <5 | 4000 | <0.05 | 3856 | 6.36 | 1600 | 1020 |
| | | 29-Dec-09 | N | 2056.38 | 2075 | 12 | <5 | 4000 | <0.05 | 3846 | 6.16 | 1300 | 832 |
| | | 5-Jan-10 | N | 2056.38 | 2075 | 12 | <5 | 4000 | <0.05 | 3850 | 6.25 | 1630 | 980 |
| | | 12-Jan-10 | N | 2056.38 | 2075 | 9.76 | <5 | 4000 | <0.05 | 3846 | 6.3 | 1240 | 603 |
| | | 19-Jan-10 | N | 2056.38 | 2075 | 8.64 | <5 | 4000 | <0.05 | 3813 | 6.62 | 1370 | 694 |
| | | 26-Jan-10 | N | 2056.38 | 2075 | 10.92 | <5 | 4000 | <0.05 | 3831 | 6.16 | 1770 | 1120 |

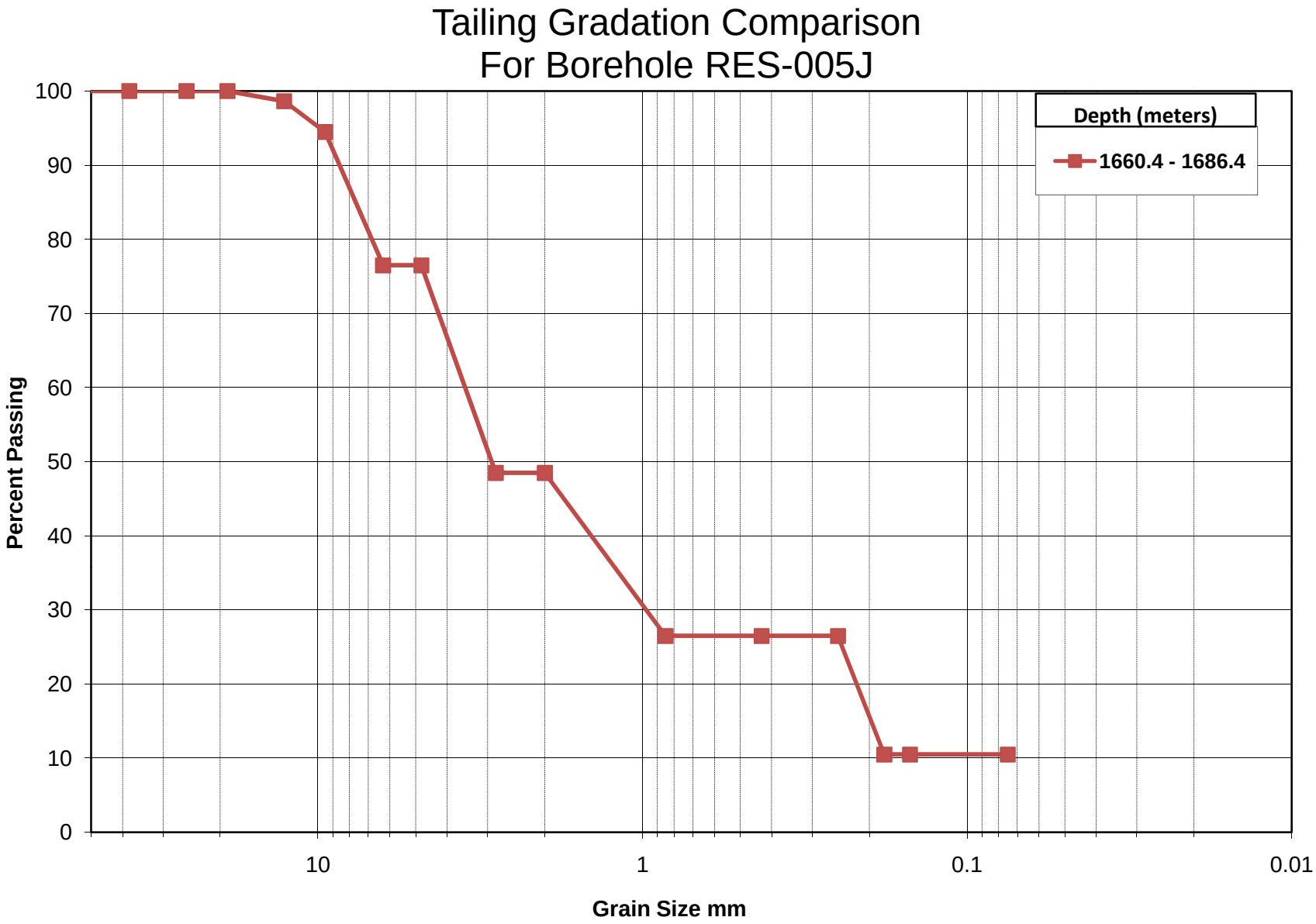
| | |
|---|---|
| -- | Not requested. |
| MG/L | milligrams per liter |
| MLS | milliliters |
| UMHOS/CM | micromhos per centimeter |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above method acceptance criteria. |
| B7 | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10X above the concentration found in the method blank. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| F | Analyte was positively identified but he reported concentrations estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| FD | Field duplicate. |
| H3 | Sample analysis requested past holding time. |
| L1 | The associated blank spike recovery was above the laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. If not other flags, the method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. If not other flags, the method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| N | Normal. |
| R1 | Relative percent difference exceeded the method control limit. |
| S | Sample was converted from cell to shoebox. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample but the sample was not reanalyzed. |

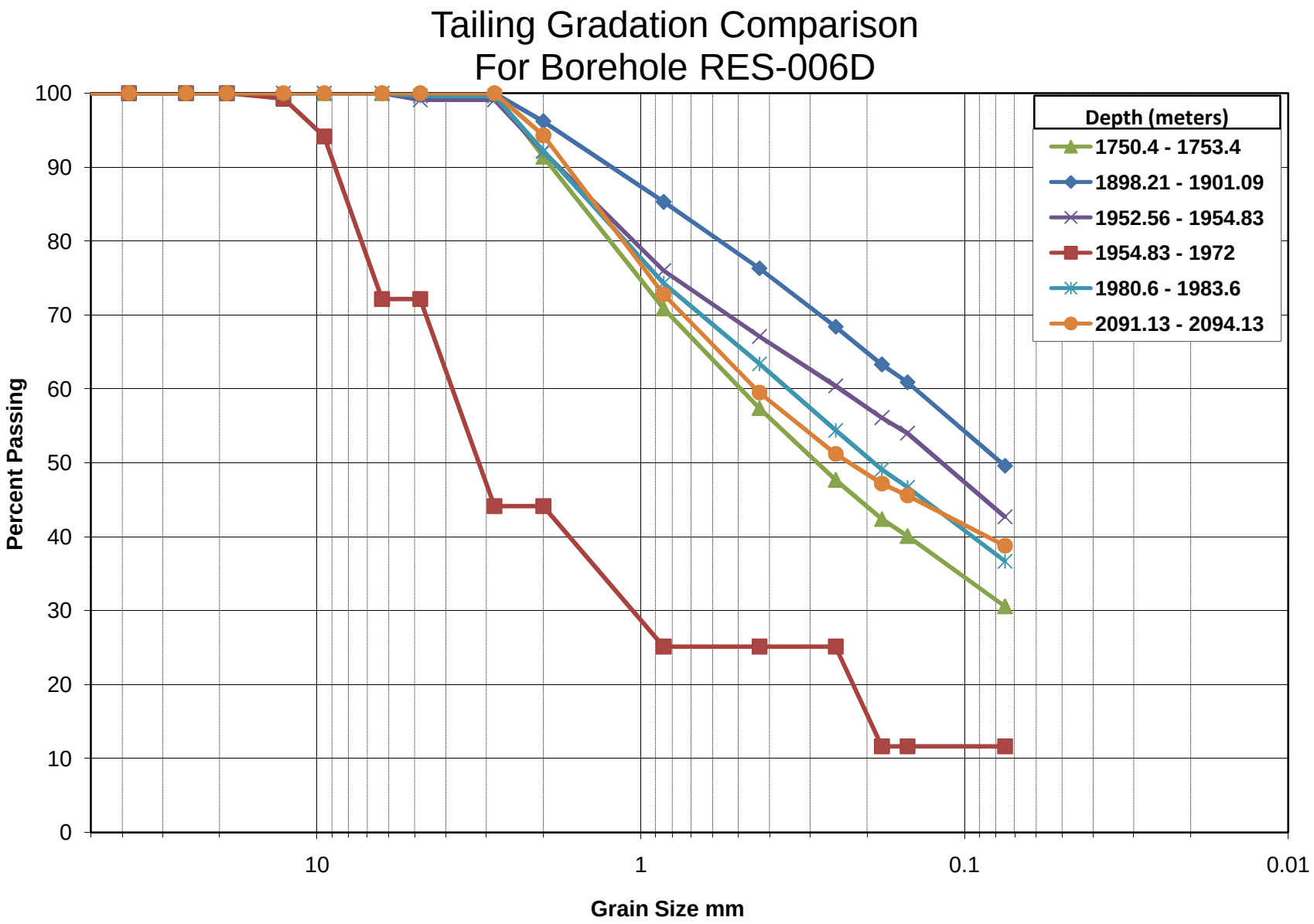
**APPENDIX G**
**GRAIN SIZE DATA AND GRADATION CURVES**

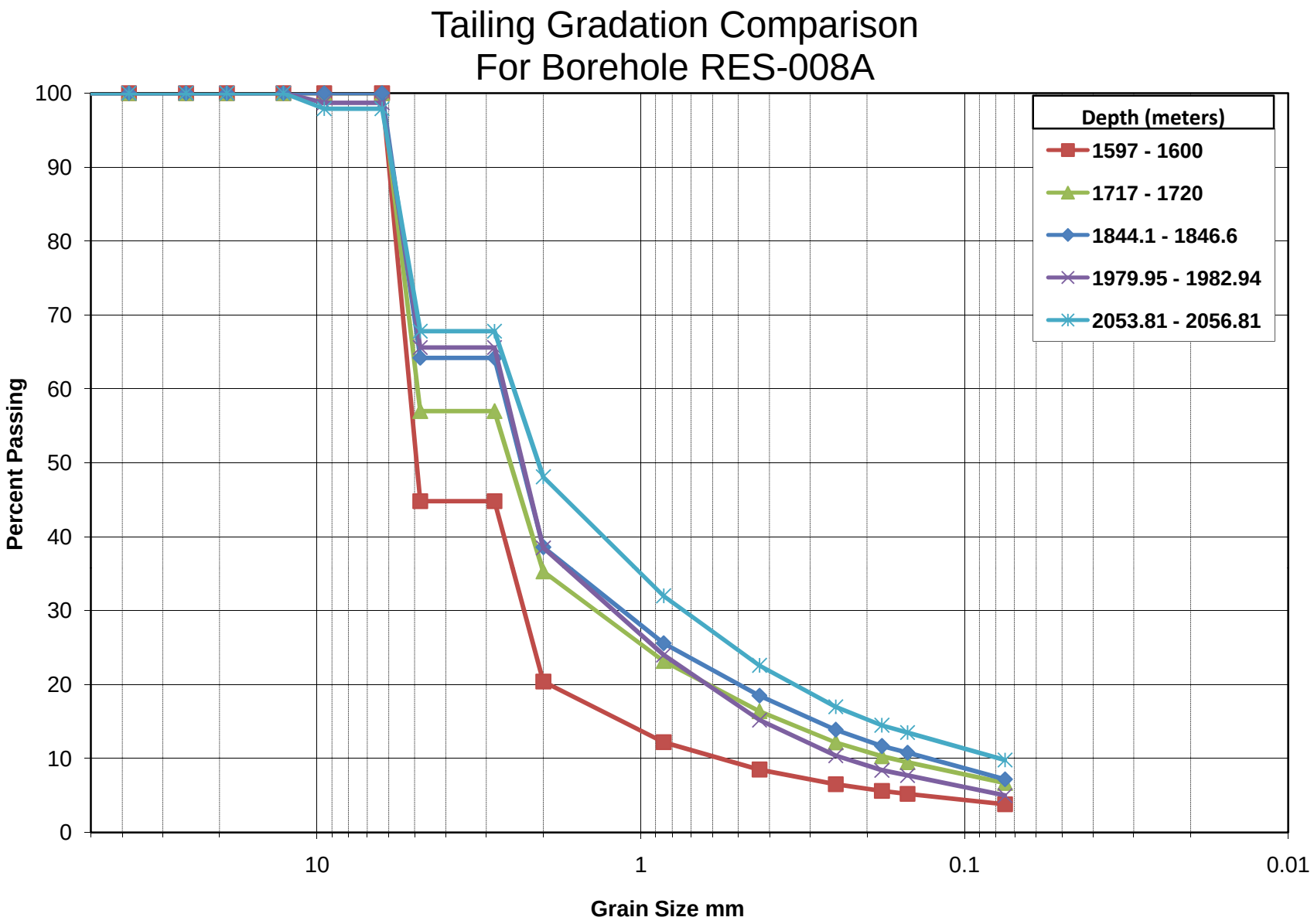

Tailing Gradation Comparison
For Borehole RES-001C
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
10
1
0.1
0.01
Grain Size mm
Depth (meters)
1639 - 1642
1745 - 1748
1771.75 - 1791.4
1855 - 1858
1873 - 1876
2041 - 2044

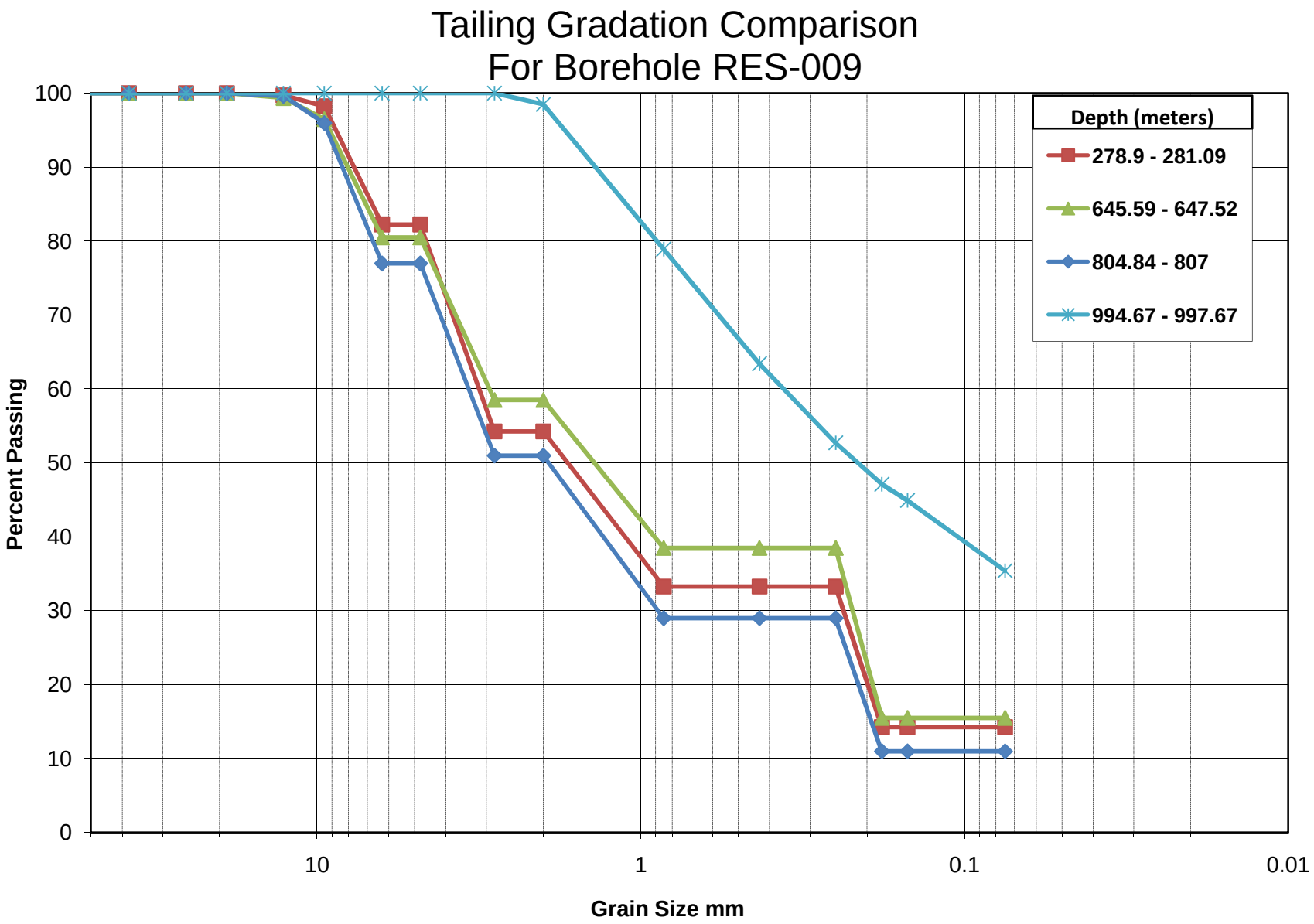

Tailing Gradation Comparison
For Borehole RES-002A
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
10
1
0.1
0.01
Grain Size mm
Depth (meters)
888 - 891
1154 - 1156
1414 - 1417
1454 - 1457
1927 - 1930

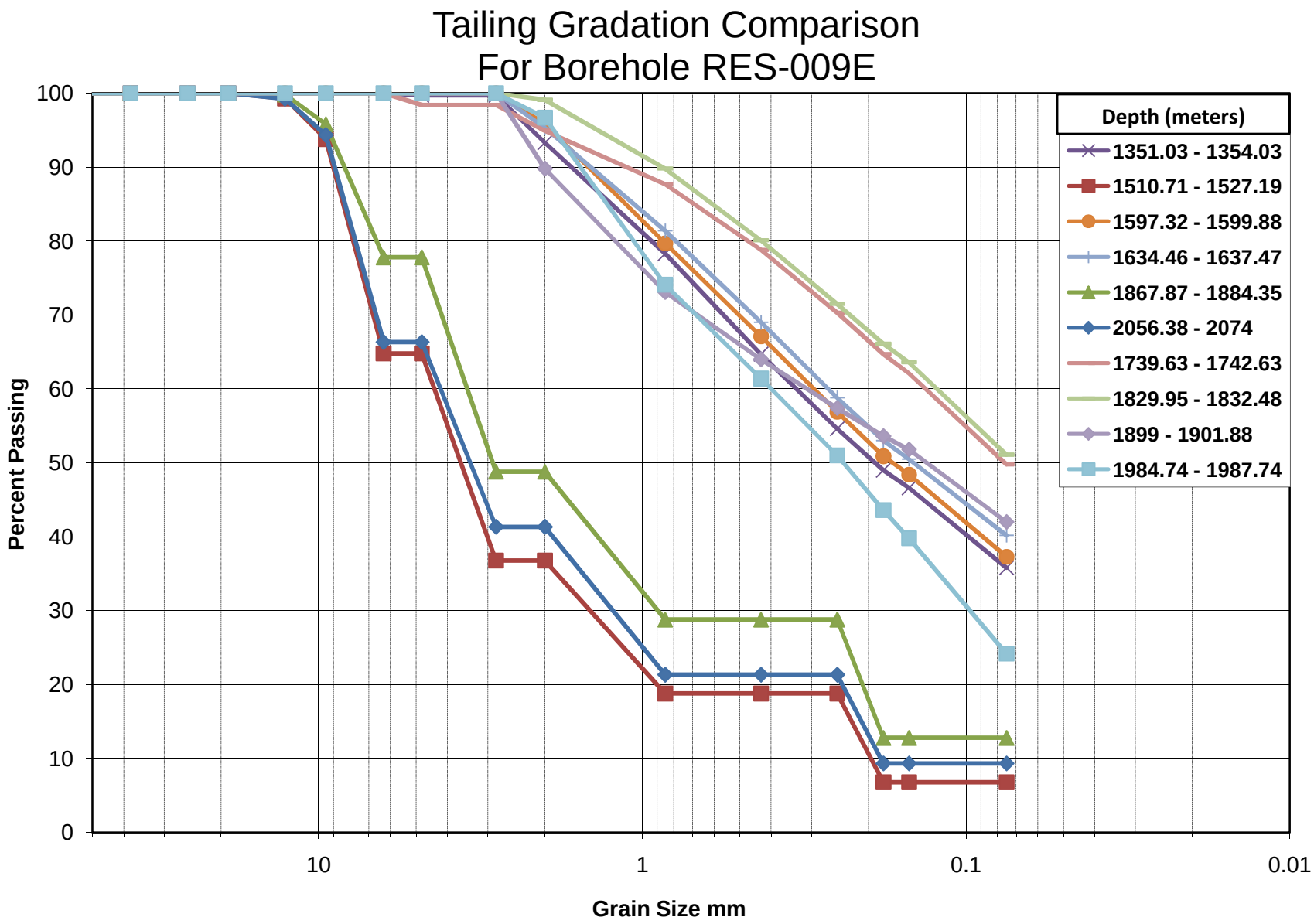

Tailing Gradation Comparison
For Borehole RES-005I
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
10
1
0.1
0.01
Grain Size mm
Depth (meters)
1317.28 - 1320.28
1428.18 - 1431.18
1499 - 1502
1586.46 - 1589.46
1632.56 - 1635.56
1652 - 1654.93
1654.93 - 1659.8
1759.23 - 1761.23
1892.81 - 1895
1917.29 - 1920.9


Tailing Gradation Comparison
For Borehole RES-005J
Depth (meters)
1660.4 - 1686.4
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
10
1
0.1
0.01
Grain Size mm


Tailing Gradation Comparison
For Borehole RES-006D
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
10
1
0.1
0.01
Grain Size mm
Depth (meters)
1750.4 - 1753.4
1898.21 - 1901.09
1952.56 - 1954.83
1954.83 - 1972
1980.6 - 1983.6
2091.13 - 2094.13


Tailing Gradation Comparison
For Borehole RES-008A
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
10
1
0.1
0.01
Grain Size mm
Depth (meters)
1597 - 1600
1717 - 1720
1844.1 - 1846.6
1979.95 - 1982.94
2053.81 - 2056.81


Tailing Gradation Comparison
For Borehole RES-009
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
10
1
0.1
0.01
Grain Size mm
Depth (meters)
278.9 - 281.09
645.59 - 647.52
804.84 - 807
994.67 - 997.67


Tailing Gradation Comparison
For Borehole RES-009E
Percent Passing
100
90
80
70
60
50
40
30
20
10
0
10
1
0.1
0.01
Grain Size mm
Depth (meters)
1351.03 - 1354.03
1510.71 - 1527.19
1597.32 - 1599.88
1634.46 - 1637.47
1867.87 - 1884.35
2056.38 - 2074
1739.63 - 1742.63
1829.95 - 1832.48
1899 - 1901.88
1984.74 - 1987.74

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Aluminum MG/L | Antimony MG/L | Antimony MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-001C | 1745 | 1748 | TEST SC2 | 8-Mar-10 | <0.2 | 0.0005 F | 0.0024 | 0.055 D1 | <0.02 D1 | <0.1 D1 | 0.0003 F | 560 M3 | <30 D1 | <0.1 D1 | <0.05 | 0.04 F | <5 D1 | <0.05 | <0.0005 |
| | | | | 15-Mar-10 | <0.2 | <0.002 | 0.0009 F | 0.019 F | <0.01 | <0.05 | 0.0002 F | 592 M3 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 22-Mar-10 | 0.05 F | <0.002 | <0.002 | 0.011 F | <0.01 | <0.05 | 0.0002 F | 512 | <5 | <0.05 | <0.05 | 0.04 F | 0.5 | <0.05 | <0.0005 |
| | | | | 29-Mar-10 | <0.2 | <0.002 | <0.002 | 0.009 F | <0.01 | <0.05 | 0.0002 F | 466 | <5 | <0.05 | <0.05 | <0.05 | 0.4 F | <0.05 | <0.0005 |
| | | | | 5-Apr-10 | <0.2 | <0.002 | <0.002 | 0.008 F | <0.01 | <0.05 | 0.0001 F | 453 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 12-Apr-10 | <0.2 | <0.002 | <0.002 | 0.011 F | <0.01 | <0.05 | 0.0001 F | 430 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 19-Apr-10 | -- | ---- | ---- | -- -- | ---- | ---- | -- -- | -- -- | -- | ---- | ---- | ---- | ---- | -- | ---- | ---- |
| | | | | 26-Apr-10 | <0.2 | <0.002 | <0.002 | 0.006 F | <0.01 | <0.05 | 0.0001 F | 440 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 3-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | ---- | ---- |
| | | | | 10-May-10 | 0.04 F | <0.002 | <0.002 | 0.008 F | <0.01 | <0.05 | <0.0005 | 419 M3 | <30 D1M2 | 0.01 F | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 17-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | -- -- | ---- | ---- | -- | ---- | ---- |
| | | | | 24-May-10 | 0.03 F | <0.002 | <0.002 | 0.006 F | <0.01 | <0.05 | <0.0005 | 430 M3 | <30 D1 | 0.1 <D1 | <0.1 D1 | 0.04 F | <5 D1 | <0.05 | <0.0005 |
| RES-002A | 1414.6 | 1417 | TEST SC11 | 8-Mar-10 | 300 D1 | <0.02 D1 | 0.006 FD1 | 0.3 FD1 | <0.5 D1 | <3 D1 | 0.002 FD1 | 11 D1 | <50 D1 | 0.5 FD1 | 1.3 D1 | 3060 D1 | <10 M1 | 140 D1 | 0.004 FD1 |
| | | | | 15-Mar-10 | 73.1 B7 | <0.01 D1 | <0.01 D1 | <0.2 D1 | <0.1 D1 | <0.3 D1 | 0.0005 FD1 | 4 FD1 | <50 D1 | 0.16 FD1 | 0.3 D1 | 864 D1 | <10 D1 | 70.1 D1 | 0.001 FD1 |
| | | | | 22-Mar-10 | 3.45 | <0.002 | <0.002 | 0.007 F | <0.01 | <0.05 | <0.0005 | 0.9 F | <5 | <0.05 | 0.02 F | 49.5 | <5 D1 | 34.5 | 0.0005 |
| | | | | 29-Mar-10 | 1.12 | <0.002 | <0.002 | 0.005 F | <0.01 | <0.05 | <0.0005 | 0.7 F | <5 | <0.05 | <0.05 | 13.2 | <0.5 | 32.5 | 0.0006 |
| | | | | 5-Apr-10 | 0.72 | <0.002 | <0.002 | 0.006 F | <0.01 | <0.05 | <0.0005 | 0.7 F | <30 D1 | <0.05 | <0.05 | 8.16 | <5 D1 | 30.7 | 0.0005 |
| | | | | 12-Apr-10 | 0.62 | <0.002 | <0.002 | 0.009 F | <0.01 | <0.05 | <0.0005 | 0.5 F | <30 D1 | <0.05 | <0.05 | 5.79 | <5 D1 | 29.3 | 0.0008 |
| | | | | 19-Apr-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 0.48 | <0.002 | <0.002 | 0.02 | <0.01 | <0.05 | <0.0005 | 0.5 F | <30 D1 | 0.01 F | <0.05 | 3.51 | <5 D1 | 30.7 | 0.0008 |
| | | | | 3-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 10-May-10 | 0.43 | <0.002 | <0.002 | 0.008 F | <0.01 | <0.05 | <0.0005 | 1.5 | <30 D1 | <0.05 | <0.05 | 2.6 | <5 D1 | 28.3 | 0.0015 |
| | | | | 17-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 24-May-10 | 0.27 | <0.002 | <0.002 | 0.007 F | <0.01 | <0.05 | <0.0005 | 0.3 F | <30 D1M2 | <0.05 | <0.05 | 2.07 | <5 D1M2 | 23.2 | 0.0005 |
| | 1454 | 1457 | TEST SC12 | 8-Mar-10 | 1 FD1 | <0.02 D1 | <0.02 D1 | 0.3 FD1 | <0.5 D1 | <3 D1 | 0.003 FD1 | 10 D1 | <30 D1 | <3 D1 | 0.4 FD1 | 2010 D1 | <5 D1 | 0.6 D1 | 0.002 FD1 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Aluminum MG/L | Antimony MG/L | Antimony MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-002A | 1454 | 1457 | TEST SC12 | 15-Mar-10 | 0.14 F | <0.002 | <0.002 | <0.08 D1 | <0.05 D1 | <0.05 | 0.0004 F | 4 FD1 | <30 D1 | 0.03 F | 0.03 F | 387 M3 | <5 D1 | 0.3 D1 | 0.0003 F |
| | | | | 22-Mar-10 | 0.09 F | <0.002 | <0.002 | 0.007 F | <0.01 | <0.1 D1 | 0.0002 F | 2.4 | <5 | <0.05 | 0.01 F | 134 D1 | <0.5 | 0.11 | 0.0001 F |
| | | | | 29-Mar-10 | 0.05 F | <0.002 | <0.002 | 0.007 F | <0.01 | <0.05 | 0.0002 F | 2.9 | <5 | <0.05 | <0.05 | 109 D1 | <5 D1 | 0.12 | 0.0002 F |
| | | | | 5-Apr-10 | <0.2 | <0.002 | <0.002 | 0.01 F | <0.01 | <0.05 | 0.0001 F | 3.1 | <30 D1 | <0.05 | <0.05 | 92.3 | <5 D1 | 0.1 | 0.0002 F |
| | | | | 12-Apr-10 | <0.2 | <0.002 | <0.002 | 0.013 F | <0.01 | <0.05 | 0.0001 F | 3 | <30 D1 | <0.05 | <0.05 | 81.7 | <5 D1 | 0.08 | 0.0001 F |
| | | | | 19-Apr-10 | -- | ---- | ---- | -- -- | ---- | ---- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 0.03 F | <0.002 | <0.002 | 0.027 | <0.01 | <0.05 | 0.0001 F | 2.6 | <30 D1 | 0.01 F | <0.05 | 74.9 | <5 D1 | 0.09 | 0.0001 F |
| | | | | 3-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 10-May-10 | <0.2 | <0.002 | <0.002 | 0.014 F | <0.01 | <0.05 | <0.0005 | 2.7 | <30 D1 | <0.05 | <0.05 | 61.9 | <5 D1 | 0.13 | 0.0001 F |
| | | | | 17-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 24-May-10 | <0.2 | <0.002 | <0.02 M1 | 0.015 F | <0.01 | <0.05 | <0.0005 M3 | 2.1 | <30 D1 | <0.05 | <0.05 | 49.7 | <5 D1 | 0.05 | 0.0008 M1 |
| | 1927 | 1930 | TEST SC14 | 15-Mar-10 | 36.7 B7 | <0.002 | 0.0098 | 0.03 D1 | 0.012 FD1 | <0.05 | 0.0089 | 530 D1 | <30 D1 | 0.01 F | 0.15 | 192 D1 | 49 D1 | 0.37 D1 | 0.0005 |
| | | | | 22-Mar-10 | 9.53 | <0.002 | <0.002 | 0.021 | 0.005 F | <0.05 | 0.0053 | 548 | <5 | <0.05 | 0.08 | 82.6 | 13 D1 | 0.19 | 0.0001 F |
| | | | | 29-Mar-10 | 3.85 | <0.002 | <0.002 | 0.014 F | 0.002 F | <0.05 | 0.0031 | 560 | <5 | <0.05 | 0.04 F | 43.9 | 6 D1 | 0.23 | 0.0001 F |
| | | | | 5-Apr-10 | 1.96 | <0.002 | <0.002 | 0.013 F | <0.01 | <0.05 | 0.0023 | 576 | <30 D1 | <0.05 | 0.01 F | 21.6 | 4 FD1 | 0.22 | <0.0005 |
| | | | | 12-Apr-10 | 1.13 | <0.002 | <0.002 | 0.015 F | <0.01 | <0.05 | 0.0017 | 551 | <30 D1 | <0.05 | <0.05 | 8.9 | 3 FD1 | 0.26 | 0.0001 F |
| | | | | 19-Apr-10 | -- | ---- | ---- | -- -- | ---- | ---- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 0.89 | <0.002 | <0.002 | 0.018 F | <0.01 | <0.05 | 0.0015 | 551 | <30 D1 | <0.05 | <0.05 | 2.37 | 3 FD1 | 0.28 | 0.0001 F |
| | | | | 3-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 10-May-10 | 0.88 | <0.002 | <0.002 | 0.013 F | <0.01 | <0.05 | 0.0013 | 585 | <30 D1 | 0.01 F | <0.05 | 0.99 | 2 FD1 | 0.27 | <0.0005 |
| | | | | 17-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | -- -- | -- -- | -- | -- -- | ---- | -- -- | -- | -- -- | ---- |
| | | | | 24-May-10 | 0.62 | <0.002 | <0.002 | 0.015 F | <0.01 | <0.05 | 0.0009 | 612 | <30 D1 | <0.1 D1 | <0.1 D1 | 0.49 | 2 FD1 | 0.24 | <0.0005 |
| RES-005I | 1652 | 1654.93 | TEST SC21 | 8-Mar-10 | 131 D1 | <0.002 | 0.127 | 0.08 FD1 | <0.1 D1 | <0.5 D1 | 0.0027 | 11 D1 | <30 D1 | 0.1 FD1 | 0.55 D1 | 539 D1 | <5 D1 | 128 D1 | 0.0037 |
| | | | | 15-Mar-10 | 20.7 B7 | <0.002 | 0.0217 | 0.046 | <0.01 | <0.05 | 0.0005 | 2.2 | <30 D1 | 0.04 F | 0.08 | 91.3 D1 | <5 D1 | 39.8 | 0.0011 |
| | | | | 22-Mar-10 | 1.16 | <0.002 | 0.0023 | 0.051 | <0.01 | <0.05 | <0.0005 | 0.4 F | <5 | <0.05 | <0.05 | 7.07 | <0.5 | 14.6 | 0.0008 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Aluminum MG/L | Antimony MG/L | Antimony MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-005I | 1652 | 1654.93 | TEST SC21 | 29-Mar-10 | 0.39 | <0.002 | 0.0048 | 0.047 | <0.01 | <0.05 | <0.0005 | 0.2 F | <5 | <0.05 | <0.05 | 2.65 | <0.5 | 13.1 | 0.0007 |
| | | | | 5-Apr-10 | 0.14 F | <0.002 | 0.0023 | 0.059 | <0.01 | <0.05 | <0.0005 | <1 | <30 D1 | <0.05 | <0.05 | 1.17 | <5 D1 | 9.55 | 0.0007 |
| | | | | 12-Apr-10 | 0.08 F | <0.002 | 0.0008 F | 0.07 | <0.01 | <0.05 | <0.0005 | <1 | <30 D1 | <0.05 | <0.05 | 0.65 | <5 D1 | 6.33 | 0.0005 |
| | | | | 19-Apr-10 | -- -- | ---- | -- -- | -- -- | ---- | ---- | ---- | ---- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 0.04 F | <0.002 | 0.0013 F | 0.12 | <0.01 | <0.05 | <0.0005 | <1 | <30 D1 | <0.05 | <0.05 | 0.17 | <5 D1 | 2.37 | 0.0003 F |
| | | | | 3-May-10 | -- -- | ---- | -- -- | -- -- | ---- | ---- | ---- | ---- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 10-May-10 | 0.04 F | <0.002 | <0.002 | 0.138 | <0.01 | <0.05 | <0.0005 | 0.8 F | <30 D1 | <0.05 | <0.05 | 0.29 | <5 D1 | 3.68 | 0.0003 F |
| | | | | 17-May-10 | -- -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 24-May-10 | <0.2 | <0.002 | <0.002 | 0.119 | <0.01 | <0.05 | 0.0001 F | <1 | <30 D1 | <0.05 | <0.05 | 0.07 | <5 D1 | 1.83 | 0.0002 F |
| RES-006D | 1898.21 | 1901.09 | TEST SC28 | 8-Mar-10 | 1230 D1 | <0.02 D1 | 0.011 FD1 | 0.3 FD1 | <0.5 D1 | <3 D1 | 0.031 D1 | 925 D1 | <30 D1 | <3 D1 | 8.6 D1 | 2480 D1 | 710 D1 | 1690 D1 | <0.005 D1 |
| | | | | 15-Mar-10 | 26.5 B7 | <0.002 | 0.0013 F | <0.03 D1 | <0.02 D1 | 0.01 F | 0.0013 | 210 D1 | <30 D1 | 0.02 F | 0.18 | 114 D1 | 26 D1 | 117 D1 | <0.0005 |
| | | | | 22-Mar-10 | 4.02 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0001 F | 37.2 | <5 | <0.05 | <0.05 | 2.38 | 8 | 50.2 | <0.0005 |
| | | | | 29-Mar-10 | 3.85 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 25.9 | <5 | <0.05 | <0.05 | 0.63 | 8.1 | 53.3 | <0.0005 |
| | | | | 5-Apr-10 | 2.66 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 18 | <30 D1 | <0.05 | <0.05 | 0.18 | 7 D1 | 37.7 | 0.0001 F |
| | | | | 12-Apr-10 | 1.24 | <0.002 | <0.002 | 0.004 F | <0.01 | <0.05 | <0.0005 | 10.1 | <30 D1 | <0.05 | <0.05 | 0.05 | 6 D1 | 18.7 | <0.0005 |
| | | | | 19-Apr-10 | -- -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | -- -- | ---- |
| | | | | 26-Apr-10 | 0.95 | <0.002 | <0.002 | 0.013 F | <0.01 | <0.05 | <0.0005 | 7.6 | <30 D1 | <0.05 | <0.05 | <0.05 | 5 D1 | 15.5 | <0.0005 |
| | | | | 3-May-10 | -- -- | ---- | ---- | ---- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | -- -- | ---- |
| | | | | 10-May-10 | 0.83 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 8.6 | <30 D1 | <0.05 | <0.05 | 0.01 F | 4 FD1 | 11.4 | 0.0001 F |
| | | | | 17-May-10 | -- -- | ---- | ---- | ---- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | -- -- | ---- |
| | | | | 24-May-10 | 0.42 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | <0.0005 | 5.5 | <30 D1 | <0.05 | <0.05 | <0.05 | 3 FD1 | 7.35 | 0.0002 F |
| RES-008A | 1717 | 1720 | TEST SC34 | 8-Mar-10 | 0.05 F | <0.002 | 0.0007 F | 0.08 | <0.01 | <0.05 | 0.0006 | 138 | <30 D1 | <0.05 | <0.05 | 0.12 | <5 D1 | <0.05 | <0.0005 |
| | | | | 15-Mar-10 | 0.04 F | <0.002 | 0.0007 F | 0.045 | <0.01 | <0.05 | 0.0004 F | 108 | <30 D1 | 0.02 F | <0.05 | 0.04 F | <5 D1 | 0.03 F | <0.0005 |
| | | | | 22-Mar-10 | <0.2 | <0.002 | <0.002 | 0.023 | <0.01 | <0.05 | 0.0001 F | 52 | 1 F | <0.05 | <0.05 | 0.02 F | <0.5 | <0.05 | <0.0005 |
| | | | | 29-Mar-10 | <0.2 | <0.002 | <0.002 | 0.014 F | <0.01 | <0.05 | <0.0005 | 38.7 | <5 | <0.05 | <0.05 | <0.05 | <0.5 | 0.02 F | <0.0005 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
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| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
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| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Aluminum MG/L | Antimony MG/L | Antimony MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-008A | 1717 | 1720 | TEST SC34 | 5-Apr-10 | <0.2 | <0.002 | <0.002 | 0.011 F | <0.01 | <0.05 | <0.0005 | 29.9 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 12-Apr-10 | <0.2 | <0.002 | <0.002 | 0.015 F | <0.01 | <0.05 | <0.0005 | 21.2 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 19-Apr-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | ---- | ---- |
| | | | | 26-Apr-10 | <0.2 | <0.002 | <0.002 | 0.016 F | <0.01 | <0.05 | <0.0005 | 13.5 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 3-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | ---- | ---- |
| | | | | 10-May-10 | 0.05 F | <0.002 | <0.002 | 0.004 F | <0.01 | <0.05 | <0.0005 | 11.6 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | 0.03 F | <0.0005 |
| | | | | 17-May-10 | -- -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | -- -- | ---- |
| | | | | 24-May-10 | 0.05 F | <0.002 | <0.002 | 0.006 F | <0.01 | <0.05 | <0.0005 | 9.4 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| RES-009 | 278.9 | 281.09 | TEST SC38 | 8-Mar-10 | 0.58 | <0.02 D1 | <0.02 D1 | 0.061 | <0.01 | 0.02 F | <0.005 D1 | 15 | <30 D1 | <0.05 | <0.05 | 0.04 F | <5 D1 | 0.04 F | <0.005 D1 |
| | | | | 15-Mar-10 | 0.4 | <0.002 | 0.0046 | 0.013 F | <0.01 | 0.1 | <0.0005 | 7.6 | <30 D1 | <0.05 | <0.05 V1 | 0.02 F | <5 D1 | 0.24 | 0.0002 F |
| | | | | 22-Mar-10 | 0.27 | <0.002 | 0.0024 | 0.007 F | <0.01 | <0.05 | <0.0005 | 6.7 | | <0.05 | <0.05 | <0.05 | <0.5 | 0.02 F | 0.0001 F |
| | | | | 29-Mar-10 | 0.17 F | <0.002 | 0.0036 | 0.007 F | <0.01 | <0.05 | 0.0002 F | 5.5 | | <0.05 | <0.05 | <0.05 | <0.5 | 0.04 F | 0.0003 F |
| | | | | 5-Apr-10 | 0.38 | <0.002 | 0.0033 | 0.005 F | <0.01 | <0.05 | <0.0005 | 5.2 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | 0.0002 F |
| | | | | 12-Apr-10 | 0.28 | <0.002 | 0.003 | 0.007 F | <0.01 | <0.05 | <0.0005 | 4.7 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 19-Apr-10 | -- -- | ---- | -- -- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | ---- | ---- |
| | | | | 26-Apr-10 | 0.2 | <0.002 | 0.0027 | 0.004 F | <0.01 | <0.05 | <0.0005 | 4.5 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 3-May-10 | -- -- | ---- | -- -- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | ---- | ---- |
| | | | | 10-May-10 | 0.22 | <0.002 | 0.0015 F | 0.004 F | <0.01 | <0.05 | <0.0005 | 4.7 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | | | | 17-May-10 | -- -- | ---- | -- -- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | ---- | -- | ---- | ---- |
| | | | | 24-May-10 | 0.1 F | <0.002 | 0.0013 F | 0.006 F | <0.01 | <0.05 | <0.0005 | 5 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | <0.05 | <0.0005 |
| | 645.59 | 647.52 | TEST SC39 | 8-Mar-10 | 0.56 | <0.02 D1 | | 0.045 | <0.01 | 0.42 | <0.005 D1 | 13.6 | <30 D1 | <0.05 | <0.05 | 0.1 | 2 FD1 | 0.4 | <0.005 D1 |
| | | | | 15-Mar-10 | 0.7 | <0.002 | 0.0051 | 0.017 F | <0.01 | 0.14 | <0.0005 | 6.8 | <30 D1 | <0.05 | <0.05 V1 | 0.04 F | 1 FD1 | 0.42 | 0.0005 |
| | | | | 22-Mar-10 | 0.54 | <0.002 | 0.0059 | 0.006 F | <0.01 | 0.15 | <0.0005 | 2.9 | <5 | <0.05 | <0.05 | 0.03 F | 2.5 | 0.45 | 0.0004 F |
| | | | | 29-Mar-10 | 0.37 | <0.002 | 0.0077 | <0.02 | <0.01 | 0.12 | <0.0005 | 2.3 | <5 | <0.05 | <0.05 | 0.02 F | 2.3 | 0.35 | 0.0003 F |
| | | | | 5-Apr-10 | 0.37 | <0.002 | 0.0064 | <0.02 | <0.01 | 0.08 | <0.0005 | 1.8 | <30 D1 | <0.05 | <0.05 | 0.02 F | 1 FD1 | 0.28 | 0.0002 F |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Aluminum MG/L | Antimony MG/L | Antimony MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009 | 645.59 | 647.52 | TEST SC39 | 12-Apr-10 | 0.4 | <0.002 | 0.0056 | 0.004 F | <0.01 | 0.06 | <0.0005 | 1.5 | <30 D1 | <0.05 | <0.05 | 0.01 F | 1 FD1 | 0.26 | 0.0002 F |
| | | | | 19-Apr-10 | -- -- | ---- | -- -- | -- -- | ----- | -- -- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 0.35 | <0.002 | 0.0048 | <0.02 | <0.01 | 0.03 F | <0.0005 | 1.6 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | 0.2 | 0.0001 F |
| | | | | 3-May-10 | -- -- | ---- | -- -- | ----- | ----- | -- -- | ---- | -- -- | -- | ---- | ---- | ---- | -- | -- -- | -- -- |
| | | | | 10-May-10 | 0.28 | <0.002 | 0.0031 | <0.02 | <0.01 | 0.02 F | <0.0005 | 1.7 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | 0.11 | <0.0005 |
| | | | | 17-May-10 | -- -- | ---- | -- -- | ----- | ----- | -- -- | ---- | -- -- | -- | ---- | ---- | ---- | -- | -- -- | ---- |
| | | | | 24-May-10 | 0.28 | <0.002 | 0.0028 | 0.004 F | <0.01 | 0.02 F | <0.0005 | 1.8 | <30 D1 | <0.05 | <0.05 | <0.05 | <5 D1 | 0.13 | <0.0005 |
| RES-009E | 1510.74 | 1527.19 | TEST SC44 | 8-Mar-10 | 19.7 | <0.002 | 0.0093 | 0.03 FD1 | <0.1 D1 | <0.5 D1 | 0.0117 | 110 | <30 D1 | <0.5 D1 | 0.31 | 223 D1 | 9 D1 | 884 D1 | 0.0043 |
| | | | | 15-Mar-10 | 15 | <0.002 | 0.0049 | 0.02 FD1 | <0.05 D1 | <0.3 D1 | 0.0086 | 81 D1 | <30 D1 | 0.1 FD1 | 0.22 FD1 | 169 D1 | 6 D1 | 683 D1 | 0.0018 |
| | | | | 22-Mar-10 | 6.68 | <0.002 | 0.0008 F | 0.008 F | 0.003 F | <0.05 | 0.0044 | 40.1 | <5 | 0.03 F | 0.1 | 78 | 3.2 | 358 | 0.0005 |
| | | | | 29-Mar-10 | 3.37 | <0.002 | 0.0007 F | 0.007 F | <0.01 | <0.05 | 0.0025 | 23.1 | <5 | <0.05 | 0.06 | 40.8 | 2 | 229 | 0.0004 F |
| RES-009E | 1510.74 | 1527.19 | TEST SC44 | 5-Apr-10 | 1.95 | <0.002 | <0.002 | <0.02 | <0.01 | <0.05 | 0.0015 | 16.1 | <30 D1 | <0.05 | 0.03 F | 23.9 | 1 FD1 | 148 | 0.0002 F |
| | | | | 12-Apr-10 | 1.12 | <0.002 | <0.002 | 0.007 F | <0.01 | <0.05 | 0.0007 | 9.4 | <30 D1 | <0.05 | 0.01 F | 12.4 | <5 D1 | 94.9 | 0.0001 F |
| | | | | 19-Apr-10 | -- -- | ---- | ---- | -- -- | ----- | ---- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 0.51 | <0.002 | <0.002 | 0.006 F | <0.01 | <0.05 | 0.0004 F | 4.7 | <30 D1 | <0.05 | <0.05 | 3.83 | <5 D1 | 50.1 | 0.0002 F |
| | | | | 3-May-10 | -- -- | ---- | ---- | -- -- | ----- | ----- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 10-May-10 | 0.35 | <0.002 | <0.002 | 0.005 F | <0.01 | <0.05 | 0.0002 F | 3.1 | <30 D1 | <0.05 | <0.05 | 1.65 | <5 D1 | 31.1 | 0.0002 F |
| | | | | 17-May-10 | -- -- | ---- | -- | -- -- | ----- | ----- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 24-May-10 | 0.27 | <0.002 | <0.002 M1 | 0.006 F | <0.01 | <0.05 | 0.0001 F | 2.6 | <30 D1 | <0.05 | <0.05 | 1.02 | <5 D1 | 24.6 | 0.001 |
| | 1739.63 | 1742.63 | TEST SC49 | 8-Mar-10 | 830 D1 | <0.02 M1 | 0.014 FD1 | <2 D1 | <1 D1 | <5 D1 | 0.217 D1 | 140 D1 | <30 D1 | <5 D1 | 5.4 D1 | 9350 D1 | 190 D1 | 238 D1 | 0.004 FD1 |
| | | | | 15-Mar-10 | 160 D1 | <0.01 D1 | <0.01 D1 | <0.3 D1 | <0.2 D1 | <0.5 V1 | 0.0364 D1 | 27 D1 | <30 D1 | <1 D1 | 0.9 FD1 | 1760 D1 | 26 D1 | 91 D1 | 0.0014 FD1 |
| | | | | 22-Mar-10 | 6.39 | <0.002 | <0.002 | 0.009 F | <0.01 | <0.05 | 0.0009 | 1.6 | <5 | <0.05 | 0.02 F | 31.3 | 1.9 | 49 | 0.0071 |
| | | | | 29-Mar-10 | 3.27 | <0.002 | 0.0006 F | 0.019 F | <0.01 | <0.05 | 0.0003 F | 0.7 F | <5 | <0.05 | <0.05 | 4.62 | 1.2 | 42.9 | 0.0277 |
| | | | | 5-Apr-10 | 2.37 | <0.002 | <0.002 | 0.06 | <0.01 | <0.05 | 0.0001 F | 0.6 F | <30 D1 | <0.05 | <0.05 | 2.52 | <5 D1 | 37.7 | 0.0889 |
| | | | | 12-Apr-10 | 1.81 | <0.002 | <0.002 | 0.122 | <0.01 | <0.05 | 0.0001 F | 0.4 F | <30 D1 | <0.05 | <0.05 | 1.43 | <5 D1 | 31.5 | 0.156 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Aluminum MG/L | Antimony MG/L | Antimony MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | 1739.63 | 1742.63 | TEST SC49 | 19-Apr-10 | -- -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 1.12 | <0.002 | <0.002 | 0.211 | <0.01 | <0.05 | <0.0005 | 0.5 F | <30 D1 | <0.05 | <0.05 | 0.48 | <5 D1 | 24.6 | 0.308 |
| | | | | 3-May-10 | -- -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 10-May-10 | 0.83 | <0.002 | <0.002 | 0.189 | <0.01 | <0.05 | <0.0005 | 0.4 F | <30 M2 | <0.05 | <0.05 | 0.24 | <5 D1 | 18.5 M3 | 0.419 |
| | | | | 17-May-10 | -- -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 24-May-10 | 0.47 | <0.002 | <0.002 | 0.154 | <0.01 | <0.05 | <0.001 D1 | 0.2 F | <30 D1 | <0.05 | <0.05 | 0.13 | <5 D1 | 14.1 M3 | 0.481 D1 |
| | 1829.95 | 1832.48 | TEST SC50 | 8-Mar-10 | 154 D1 | <0.002 | 0.0126 M1 | <0.2 D1 | 0.07 FD1 | <0.5 D1 | 0.0258 | 161 D1 | <30 D1 | <0.5 D1 | 0.42 D1 | 670 M3 | 190 M2 | 71.5 D1 | 0.0009 |
| | | | | 15-Mar-10 | 42.3 | <0.002 | 0.0022 | 0.004 F | 0.017 | <0.05 V1 | 0.0034 | 53.2 | <30 M2 | 0.01 F | 0.06 | 78.6 M3 | 0.5 | 18.3 M3 | 0.0002 F |
| | | | | 22-Mar-10 | 14.1 | <0.002 | <0.002 | 0.008 F | 0.005 F | <0.05 | 0.0008 | 19.7 | <5 | <0.05 | 0.01 F | 12.2 | 21.5 | 6.84 | 0.0001 F |
| | | | | 29-Mar-10 | 14 | <0.002 | <0.002 | <0.02 | 0.005 F | <0.05 | 0.0008 | 20.1 | <5 | <0.05 | <0.05 | 5.9 | 21.5 | 6.27 | 0.0002 F |
| | | | | 5-Apr-10 | 8.35 | <0.002 | <0.002 | <0.02 | 0.003 F | <0.05 | 0.0005 | 16.8 | <30 D1 | <0.05 | 0.01 F | 1.48 | 19 D1 | 4.73 | 0.0002 F |
| | | | | 12-Apr-10 | 7.72 | <0.002 | <0.002 | 0.01 F | 0.004 F | <0.05 | 0.0005 | 17.9 | <30 D1 | <0.05 | <0.05 | 0.61 | 19 D1 | 5.21 | 0.0002 F |
| | | | | 19-Apr-10 | -- -- | ---- | ---- | -- -- | -- -- | ---- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 6.39 | <0.002 | 0.0008 F | 0.015 F | 0.004 F | <0.05 | 0.0005 | 18.9 | <30 D1 | <0.05 | 0.01 F | 0.04 F | 17 D1 | 7.26 | 0.0004 F |
| | | | | 3-May-10 | -- -- | ---- | ---- | -- -- | -- -- | ---- | -- -- | -- -- | -- | ---- | ---- | ---- | -- | -- -- | -- -- |
| | | | | 10-May-10 | 4.31 | <0.002 | <0.002 | 0.015 F | 0.003 F | <0.05 | 0.0003 F | 12.6 | <30 D1 | <0.05 | <0.05 | <0.05 | 11 D1 | 6.29 | 0.0003 F |
| | | | | 17-May-10 | -- -- | ---- | ---- | -- -- | -- -- | ---- | -- -- | -- -- | -- | ---- | ---- | ---- | -- | -- -- | -- -- |
| | | | | 24-May-10 | 2.61 | <0.002 | <0.002 | 0.014 F | 0.003 F | <0.05 | 0.0002 F | 8.4 | <30 D1M2 | <0.05 | <0.05 | <0.05 | 10 D1M2 | 4.92 | 0.0002 F |
| | 1899 | 1901.88 | TEST SC52 | 8-Mar-10 | 0.05 F | <0.002 | 0.0024 | 0.085 | <0.01 | <0.05 | 0.0043 | 655 | <30 D1 | <0.05 | 0.09 | 3.54 | 1 FD1 | <0.05 | <0.0005 |
| | | | | 15-Mar-10 | 0.04 F | <0.002 | 0.0013 F | 0.035 | <0.01 | <0.05 V1 | 0.0016 | 641 | <30 D1 | <0.05 | 0.03 F | 0.85 | 2 FD1 | <0.05 | <0.0005 |
| | | | | 22-Mar-10 | <0.2 | <0.002 | <0.002 | 0.026 | <0.01 | <0.05 | 0.0011 | 616 | <5 | <0.05 | 0.01 F | 0.41 | 2.7 | <0.05 | <0.0005 |
| | | | | 29-Mar-10 | 0.09 FD1 | <0.002 | <0.002 | 0.019 F | <0.01 | <0.05 | 0.0007 | 592 | <5 | <0.05 | <0.05 | 0.28 | 3.1 | <0.05 | <0.0005 |
| | | | | 5-Apr-10 | <0.2 | <0.002 | <0.002 | 0.018 F | <0.01 | <0.05 | 0.0004 F | 595 | <30 D1 | <0.05 | 0.01 F | 0.24 | 4 FD1 | <0.05 | <0.0005 |
| | | | | 12-Apr-10 | 0.04 F | <0.002 | <0.002 | 0.019 F | <0.01 | <0.05 | 0.0003 F | 474 | <30 D1 | <0.05 | <0.05 | 0.21 | 5 D1 | <0.05 | <0.0005 |
| | | | | 19-Apr-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | ---- | ---- |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Aluminum MG/L | Antimony MG/L | Antimony MG/L | Barium MG/L | Beryllium MG/L | Boron MG/L | Cadmium MG/L | Calcium MG/L | Chloride (as Cl) MG/L | Chromium, Total MG/L | Cobalt MG/L | Copper MG/L | Fluoride MG/L | Iron MG/L | Lead MG/L |
| RES-009E | 1899 | 1901.88 | TEST SC52 | 26-Apr-10 | <0.2 | <0.002 | <0.002 | 0.04 | <0.01 | <0.05 | <0.0005 | 66.5 | <30 D1 | <0.05 | <0.05 | 0.04 F | 6 D1 | <0.05 | <0.0005 |
| | | | | 3-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | ---- | ---- |
| | | | | 10-May-10 | <0.2 | <0.002 | <0.002 | 0.065 | <0.01 | <0.05 | <0.0005 | 32.4 | <30 D1 | <0.05 | <0.05 | 0.02 F | 5 D1 | <0.05 | <0.0005 |
| | | | | 17-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | ---- | ---- |
| | | | | 24-May-10 | <0.2 | <0.002 | <0.002 | 0.095 | <0.01 | <0.05 | <0.0005 | 25.5 | <30 D1 | <0.05 | <0.05 | 0.01 F | 3 FD1 | <0.05 | <0.0005 |
| | 2056.38 | 2075 | TEST SC54 | 8-Mar-10 | 0.13 F | <0.002 D1 | <D10.02 | 0.01 F | 0.011 | <0.05 M1 | 0.003 FD1 | 539 | | <0.05 | 0.08 | 13.7 M3 | <5 D1 | <0.05 | <0.005 D1 |
| | | | | 15-Mar-10 | 0.05 F | <0.002 | FM10.0006 | 0.012 F | 0.005 F | <0.05 V1 | 0.0016 | 599 | <30 D1 | <0.05 | 0.04 F | 8.21 | 2 FD1 | <0.05 | <0.0005 |
| | | | | 22-Mar-10 | 0.07 F | <0.002 | <0.002 | 0.01 F | 0.003 F | <0.05 | 0.001 | 596 | <5 | <0.05 | 0.02 F | 3.32 | 1.8 | <0.05 | 0.0032 |
| | | | | 29-Mar-10 | <0.2 | <0.002 | <0.002 | 0.008 F | <0.01 | <0.05 | 0.0007 | 563 | <5 | <0.05 | 0.01 F | 1.54 | 1.8 | <0.05 | <0.0005 |
| | | | | 5-Apr-10 | <0.2 | <0.002 | <0.002 | 0.008 F | <0.01 | <0.05 | 0.0005 | 594 D1 | <30 D1 | <0.05 | <0.1 D1 | 0.79 | 1 FD1 | <0.05 | <0.0005 |
| | | | | 12-Apr-10 | <0.2 | <0.002 | <0.002 | 0.012 F | <0.01 | <0.05 | 0.0004 F | 583 | <30 D1 | <0.05 | <0.05 | 0.42 | 1 FD1 | <0.05 | <0.0005 |
| | | | | 19-Apr-10 | -- | ---- | ---- | -- -- | ---- | ---- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | ---- | ---- |
| | | | | 26-Apr-10 | <0.2 | <0.002 | <0.002 | 0.01 F | <0.01 | <0.05 | 0.0003 F | 583 | <30 D1 | <0.05 | <0.05 | 0.14 | 1 FD1 | <0.05 | <0.0005 |
| | | | | 3-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | -- -- | -- -- | -- | ---- | ---- | -- -- | -- | ---- | ---- |
| | | | | 10-May-10 | <0.2 | <0.002 | <0.002 | 0.009 F | <0.01 | <0.05 | 0.0001 F | 594 | <30 D1 | <0.05 | <0.05 | 0.09 | 2 FD1 | <0.05 | <0.0005 |
| | | | | 17-May-10 | -- | ---- | ---- | -- -- | ---- | ---- | ---- | -- -- | -- | ---- | ---- | -- -- | -- | ---- | ---- |
| | | | | 24-May-10 | <0.2 | <0.002 | <0.002 | 0.017 F | <0.01 | <0.05 | <0.0005 | 620 D1 | <30 D1 | <0.1 D1 | <0.1 D1 | 0.11 | <5 D1 | <0.05 | <0.0005 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Magnesium MG/L | Manganese MG/L | Manganese MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Thallium MG/L | Vanadium MG/L |
| RES-001C | 1745 | 1748 | TEST SC2 | 8-Mar-10 | 3.3 | 0.759 | <0.001 M2 | 0.17 | 0.03 F | 9.3 | 0.0164 | 20.1 M1 | <0.03 M2 | 2.6 | <0.0005 | 0.0017 | <0.03 |
| | | | | 15-Mar-10 | 1.7 | 0.628 | <0.001 | 0.03 F | <0.05 M2 | 8.3 | 0.0041 | 14.2 M1 | <0.03 M2 | 1.6 FM1 | <0.0005 | 0.0017 | <0.03 |
| | | | | 22-Mar-10 | 1.2 | 0.459 | <0.001 | 0.02 F | <0.05 | 7.3 | 0.0019 | 11.4 | <0.03 | 1 F | <0.0005 | 0.0011 | <0.03 |
| | | | | 29-Mar-10 | 1.1 | 0.439 | <0.001 | 0.03 F | <0.05 | 7.2 | 0.0017 | 8.9 | <0.03 | 1.2 F | <0.0005 | 0.0008 | 0.01 F |
| | | | | 5-Apr-10 | 0.9 F | 0.347 | <0.001 | 0.02 F | <0.05 | 7 | 0.0016 | 8.2 | 0.01 F | 0.8 F | <0.0005 | 0.0006 | 0.011 F |
| | | | | 12-Apr-10 | 0.6 F | 0.313 | <0.001 | 0.02 F | <0.05 | 6.2 | 0.0016 | 7.6 | <0.03 | 0.8 F | <0.0005 | 0.0005 | 0.014 F |
| | | | | 19-Apr-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 0.6 F | 0.245 | <0.001 | 0.03 F | <0.05 | 5.7 | 0.0016 | 7.6 | <0.03 | 0.4 F | <0.0005 | 0.0004 F | 0.009 F |
| | | | | 3-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | 0.6 F | 0.212 | <0.001 | <0.05 | <0.05 | 5.9 M1 | 0.0013 | 8 M1 | <0.03 M2 | 0.8 F | <0.0005 | 0.0003 F | 0.015 F |
| | | | | 17-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | 0.3 F | 0.187 | <0.001 | 0.02 F | <0.1 D1 | 5.4 | 0.0013 | 7.3 M1 | <0.03 M2 | 0.4 F | <0.0005 | 0.0002 F | <0.03 |
| RES-002A | 1414.6 | 1417 | TEST SC11 | 8-Mar-10 | 5 FD1 | 6.44 D1 | <0.001 | 0.1 FD1 | 1.1 D1 | <20 D1 | 0.099 D1 | 24 D1 | <0.3 D1 | <20 D1 | <0.005 D1 | 0.032 D1 | 0.05 FD1 |
| | | | | 15-Mar-10 | <10 D1 | 1.69 D1 | <0.001 | 0.17 FD1 | 0.26 FD1 | <8 D1 | 0.0286 D1 | 24 D1 | <0.1 D1 | 3 FD1 | <0.003 D1 | 0.0079 D1 | <0.1 D1 |
| | | | | 22-Mar-10 | <1 | 0.117 | <0.001 | <0.05 | 0.02 F | 0.7 F | 0.0056 | 9.6 | <0.03 | <2 | <0.0005 | 0.0005 | <0.03 |
| | | | | 29-Mar-10 | <1 | 0.046 | <0.001 | <0.05 | <0.05 | 1.9 F | 0.0056 | 6.8 | <0.03 | 0.3 F | <0.0005 | 0.0003 F | <0.03 |
| | | | | 5-Apr-10 | <1 | 0.029 F | <0.001 | <0.05 | <0.05 | 4.5 | 0.0044 | 6.1 | 0.01 F | <2 | <0.0005 | 0.0002 F | <0.03 |
| | | | | 12-Apr-10 | <1 | 0.027 F | <0.001 | <0.05 | <0.05 | 5.9 | 0.0041 | 5.5 | <0.03 | <2 | <0.0005 | 0.0002 F | <0.03 |
| | | | | 19-Apr-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | <1 | 0.021 F | <0.001 | 0.01 F | <0.05 | 9.5 | 0.0052 | 5.7 | <0.03 | <2 | <0.0005 | 0.0002 F | <0.03 |
| | | | | 3-May-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | <1 | 0.017 F | <0.001 | <0.05 | <0.05 | 11 | 0.0034 | 5.6 | <0.03 | 0.4 F | <0.0005 | 0.0001 F | <0.03 |
| | | | | 17-May-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | <1 | 0.007 F | <0.001 | <0.05 | <0.05 | 10.5 | 0.0034 | 4 | <0.03 | 0.4 F | <0.0005 | 0.0001 F | <0.03 |
| | 1454 | 1457 | TEST SC12 | 8-Mar-10 | <10 D1 | 1.17 D1 | <0.001 | <0.5 D1 | 0.4 FD1 | <20 D1 | 0.041 D1 | 14 D1 | <0.3 D1 | <20 D1 | <0.005 D1 | 0.005 D1 | <0.3 D1 |

| | |
|---|---|
| -- | not requested |
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| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Magnesium MG/L | Manganese MG/L | Manganese MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Thallium MG/L | Vanadium MG/L |
| RES-002A | 1454 | 1457 | TEST SC12 | 15-Mar-10 | <5 D1 | 0.1 | <0.001 | 0.01 F | 0.02 FM1 | 1.7 F | 0.009 | 8 FD1 | <0.03 | 0.6 F | 0.0002 F | 0.0004 F | <0.03 |
| | | | | 22-Mar-10 | <1 | 0.016 F | <0.001 | <0.05 | 0.03 FD1 | 1.8 F | 0.0032 | 4.9 | <0.05 D1 | <2 | 0.0002 F | <0.0005 | <0.03 |
| | | | | 29-Mar-10 | <1 | 0.018 F | <0.001 | 0.01 F | <0.05 | 2.4 FD1 | 0.0032 | 4.2 | <0.05 D1 | <2 | 0.0003 F | <0.0005 | <0.03 |
| | | | | 5-Apr-10 | <1 | 0.014 F | <0.001 | <0.05 | <0.05 | 2.2 | 0.0025 | 4.2 | <0.03 | <2 | 0.0003 F | <0.0005 | <0.03 |
| | | | | 12-Apr-10 | <1 | 0.016 F | <0.001 | <0.05 | <0.05 | 1.7 F | 0.002 | 4 | <0.03 | <2 | 0.0002 F | <0.0005 | <0.03 |
| | | | | 19-Apr-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | <1 | 0.017 F | <0.001 | <0.05 | <0.05 | 1.3 F | 0.0021 | 4.5 | <0.03 | <2 | 0.0001 F | <0.0005 | 0.017 F |
| | | | | 3-May-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | <1 | 0.017 F | <0.001 | <0.05 | <0.05 | 0.9 F | 0.0012 | 4.3 | <0.03 | <2 | 0.0001 F | <0.0005 | 0.014 F |
| | | | | 17-May-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | <1 | 0.012 F | <0.001 | <0.05 | <0.05 | 0.6 F | 0.001 | 3.4 | <0.03 | <2 | <0.0005 M1 | <0.0005 M1 | <0.03 |
| | 1927 | 1930 | TEST SC14 | 15-Mar-10 | 14.5 D1 | 2.01 | <0.001 | 0.02 F | 0.19 FD1 | 28.6 | 0.187 | 43 D1 | <0.03 | 7.3 | 0.0002 F | 0.0037 | 0.007 F |
| | | | | 22-Mar-10 | 7.2 | 0.914 | <0.001 | <0.05 | 0.09 | 23.6 | 0.0157 | 23 | <0.03 | 1.5 F | 0.0001 F | 0.0012 | <0.03 |
| | | | | 29-Mar-10 | 3.9 | 0.446 | <0.001 | <0.05 | 0.05 | 20.5 | 0.0057 | 16.3 | <0.03 | 0.8 F | 0.0001 F | 0.0007 | 0.011 F |
| | | | | 5-Apr-10 | 1.8 | 0.202 | <0.001 | 0.01 F | 0.03 F | 18.3 | 0.0029 | 13.2 | 0.01 F | 0.6 F | 0.0001 F | 0.0004 F | 0.008 F |
| | | | | 12-Apr-10 | 0.9 F | 0.109 | <0.001 | 0.01 F | 0.01 F | 15.6 | 0.0017 | 11.7 | <0.03 | 0.5 F | 0.0001 F | 0.0003 F | 0.013 F |
| | | | | 19-Apr-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 1.2 | 0.106 | <0.001 | <0.05 | 0.02 F | 15.6 | 0.0022 | 11.2 | <0.03 | 0.5 F | 0.0001 F | 0.0002 F | 0.027 F |
| | | | | 3-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | 1.4 | 0.117 | <0.001 | <0.05 | <0.05 | 16.8 | 0.0017 | 11.2 | <0.03 | 0.5 F | <0.0005 | 0.0001 F | 0.013 F |
| | | | | 17-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | 1.4 | 0.122 | <0.001 | 0.04 F | <0.1 D1 | 15.8 | 0.0022 | 9.6 | <0.03 | 0.6 F | 0.0001 F | <0.0005 | <0.03 |
| RES-005I | 1652 | 1654.93 | TEST SC21 | 8-Mar-10 | 2 FD1 | 1.22 D1 | <0.001 | <0.3 D1 | 0.15 FD1 | 3 FD1 | 1.92 B7 | 24 D1 | <0.1 D1 | <8 D1 | <0.0005 | 0.0071 | <0.1 D1 |
| | | | | 15-Mar-10 | 0.5 F | 0.205 | <0.001 | 0.01 F | <0.1 D1 | 1.3 F | 0.426 D1 | 13.7 | <0.03 | 0.4 F | <0.0005 | 0.0013 | <0.03 |
| | | | | 22-Mar-10 | <1 | 0.027 F | <0.001 | <0.05 | <0.05 | 1.8 F | 0.108 | 9.1 | <0.03 | <2 | <0.0005 | 0.0001 F | <0.03 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

## APPENDIX H
## SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Magnesium MG/L | Manganese MG/L | Manganese MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Thallium MG/L | Vanadium MG/L |
| RES-005I | 1652 | 1654.93 | TEST SC21 | 29-Mar-10 | <1 | 0.015 F | <0.001 | <0.05 | <0.05 | 2.4 | 0.106 | 7.9 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 5-Apr-10 | <1 | <0.03 | <0.001 | 0.01 F | <0.05 | 2.6 | 0.0788 | 6.2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 12-Apr-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 2 | 0.0531 | 4.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 19-Apr-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | <1 | <0.03 | <0.001 | 0.01 F | <0.05 | 0.9 F | 0.0341 | 2.7 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 3-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | <1 | 0.006 F | <0.001 | <0.05 | <0.05 | 0.7 F | 0.0319 | 4.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 17-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0255 | 2.8 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| RES-006D | 1898.21 | 1901.09 | TEST SC28 | 8-Mar-10 | 7 FD1 | 0.69 D1 | <0.001 | <0.5 D1 | 2.5 D1 | <20 D1 | 0.258 D1 | 328 D1 | <0.3 D1 | 5 FD1 | <0.005 D1 | 0.106 D1 | 0.24 FD1 |
| | | | | 15-Mar-10 | <2 D1 | 0.03 | <0.001 | 0.03 F | 0.04 F | <2 | 0.0262 | 62.9 | <0.03 | 0.6 F | <0.0005 | 0.0045 | 0.008 F |
| | | | | 22-Mar-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | 0.0074 | 46.6 | <0.03 | 0.4 F | <0.0005 | 0.0004 F | <0.03 |
| | | | | 29-Mar-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.4 F | 0.011 | 44.5 | <0.03 | 0.4 F | <0.0005 | 0.0003 F | <0.03 |
| | | | | 5-Apr-10 | <1 | <0.03 | <0.001 | 0.01 F | <0.05 | 0.7 F | 0.0107 | 34.5 | <0.03 | <2 | <0.0005 | 0.0002 F | <0.03 |
| | | | | 12-Apr-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.1 F | 0.0055 | 19.5 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 19-Apr-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | <1 | <0.03 | <0.001 | <0.05 | 0.01 F | 1.3 F | 0.0067 | 20.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 3-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | <1 | 0.008 F | <0.001 | <0.05 | <0.05 | 0.9 F | 0.0047 | 21.9 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 17-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | <1 | <0.03 | <0.001 | 0.02 F | <0.05 | 0.6 F | 0.0039 | 15.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| RES-008A | 1717 | 1720 | TEST SC34 | 8-Mar-10 | 3.8 | 2.79 | <0.001 | <0.05 | 0.02 F | 5.3 | 0.0032 | 12.9 | <0.03 | 0.6 F | <0.0005 | 0.0004 F | <0.03 |
| | | | | 15-Mar-10 | 2.7 | 2.04 | <0.001 | <0.05 | <0.05 | 4.2 | 0.0019 | 10.6 | <0.03 | 0.5 F | <0.0005 | 0.0003 F | 0.009 F |
| | | | | 22-Mar-10 | 1.3 | 0.916 | <0.001 | <0.05 | <0.05 | 3 | 0.0006 | 7.6 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 29-Mar-10 | 1 | 0.637 | <0.001 | <0.05 | <0.05 | 2.6 | 0.0005 | 6.2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |

| | |
|---|---|
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| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
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| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
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| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
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| R1 | Duplicate: RPD exceeded the method control limit. |
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| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Magnesium MG/L | Manganese MG/L | Manganese MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Thallium MG/L | Vanadium MG/L |
| RES-008A | 1717 | 1720 | TEST SC34 | 5-Apr-10 | 0.7 F | 0.442 | <0.001 | <0.05 | <0.05 | 2.2 | 0.0004 F | 5.8 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 12-Apr-10 | 0.4 F | 0.315 | <0.001 | <0.05 | <0.05 | 1.9 F | 0.0002 F | 5.5 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 19-Apr-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 0.3 F | 0.19 | <0.001 | <0.05 | <0.05 | 1.7 F | 0.0002 F | 5.2 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 3-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | 0.3 F | 0.107 | <0.001 | <0.05 | <0.05 | 1.3 F | 0.0001 F | 4.9 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 17-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | <1 | 0.07 | <0.001 | <0.05 | <0.05 | 1.2 F | 0.0002 F | 4.3 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| RES-009 | 278.9 | 281.09 | TEST SC38 | 8-Mar-10 | 1.8 | 0.03 | <0.001 | <0.05 | 0.04 F | 2.2 | <0.005 B1 | 33.5 | <0.03 | 24.2 | <0.005 D1 | 0.023 D1 | <0.03 |
| | | | | 15-Mar-10 | 0.7 F | 0.007 F | <0.001 | <0.05 V1 | <0.05 | 0.7 F | 0.004 | 22.8 | <0.03 | 45.9 | <0.0005 | 0.0075 | 0.029 F |
| | | | | 22-Mar-10 | 0.4 F | 0.005 F | <0.001 | <0.05 | 0.01 F | 0.4 F | <0.0005 | 28.3 | <0.03 | 13.1 | <0.0005 | 0.0037 | <0.03 |
| | | | | 29-Mar-10 | 0.3 F | <0.03 | <0.001 | <0.05 | <0.05 | <2 | <0.0005 | 26.8 | <0.03 | 11.1 | <0.0005 | 0.0023 | <0.03 |
| | | | | 5-Apr-10 | 0.2 F | <0.03 | <0.001 | <0.05 | <0.05 | 0.4 F | <0.0005 | 25.9 | <0.03 | 9.6 | <0.0005 | 0.0012 | 0.006 F |
| | | | | 12-Apr-10 | <1 | <0.03 | <0.001 | 0.01 F | <0.05 | 0.6 F | <0.0005 | 24.5 | <0.03 | 8.7 | <0.0005 | 0.0008 | 0.006 F |
| | | | | 19-Apr-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.4 F | <0.0005 | 23.4 | <0.03 | 6.5 | <0.0005 | 0.0004 F | 0.005 F |
| | | | | 3-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | | <0.03 | <0.001 | <0.05 | <0.05 | <2 | <0.0005 | 23.7 | <0.03 | 5.8 | <0.0005 | 0.0003 F | <0.03 |
| | | | | 17-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | <2 | <0.0005 | 21 | <0.03 | 4.8 | <0.0005 | 0.0002 F | <0.03 |
| | 645.59 | 647.52 | TEST SC39 | 8-Mar-10 | 1.6 | 0.04 | <0.001 | 0.03 F | 0.02 F | 3.2 | 0.181 | 20.1 | <0.03 | 123 | <0.005 D1 | 0.003 FD1 | 0.024 F |
| | | | | 15-Mar-10 | 0.7 F | 0.013 F | <0.001 | <0.05 | <0.05 | 0.9 F | 0.0097 | 22.4 | <0.03 | 54.2 | <0.0005 | 0.0048 | 0.028 F |
| | | | | 22-Mar-10 | 0.4 F | 0.006 F | <0.001 | <0.05 | <0.05 | 1.2 F | 0.0046 | 17.3 | <0.03 | 58.2 | <0.0005 | 0.0017 | 0.058 |
| | | | | 29-Mar-10 | 0.3 F | <0.03 | <0.001 | <0.05 | <0.05 | 1.1 F | 0.0062 | 15.4 | <0.03 | 51.3 | <0.0005 | 0.0014 | 0.068 |
| | | | | 5-Apr-10 | 0.2 F | <0.03 | <0.001 | <0.05 | <0.05 | 1 F | 0.0052 | 14.5 | <0.03 | 44.9 | <0.0005 | 0.0011 | 0.074 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Magnesium MG/L | Manganese MG/L | Manganese MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Thallium MG/L | Vanadium MG/L |
| RES-009 | 645.59 | 647.52 | TEST SC39 | 12-Apr-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.9 F | 0.0046 | 14.6 | <0.03 | 39.5 | <0.0005 | 0.0008 | 0.069 |
| | | | | 19-Apr-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.9 F | 0.0051 | 13.6 | <0.03 | 30.5 | <0.0005 | 0.0004 F | 0.045 |
| | | | | 3-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.8 F | 0.0031 | 13.1 | <0.03 | 25 | <0.0005 | 0.0002 F | 0.037 |
| | | | | 17-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.6 F | 0.0036 | 11.9 | <0.03 | 21.9 | <0.0005 | 0.0001 F | 0.028 F |
| RES-009E | 1510.74 | 1527.19 | TEST SC44 | 8-Mar-10 | 2 FD1 | 0.856 | <0.001 | 0.01 F | 0.17 | <2 | 0.021 D1 | 23.3 | 0.03 | 0.7 F | <0.0005 | 0.0338 | 0.023 F |
| | | | | 15-Mar-10 | 2 FD1 | 0.66 D1 | <0.001 | <0.05 V1 | 0.09 | <2 | 0.0207 | 21.3 | 0.02 F | <8 D1 | <0.0005 | 0.0239 | <0.1 D1 |
| | | | | 22-Mar-10 | 0.9 F | 0.329 | <0.001 | <0.05 | 0.04 F | <2 | 0.0098 | 14.4 | <0.03 | 0.3 F | <0.0005 | 0.0067 | 0.037 |
| | | | | 29-Mar-10 | 0.6 F | 0.171 | <0.001 | 0.02 F | 0.02 F | <2 | 0.0065 | 10.1 | <0.03 | <2 | <0.0005 | 0.0017 | 0.037 |
| RES-009E | 1510.74 | 1527.19 | TEST SC44 | 5-Apr-10 | 0.4 F | 0.084 | <0.001 | <0.05 | <0.05 | <2 | 0.0062 | 8.6 | 0.01 F | <2 | <0.0005 | 0.0007 | 0.005 F |
| | | | | 12-Apr-10 | <1 | 0.045 | <0.001 | 0.01 F | <0.05 | 0.4 F | 0.0046 | 7.2 | <0.03 | <2 | <0.0005 | 0.0003 F | <0.03 |
| | | | | 19-Apr-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | <1 | 0.018 F | <0.001 | <0.05 | <0.05 | 0.6 F | 0.006 | 6.1 | <0.03 | <2 | <0.0005 | <0.0005 | 0.007 F |
| | | | | 3-May-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | <1 | 0.012 F | <0.001 | <0.05 | <0.05 | 0.6 F | 0.0042 | 5.7 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 17-May-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | <1 | 0.006 F | <0.001 | 0.02 F | <0.05 | 0.7 F | 0.0049 M1 | 4.9 | <0.03 | <2 | <0.0005 M1 | <0.0005 | <0.03 |
| | 1739.63 | 1742.63 | TEST SC49 | 8-Mar-10 | <50 V1 | 1.2 D1 | <0.001 | 1 FD1 | 2.5 FD1 | <80 D1 | 0.134 B7 | 60 D1 | <1 D1 | <80 D1 | <0.005 D1 | 0.122 M1 | <1 D1 |
| | | | | 15-Mar-10 | <20 D1 | 0.2 FD1 | <0.001 | <1 D1 | 0.3 FD1 | <20 D1 | 0.0237 D1 | 45 D1 | <0.3 D1 | <20 V1 | <0.003 D1 | 0.0201 D1 | <0.3 V1M1 |
| | | | | 22-Mar-10 | <1 | 0.01 F | <0.001 | <0.05 | 0.01 F | 1.3 F | 0.0022 | 35.6 | <0.03 | 0.5 F | 0.0002 F | 0.0006 | <0.03 |
| | | | | 29-Mar-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.5 F | 0.0022 | 30.6 | <0.03 | 0.5 F | 0.0003 F | 0.0002 F | <0.03 |
| | | | | 5-Apr-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 1.1 F | 0.0023 | 29.1 | <0.03 | 0.5 F | 0.0005 | 0.0002 F | <0.03 |
| | | | | 12-Apr-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.8 F | 0.0016 | 27.2 | <0.03 | <2 | 0.0004 F | 0.0001 F | <0.03 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Magnesium MG/L | Manganese MG/L | Manganese MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Thallium MG/L | Vanadium MG/L |
| RES-009E | 1739.63 | 1742.63 | TEST SC49 | 19-Apr-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | <1 | <0.03 | <0.001 | <0.05 | <0.05 | 0.6 F | 0.0018 | 27.8 | <0.03 | <2 | 0.0002 F | <0.0005 | <0.03 |
| | | | | 3-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | <1 | 0.005 F | <0.001 | <0.05 | <0.05 | 0.3 FM1 | 0.0012 | 27.6 | <0.03 M2 | <2 | 0.0002 F | <0.0005 | <0.03 |
| | | | | 17-May-10 | ---- | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | <1 | <0.03 | <0.001 | 0.01 F | <0.05 | <2 | 0.0013 | 22.7 | <0.03 M2 | <2 | 0.0002 F | <0.001 D1 | <0.03 |
| | 1829.95 | 1832.48 | TEST SC50 | 8-Mar-10 | 189 D1 | 10.9 D1 | <0.001 M2 | <0.3 D1 | 0.66 D1 | 6 FD1 | 0.185 B7 | 218 D1 | <0.1 D1 | <8 D1 | <0.0005 | 0.318 D1 | <0.1 D1 |
| | | | | 15-Mar-10 | 33.6 | 1.61 M3 | <0.001 | <0.05 V1M1 | 0.06 | 5.7 | 0.0485 | 81.2 | <0.03 | 0.8 F | <0.0005 | 0.0353 | 0.006 F |
| | | | | 22-Mar-10 | 9.2 | 0.407 | <0.001 | <0.05 | 0.02 F | 6.7 | 0.0145 | 30.9 | <0.03 | 1.7 F | <0.0005 | 0.0083 | <0.03 |
| | | | | 29-Mar-10 | 9.2 | 0.387 | <0.001 | <0.05 | 0.02 F | 8.3 | 0.0177 | 27.4 | <0.03 | 3 | <0.0005 | 0.0066 | <0.03 |
| | | | | 5-Apr-10 | 7.7 | 0.325 | <0.001 | <0.05 | 0.01 F | 7.8 | 0.0163 | 18.2 | <0.03 | 2.5 | <0.0005 | 0.0039 | <0.03 |
| | | | | 12-Apr-10 | 8 | 0.364 | <0.001 | 0.01 F | <0.05 | 7.6 | 0.0137 | 18.3 | 0.03 | 3.8 | <0.0005 | 0.0029 | <0.03 |
| | | | | 19-Apr-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 9.7 | 0.443 | <0.001 | 0.01 F | 0.01 F | 8.9 | 0.0176 | 20.3 | <0.03 | 3.1 | <0.0005 | 0.0019 | <0.03 |
| | | | | 3-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | 6.7 | 0.298 | <0.001 | <0.05 | <0.05 | 7.1 | 0.0092 | 16.5 | <0.03 | 2 | <0.0005 | 0.001 | <0.03 |
| | | | | 17-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | 4.5 | 0.198 | <0.001 | <0.05 | <0.05 | 4.6 | 0.007 | 12.6 | <0.03 | 1.2 F | <0.0005 | 0.0007 | <0.03 |
| | 1899 | 1901.88 | TEST SC52 | 8-Mar-10 | 31.5 | 33.6 | <0.001 | 0.01 F | 0.03 F | 35.5 | 0.0638 M1 | 11.8 | <0.03 | 1.4 F | 0.0002 F | 0.0008 | <0.03 |
| | | | | 15-Mar-10 | 11.9 | 15.5 | <0.001 | <0.05 V1 | 0.02 F | 20.9 | 0.0168 | 8.9 M1 | <0.03 | 0.4 F | <0.0005 | 0.0005 | <0.03 V1 |
| | | | | 22-Mar-10 | 2 | 6.59 | <0.001 | <0.05 | 0.01 F | 9.8 | 0.0036 | 4.8 | <0.03 | <2 | <0.0005 | 0.0004 F | <0.03 |
| | | | | 29-Mar-10 | 0.5 F | 3.1 D1 | <0.001 | 0.02 F | <0.05 | 6.1 D1 | 0.002 | 4.2 | <0.05 D1 | 0.4 F | <0.0005 | 0.0003 F | <0.05 D1 |
| | | | | 5-Apr-10 | 0.2 F | 1.69 | <0.001 | 0.02 F | <0.05 | 5.4 | 0.0018 | 4.1 | 0.02 F | <2 | <0.0005 | 0.0003 F | 0.009 F |
| | | | | 12-Apr-10 | <1 | 0.721 | <0.001 | 0.02 F | <0.05 | 3.9 | 0.0016 | 3.4 | 0.02 F | <2 | <0.0005 | 0.0002 F | 0.013 F |
| | | | | 19-Apr-10 | ---- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Magnesium MG/L | Manganese MG/L | Manganese MG/L | Molybdenum MG/L | Nickel MG/L | Potassium MG/L | Selenium MG/L | Silica MG/L | Silver MG/L | Sodium MG/L | Thallium MG/L | Thallium MG/L | Vanadium MG/L |
| RES-009E | 1899 | 1901.88 | TEST SC52 | 26-Apr-10 | 0.2 F | 0.108 | <0.001 | 0.02 F | <0.05 | 2 | 0.0014 | 2.1 | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 3-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | 0.3 F | 0.059 | <0.001 | <0.05 | <0.05 | 1.4 F | 0.0012 | 1.9 F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | | | | 17-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | 0.3 F | 0.038 | <0.001 | 0.02 F | <0.05 | 1 F | 0.0015 | 1.4 F | <0.03 | <2 | <0.0005 | <0.0005 | <0.03 |
| | 2056.38 | 2075 | TEST SC54 | 8-Mar-10 | 49.8 M2 | 1.22 | <0.001 | 0.01 F | 0.17 | 9.5 | 0.076 | 6.7 | <0.03 | 3.7 | <0.005 D1 | 0.003 FD1 | <0.03 |
| | | | | 15-Mar-10 | 26.1 | 0.605 | <0.001 | <0.05 V1 | 0.08 | 7.8 | 0.0104 M1 | 5.8 | <0.03 | 1 F | <0.0005 | 0.0017 | <0.03 V1 |
| | | | | 22-Mar-10 | 17.7 | 0.436 | <0.001 | <0.05 | 0.06 | 7.2 | 0.0043 | 4.5 | <0.03 | 0.4 F | <0.0005 | 0.0013 | <0.03 |
| | | | | 29-Mar-10 | 15.5 | 0.36 D1 | <0.001 | 0.02 F | 0.04 F | 6.1 D1 | 0.0026 | 3.7 | <0.05 D1 | 0.6 F | <0.0005 | 0.0012 | <0.05 D1 |
| | | | | 5-Apr-10 | 13.8 | 0.317 | <0.001 | 0.01 F | 0.03 F | 6.3 D1 | 0.0018 | 3.3 | 0.03 | 0.4 F | <0.0005 | 0.0014 | 0.009 F |
| | | | | 12-Apr-10 | 11.5 | 0.261 | <0.001 | 0.01 F | 0.02 F | 6.4 | 0.0012 | 3.1 | 0.02 F | 0.5 F | <0.0005 | 0.0015 | 0.013 F |
| | | | | 19-Apr-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 26-Apr-10 | 8.6 | 0.183 | <0.001 | 0.01 F | <0.05 | 6 | 0.001 | 2.7 | <0.03 | <2 | <0.0005 | 0.0018 | 0.015 F |
| | | | | 3-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 10-May-10 | 8.6 | 0.143 | <0.001 | <0.05 | <0.05 | 5.8 | 0.0008 | 2.6 | <0.03 | <2 | <0.0005 | 0.0022 | 0.028 F |
| | | | | 17-May-10 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 24-May-10 | 9.5 D1 | 0.138 | <0.001 | 0.01 F | <0.1 D1 | 5.5 | 0.0009 | 2.4 | <0.03 | <2 | <0.0005 | 0.0028 | <0.03 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | CES | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Zinc MG/L | Acidity, Total MG/L as CaCO3 | Alkalinity, Total (as CaCO3) MG/L | Total Iron[1] MG/L | Leachate from Humidity Cell MLS | pH SU | Specific Conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-001C | 1745 | 1748 | TEST SC2 | 8-Mar-10 | <0.1 D1 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | <0.05 | <5 | 27.84 | <0.05 | 3795 | 7.28 | 2140 | 1370 |
| | | | | 22-Mar-10 | <0.05 | <5 | 27.84 | <0.05 | 2473 | 7.06 | 1960 | 1220 |
| | | | | 29-Mar-10 | <0.05 | <5 | 20.88 | <0.05 | 3794 | 6.85 | 1870 | 1350 |
| | | | | 5-Apr-10 | <0.05 | <5 | 18.56 | <0.05 | -- -- | 6.95 | 1800 | 1220 |
| | | | | 12-Apr-10 | <0.05 | <5 | 16.24 | <0.05 | 3523 | 6.76 | 1740 | 1070 |
| | | | | 19-Apr-10 | -- -- | <5 | 12.76 | <0.05 | 3475 | 7.03 | 1720 | 874 |
| | | | | 26-Apr-10 | <0.05 | <5 | 12.76 | <0.05 | 3221 | 6.78 | 1690 | 1030 |
| | | | | 3-May-10 | -- -- | <5 | 13.92 | <0.05 | 3070 | 6.79 | 1660 | 1070 |
| | | | | 10-May-10 | <0.05 | <5 | 12.76 | <0.05 | 3102 | 6.92 | 1640 | 989 |
| | | | | 17-May-10 | -- -- | <5 | 13.92 | <0.05 | 3079 | 6.77 | 1590 | 1000 |
| | | | | 24-May-10 | <0.1 D1 | <5 | 11.6 | <0.05 | 3174 | 6.77 | 1600 | 1020 |
| RES-002A | 1414.6 | 1417 | TEST SC11 | 8-Mar-10 | 0.4 FD1 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | <0.5 D1 | 1360 | <5 | <0.05 | 1793 | 3.26 | 2200 | 1580 |
| | | | | 22-Mar-10 | <0.05 | 194.88 | <5 | 2.45 | 2056 | 3.53 | 486 | 176 |
| | | | | 29-Mar-10 | 0.02 F | 107.52 | <5 | 29.7 | 1986 | 3.52 | 317 | 114 |
| | | | | 5-Apr-10 | <0.05 | 88.48 | <5 | 28.2 | 1885 | 3.54 | 285 | 98 |
| | | | | 12-Apr-10 | <0.05 | 80.64 | <5 | 26.6 | 1807 | 3.6 | 271 | 90 |
| | | | | 19-Apr-10 | -- -- | 81.76 | <5 | 26.6 | 1837 | 3.59 | 271 | 86 |
| | | | | 26-Apr-10 | 0.01 F | 79.52 | <5 | 28.1 | 1755 | 3.64 | 273 | 88 |
| | | | | 3-May-10 | -- -- | 71.68 | <5 | 26.1 | 1751 | 3.66 | 257 | 84 |
| | | | | 10-May-10 | <0.05 | 73.92 | <5 | 25.1 | 1803 | 3.67 | 256 | 80 |
| | | | | 17-May-10 | -- -- | 59.36 | <5 | 24.7 | 1766 | 3.65 | 240 | 84 |
| | | | | 24-May-10 | <0.05 | 66.08 | <5 | 20.7 | 1791 | 3.64 | 232 | 77 |
| | 1454 | 1457 | TEST SC12 | 8-Mar-10 | 0.4 FD1 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | CES | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Zinc MG/L | Acidity, Total MG/L as CaCO3 | Alkalinity, Total (as CaCO3) MG/L | Total Iron[1] MG/L | Leachate from Humidity Cell MLS | pH SU | Specific Conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-002A | 1454 | 1457 | TEST SC12 | 15-Mar-10 | <0.3 D1 | 360.32 | <5 | <0.05 | 1993 | 5.04 | 851 | 477 |
| | | | | 22-Mar-10 | <0.1 D1 | 192.44 | <5 | <0.05 | 1834 | 5.13 | 465 | 216 |
| | | | | 29-Mar-10 | 0.03 F | 139.76 | <5 | <0.05 | 1808 | 5.08 | 361 | 181 |
| | | | | 5-Apr-10 | <0.05 | 128.56 | <5 | <0.05 | 1880 | 5.06 | 321 | 160 |
| | | | | 12-Apr-10 | <0.05 | 116.28 | <5 | <0.05 | 1755 | 5.04 | 290 | 134 |
| | | | | 19-Apr-10 | -- -- | 103.92 | <5 | <0.05 | 1791 | 5.05 | 274 | 133 |
| | | | | 26-Apr-10 | 0.02 F | 103.92 | <5 | <0.05 | 1748 | 5.12 | 264 | 127 |
| | | | | 3-May-10 | -- -- | 96.08 | <5 | <0.05 | 1852 | 5.28 | 236 | 112 |
| | | | | 10-May-10 | <0.05 | 86.08 | <5 | <0.05 | 1934 | 5.23 | 215 | 92 |
| | | | | 17-May-10 | -- -- | 79.36 | <5 | <0.05 | 1809 | 5.37 | 136 | 88 |
| | | | | 24-May-10 | <0.05 | 71.44 | <5 | <0.05 | 1809 | 5.06 | 185 | 85 |
| | 1927 | 1930 | TEST SC14 | 15-Mar-10 | 0.54 D1 | 410.68 | <5 | <0.05 | 3668 | 5.03 | 2560 | 1750 |
| | | | | 22-Mar-10 | 0.27 | 165.44 | <5 | <0.05 | 3136 | 5.49 | 2510 | 1640 |
| | | | | 29-Mar-10 | 0.2 | 88.16 | <5 | <0.05 | 3385 | 5.29 | 2290 | 1510 |
| | | | | 5-Apr-10 | 0.06 | 45.56 | <5 | 0.23 | 3613 | 5.48 | 2240 | 1530 |
| | | | | 12-Apr-10 | 0.02 F | 27.68 | <5 | 0.27 | 3551 | 5.7 | 2220 | 1520 |
| | | | | 19-Apr-10 | -- -- | 22.08 | <5 | 0.36 | 3508 | 5.84 | 2220 | 1460 |
| | | | | 26-Apr-10 | 0.03 F | 15.32 | <5 | 0.29 | 3534 | 5.7 | 2240 | 1470 |
| | | | | 3-May-10 | -- -- | 14.2 | <5 | 0.27 | 3418 | 5.56 | 2230 | 1450 |
| | | | | 10-May-10 | <0.05 | 13.08 | <5 | 0.3 | 3376 | 5.66 | 2260 | 1530 |
| | | | | 17-May-10 | -- -- | 15.36 | <5 | 0.26 | 3420 | 6.12 | 2250 | 1530 |
| | | | | 24-May-10 | <0.1 D1 | 15.36 | <5 | 0.27 | 3272 | 5.56 | 2250 | 1580 |
| RES-005I | 1652 | 1654.93 | TEST SC21 | 8-Mar-10 | 0.2 FD1 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | <0.05 | 313.6 | <5 | 32.5 | 1572 | 3.44 | 730 | 335 |
| | | | | 22-Mar-10 | 0.01 F | 57.12 | <5 | 13.7 | 906 | 3.65 | 232 | 61 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | CES | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Zinc MG/L | Acidity, Total MG/L as CaCO3 | Alkalinity, Total (as CaCO3) MG/L | Total Iron[1] MG/L | Leachate from Humidity Cell MLS | pH SU | Specific Conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-005I | 1652 | 1654.93 | TEST SC21 | 29-Mar-10 | 0.01 F | 42.56 | <5 | 12.7 | 1467 | 3.72 | 171 | 43 |
| | | | | 5-Apr-10 | <0.05 | 31.36 | <5 | 8.46 | 1675 | 3.79 | 129 | 34 |
| | | | | 12-Apr-10 | <0.05 | 22.4 | <5 | 5.72 | 1695 | 3.95 | 93 | 21 |
| | | | | 19-Apr-10 | -- -- | 15.6 | <5 | 4.2 | 1704 | 4.05 | 70 | 16 |
| | | | | 26-Apr-10 | 0.01 F | 11.08 | <5 | 2.2 | 1685 | 4.23 | 40 | <10 |
| | | | | 3-May-10 | -- -- | 5.52 | <5 | 2.05 | 1701 | 4.4 | 33 | <10 |
| | | | | 10-May-10 | <0.05 | 13.32 | <5 | 3.39 | 1678 | 4.28 | 46 | 10 |
| | | | | 17-May-10 | -- -- | 8.8 | <5 | 2.24 | 1564 | 4.48 | 30 | <10 |
| | | | | 24-May-10 | <0.05 | 8.84 | <5 | 1.39 | 1578 | 4.46 | 28 | <10 |
| RES-006D | 1898.21 | 1901.09 | TEST SC28 | 8-Mar-10 | 4 D1 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | <0.1 D1 | 400.96 | <5 | 89.2 | 2000 | 3.64 | 1380 | 678 |
| | | | | 22-Mar-10 | 0.02 F | 131.04 | <5 | 47.5 | 1135 | 3.98 | 454 | 198 |
| | | | | 29-Mar-10 | 0.01 F | 129.92 | <5 | 51.7 | 1652 | 3.99 | 378 | 152 |
| | | | | 5-Apr-10 | <0.05 | 90.64 | <5 | 33.6 | 1896 | 4.21 | 264 | 111 |
| | | | | 12-Apr-10 | <0.05 | 48.04 | <5 | 18.1 | 1864 | 4.39 | 152 | 50 |
| | | | | 19-Apr-10 | -- -- | 46.84 | <5 | 17.2 | 1831 | 4.52 | 148 | 50 |
| | | | | 26-Apr-10 | 0.01 F | 44.56 | <5 | 14.1 | 1839 | 4.72 | 125 | 44 |
| | | | | 3-May-10 | -- -- | 40.12 | <5 | 14.5 | 1842 | 4.65 | 127 | 45 |
| | | | | 10-May-10 | <0.05 | 33.36 | <5 | 10.3 | 1832 | 4.84 | 99 | 31 |
| | | | | 17-May-10 | -- -- | 26.68 | <5 | 8.08 | 1828 | 5.07 | 81 | 25 |
| | | | | 24-May-10 | <0.05 | 26.68 | <5 | 6.95 | 1857 | 4.61 | 74 | 20 |
| RES-008A | 1717 | 1720 | TEST SC34 | 8-Mar-10 | 0.2 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | 0.14 | <5 | 51.04 | <0.05 | 3051 | 7.7 | 511 | 191 |
| | | | | 22-Mar-10 | 0.04 F | <5 | 45.24 | <0.05 | 3119 | 7.72 | 307 | 87 |
| | | | | 29-Mar-10 | 0.02 F | <5 | 42.92 | <0.05 | 3115 | 7.6 | 211 | 54 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | CES | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Zinc MG/L | Acidity, Total MG/L as CaCO3 | Alkalinity, Total (as CaCO3) MG/L | Total Iron[1] MG/L | Leachate from Humidity Cell MLS | pH SU | Specific Conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-008A | 1717 | 1720 | TEST SC34 | 5-Apr-10 | <0.05 | <5 | 42.92 | <0.05 | 3372 | 7.54 | 163 | 36 |
| | | | | 12-Apr-10 | <0.05 | <5 | 40.6 | <0.05 | 3338 | 7.92 | 121 | 19 |
| | | | | 19-Apr-10 | -- -- | <5 | 40.6 | <0.05 | 3301 | 7.61 | 108 | 11 |
| | | | | 26-Apr-10 | 0.01 F | <5 | 33.64 | <0.05 | 3391 | 7.59 | 86 | <10 |
| | | | | 3-May-10 | -- -- | <5 | 29 | <0.05 | 3380 | 7.65 | 71 | <10 |
| | | | | 10-May-10 | <0.05 | <5 | 29 | <0.05 | 3423 | 7.8 | 64 | <10 |
| | | | | 17-May-10 | -- -- | <5 | 26.68 | <0.05 | 3439 | 7.54 | 59 | <10 |
| | | | | 24-May-10 | <0.05 | <5 | 25.52 | <0.05 | 3406 | 7.55 | 56 | <10 |
| RES-009 | 278.9 | 281.09 | TEST SC38 | 8-Mar-10 | <0.05 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | <0.05 | <5 | 99.76 | 0.4 | 3547 | 8.45 | 203 | <10 |
| | | | | 22-Mar-10 | <0.05 | <5 | 46.4 | 0.14 | 3667 | 7.78 | 92 | <10 |
| | | | | 29-Mar-10 | <0.05 | <5 | 37.12 | 0.12 | 3810 | 7.92 | 73 | <10 |
| | | | | 5-Apr-10 | <0.05 | <5 | 34.8 | <0.05 | 3820 | 8.02 | 64 | <10 |
| | | | | 12-Apr-10 | <0.05 | <5 | 30.16 | 0.08 | 3940 | 7.96 | 58 | <10 |
| | | | | 19-Apr-10 | -- -- | <5 | 27.84 | <0.05 | 3618 | 7.94 | 55 | <10 |
| | | | | 26-Apr-10 | 0.01 F | <5 | 27.84 | 0.06 | 3857 | 7.91 | 52 | <10 |
| | | | | 3-May-10 | -- -- | <5 | 25.52 | 0.09 | 3803 | 7.95 | 50 | <10 |
| | | | | 10-May-10 | <0.05 | <5 | 26.68 | <0.05 | 3944 | 8.33 | 48 | <10 |
| | | | | 17-May-10 | -- -- | <5 | 25.52 | <0.05 | 4100 | 7.9 | 46 | <10 |
| | | | | 24-May-10 | <0.05 | <5 | 23.2 | <0.05 | 4398 | 8.02 | 44 | <10 |
| | 645.59 | 647.52 | TEST SC39 | 8-Mar-10 | <0.05 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | <0.05 | <5 | 104.4 | 0.5 | 3609 | 8.36 | 234 | 13 |
| | | | | 22-Mar-10 | <0.05 | <5 | 121.8 | 0.4 | 2263 | 8.55 | 263 | <10 |
| | | | | 29-Mar-10 | <0.05 | <5 | 105.56 | 0.31 | 3237 | 8.52 | 217 | <10 |
| | | | | 5-Apr-10 | <0.05 | <5 | 91.64 | 0.28 | 4311 | 9.08 | 193 | <10 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | CES | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Zinc MG/L | Acidity, Total MG/L as CaCO3 | Alkalinity, Total (as CaCO3) MG/L | Total Iron[1] MG/L | Leachate from Humidity Cell MLS | pH SU | Specific Conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009 | 645.59 | 647.52 | TEST SC39 | 12-Apr-10 | <0.05 | <5 | 81.2 | 0.2 | 4384 | 9.21 | 171 | <10 |
| | | | | 19-Apr-10 | -- -- | <5 | 74.24 | 0.16 | 4416 | 9.33 | 153 | <10 |
| | | | | 26-Apr-10 | <0.05 | <5 | 64.96 | 0.15 | 4396 | 9.27 | 139 | <10 |
| | | | | 3-May-10 | -- -- | <5 | 59.16 | 0.13 | 4334 | 9.31 | 122 | <10 |
| | | | | 10-May-10 | <0.05 | <5 | 53.36 | 0.14 | 4077 | 9.23 | 110 | <10 |
| | | | | 17-May-10 | -- -- | <5 | 51.04 | <0.05 | 4135 | 9 | 102 | <10 |
| | | | | 24-May-10 | <0.05 | <5 | 47.56 | <0.05 | 4106 | 8.86 | 99 | <10 |
| RES-009E | 1510.74 | 1527.19 | TEST SC44 | 8-Mar-10 | 0.23 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | 0.07 FD1 | 1710 | <5 | 628 | 3177 | 2.57 | 3940 | 2010 |
| | | | | 22-Mar-10 | 0.02 F | 931.84 | <5 | 339 | 4493 | 2.73 | 2510 | 163 |
| | | | | 29-Mar-10 | 0.06 | 526.4 | <5 | 213 | 3094 | 2.97 | 1430 | 641 |
| RES-009E | 1510.74 | 1527.19 | TEST SC44 | 5-Apr-10 | 0.02 F | 359.52 | <5 | 140 | 3844 | 3.11 | 987 | 408 |
| | | | | 12-Apr-10 | 0.01 F | 217 | <5 | 88.3 | 3603 | 3.32 | 646 | 232 |
| | | | | 19-Apr-10 | -- -- | 156.8 | <5 | 63.2 | 3882 | 3.47 | 461 | 164 |
| | | | | 26-Apr-10 | 0.01 F | 117.6 | <5 | 46.7 | 4070 | 3.61 | 356 | 116 |
| | | | | 3-May-10 | -- -- | 91.84 | <5 | 34.5 | 3792 | 3.71 | 264 | 89 |
| | | | | 10-May-10 | <0.05 | 69.44 | <5 | 29.6 | 4684 | 3.8 | 218 | 78 |
| | | | | 17-May-10 | -- -- | 64.96 | <5 | 22.8 | 4319 | 3.8 | 190 | 63 |
| | | | | 24-May-10 | <0.05 | 60.48 | <5 | 22.3 | 5004 | 3.8 | 181 | 63 |
| | 1739.63 | 1742.63 | TEST SC49 | 8-Mar-10 | 1.4 FD1 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | <1 D1 | 2250 | <5 | <0.05 | 1823 | 3.5 | 3310 | 2490 |
| | | | | 22-Mar-10 | <0.05 | 215.04 | <5 | 48.2 | 1809 | 3.79 | 465 | 186 |
| | | | | 29-Mar-10 | <0.05 | 112 | <5 | 41.3 | 1804 | 3.76 | 308 | 98 |
| | | | | 5-Apr-10 | <0.05 | 91.84 | <5 | 33.2 | 1801 | 3.79 | 262 | 93 |
| | | | | 12-Apr-10 | <0.05 | 82.88 | <5 | 28.3 | 1800 | 3.89 | 216 | 77 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX H
# SATURATED COLUMN TEST RESULTS

| | | | | | ACZS | CES | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Zinc MG/L | Acidity, Total MG/L as CaCO3 | Alkalinity, Total (as CaCO3) MG/L | Total Iron[1] MG/L | Leachate from Humidity Cell MLS | pH SU | Specific Conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | 1739.63 | 1742.63 | TEST SC49 | 19-Apr-10 | -- -- | 68.32 | <5 | 25.4 | 1818 | 3.93 | 194 | 63 |
| | | | | 26-Apr-10 | 0.01 F | 59.32 | <5 | 23 | 1818 | 4.01 | 173 | 58 |
| | | | | 3-May-10 | -- -- | 51.48 | <5 | 18.6 | 1809 | 4.08 | 148 | 49 |
| | | | | 10-May-10 | <0.05 M1 | 46.96 | <5 | 16.3 | 1814 | 4.11 | 134 | 44 |
| | | | | 17-May-10 | -- -- | 42.56 | <5 | 14.8 | 1807 | 4 | 117 | 39 |
| | | | | 24-May-10 | <0.05 | 40.24 | <5 | 12.7 | 1821 | 4.09 | 106 | 34 |
| | 1829.95 | 1832.48 | TEST SC50 | 8-Mar-10 | 10.4 D1 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | 1.43 N1 | 322.32 | <5 | 1.54 | 1371 | 4.34 | 844 | 189 |
| | | | | 22-Mar-10 | 0.37 | 111.84 | <5 | 6.52 | 1486 | 4.47 | 345 | 142 |
| | | | | 29-Mar-10 | 0.34 | 97.44 | <5 | 5.94 | 1429 | 4.56 | 309 | 136 |
| | | | | 5-Apr-10 | 0.21 | 58.04 | <5 | 4.31 | 2808 | 4.67 | 244 | 103 |
| | | | | 12-Apr-10 | 0.2 | 54.64 | <5 | 4.96 | 1255 | 4.72 | 260 | 108 |
| | | | | 19-Apr-10 | -- -- | 61.6 | <5 | 6.12 | 1352 | 4.65 | 304 | 122 |
| | | | | 26-Apr-10 | 0.17 | 58.24 | <5 | 6.92 | 1372 | 4.7 | 287 | 118 |
| | | | | 3-May-10 | -- -- | 45.72 | <5 | 6.29 | 1603 | 4.69 | 235 | 97 |
| | | | | 10-May-10 | 0.11 | 37.84 | <5 | 5.71 | 1594 | 4.88 | 201 | 72 |
| | | | | 17-May-10 | -- -- | 36.76 | <5 | 5.18 | 1556 | 4.56 | 176 | 62 |
| | | | | 24-May-10 | 0.06 | 33.4 | <5 | 4.48 | 1558 | 4.72 | 148 | 49 |
| | 1899 | 1901.88 | TEST SC52 | 8-Mar-10 | 0.79 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | 0.2 | <5 | 87 | <0.05 | 773 | 8.05 | 2380 | 1520 |
| | | | | 22-Mar-10 | 0.08 | <5 | 62.64 | <0.05 | 1450 | 7.59 | 2650 | 1460 |
| | | | | 29-Mar-10 | 0.06 | <5 | 58 | <0.05 | 1604 | 7.58 | 2320 | 1510 |
| | | | | 5-Apr-10 | 0.04 F | <5 | 58 | <0.05 | 1564 | 7.51 | 2890 | 1470 |
| | | | | 12-Apr-10 | 0.03 F | <5 | 59.16 | <0.05 | 1454 | 7.63 | 1890 | 1140 |
| | | | | 19-Apr-10 | -- -- | <5 | 62.64 | <0.05 | 1678 | 7.82 | 1030 | 449 |

| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

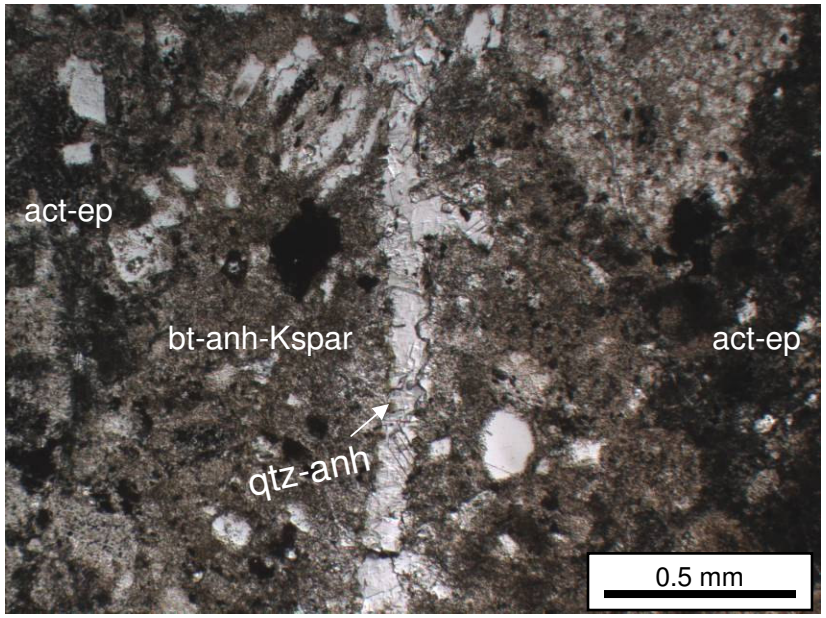
# APPENDIX H
# SATURATED COLUMN TEST RESULTS

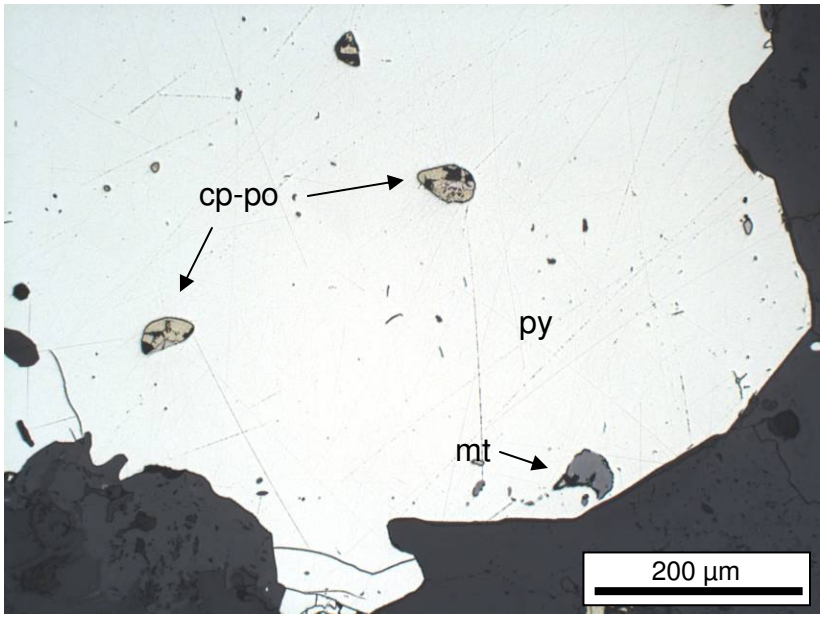
| | | | | | ACZS | CES | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Borehole | Bottom Depth (m) | Top Depth (m) | Column ID | Sample Date | Zinc MG/L | Acidity, Total MG/L as CaCO3 | Alkalinity, Total (as CaCO3) MG/L | Total Iron[1] MG/L | Leachate from Humidity Cell MLS | pH SU | Specific Conductance UMHOS/CM | Sulfate (as SO4) MG/L |
| RES-009E | 1899 | 1901.88 | TEST SC52 | 26-Apr-10 | <0.05 | <5 | 58 | <0.05 | 1643 | 7.78 | 346 | 100 |
| | | | | 3-May-10 | -- -- | <5 | 53.36 | <0.05 | 1568 | 7.85 | 224 | 46 |
| | | | | 10-May-10 | <0.05 | <5 | 48.72 | <0.05 | 1615 | 7.88 | 170 | 19 |
| | | | | 17-May-10 | -- -- | <5 | 46.4 | <0.05 | 1579 | 7.77 | 147 | 14 |
| | | | | 24-May-10 | <0.05 | <5 | 41.76 | <0.05 | 1626 | 7.79 | 136 | 10 |
| | 2056.38 | 2075 | TEST SC54 | 8-Mar-10 | 1.29 | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- | -- -- |
| | | | | 15-Mar-10 | 0.67 | <5 | 39.44 | <0.05 | 3895 | 6.7 | 2430 | 1460 |
| | | | | 22-Mar-10 | 0.29 | <5 | 20.88 | <0.05 | 4131 | 6.9 | 2420 | 1480 |
| | | | | 29-Mar-10 | 0.22 | <5 | 19.72 | <0.05 | 3153 | 7.24 | 2290 | 1510 |
| | | | | 5-Apr-10 | 0.11 | <5 | 23.2 | <0.05 | 3543 | 7.13 | 2330 | 1520 |
| | | | | 12-Apr-10 | 0.06 | <5 | 25.52 | <0.05 | 3226 | 7.41 | 2310 | 1500 |
| | | | | 19-Apr-10 | -- -- | <5 | 25.52 | <0.05 | 4222 | 7.32 | 2320 | 1520 |
| | | | | 26-Apr-10 | 0.03 F | <5 | 27.84 | <0.05 | 3471 | 7.43 | 2370 | 1510 |
| | | | | 3-May-10 | -- -- | <5 | 29 | <0.05 | 4065 | 7.46 | 2360 | 1440 |
| | | | | 10-May-10 | <0.05 | <5 | 29 | <0.05 | 4071 | 7.38 | 2340 | 1510 |
| | | | | 17-May-10 | -- -- | <5 | 29 | <0.05 | 4009 | 7.53 | 2370 | 1540 |
| | | | | 24-May-10 | <0.1 D1 | <5 | 34.8 | <0.05 | 4626 | 7.53 | 2330 | 1350 |

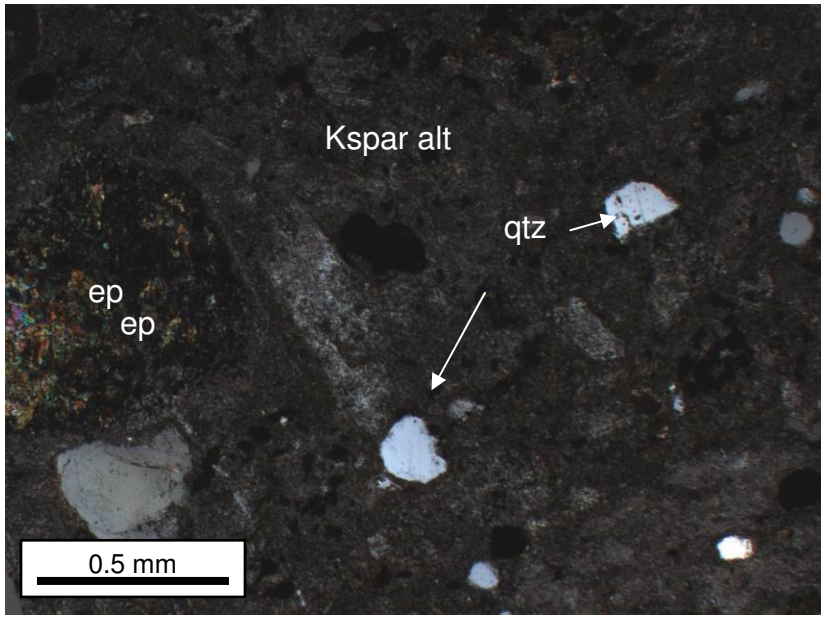
| | |
|---|---|
| -- | not requested |
| N | normal sample |
| MG/L | milligrams per liter |
| SU | standard units |
| UMHOS/CM | micromhos per centimeter |
| Iron [1] | Iron results from Chemac are suspect due to interference. Iron results from ACZ labs should be used for all calculations/evaluations. |
| B1 | Target analyte detected in method blank at or above the method reporting limit. |
| B3 | Target analyte detected in calibration blank at or above the method reporting limit. |
| B4 | Target analyte detected in blank at or above the method reporting limit. |
| B7 | Target analyte detected in method blank at or above method repotting limit. Concentration found in the sample <10X above concentration found in method blank |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| H3 | Sample received and analyzed past holding time. |
| L1 | The associated blank spike recovery was above laboratory acceptance limits. |
| M1 | Matrix spike recovery was high. The method control sample recovery was acceptable. |
| M2 | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| M3 | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| Q3 | Sample received with improper chemical preservation. |
| R1 | Duplicate: RPD exceeded the method control limit. |
| R4 | RPD exceeded the method control limit. Recovery met acceptance criteria. |
| V1 | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |
| V2 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| V3 | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample, but the sample was not reanalyzed. |
| V5 | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per Environmental Protection Agency Method 8000B. |

# APPENDIX I
# PETROGRAPHIC PHOTOGRAPHS

# RES-1C 1745m; Kvs- potassic

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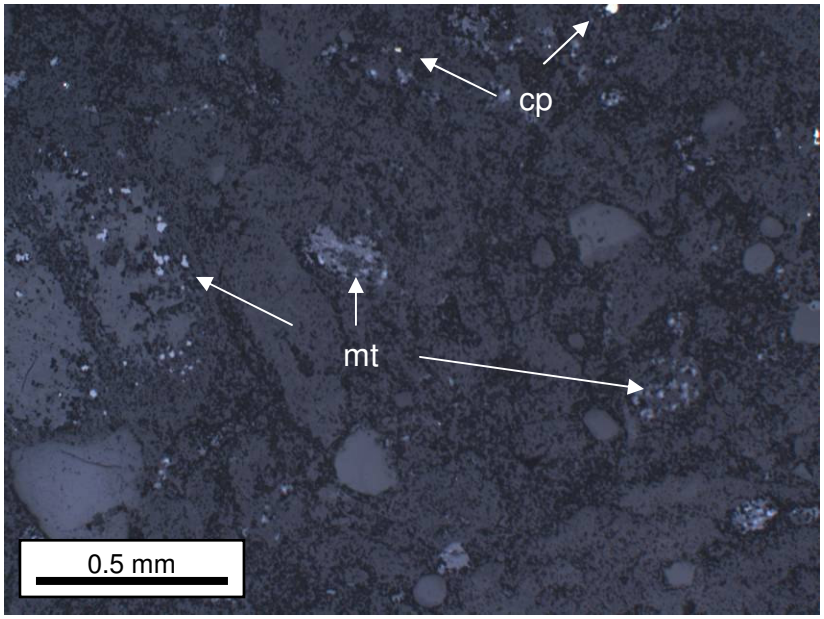
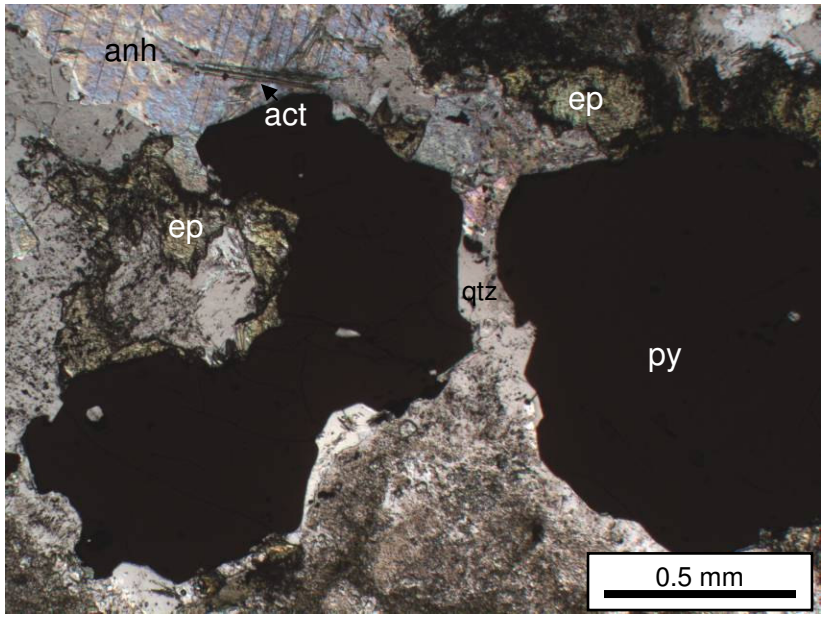
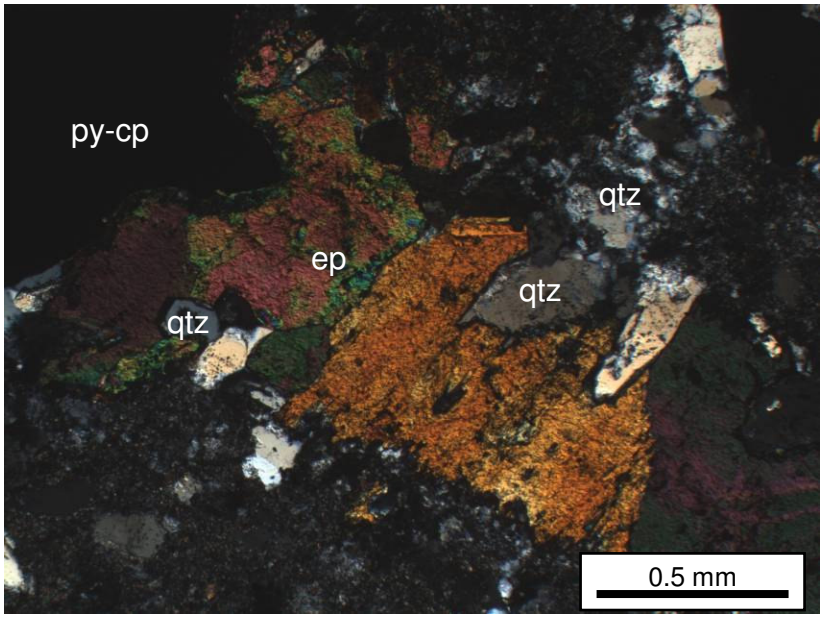
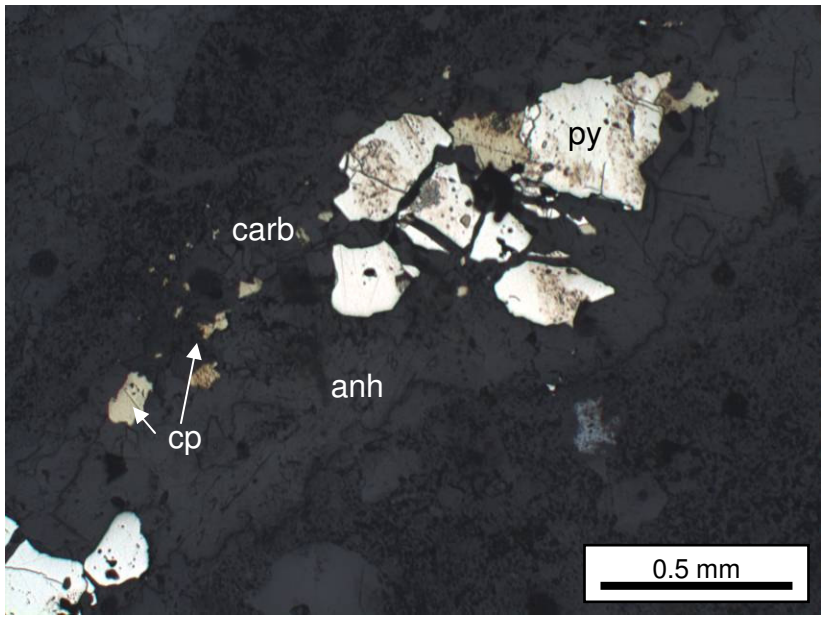


# RES-1C 1745m; Kvs- potassic

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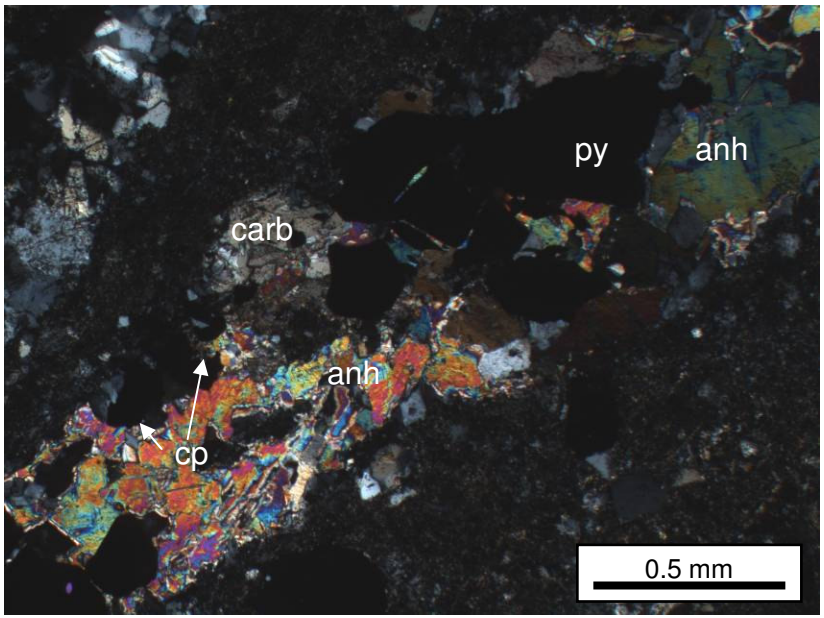
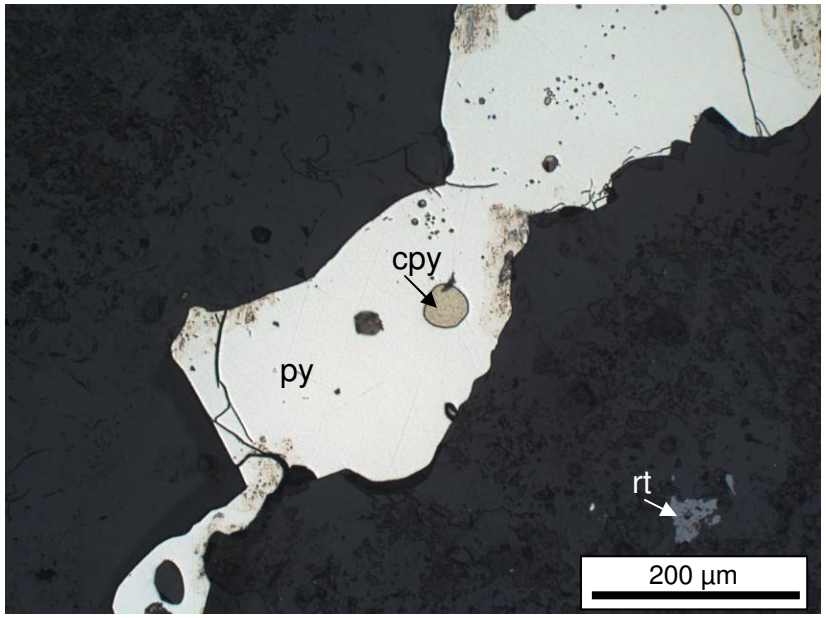
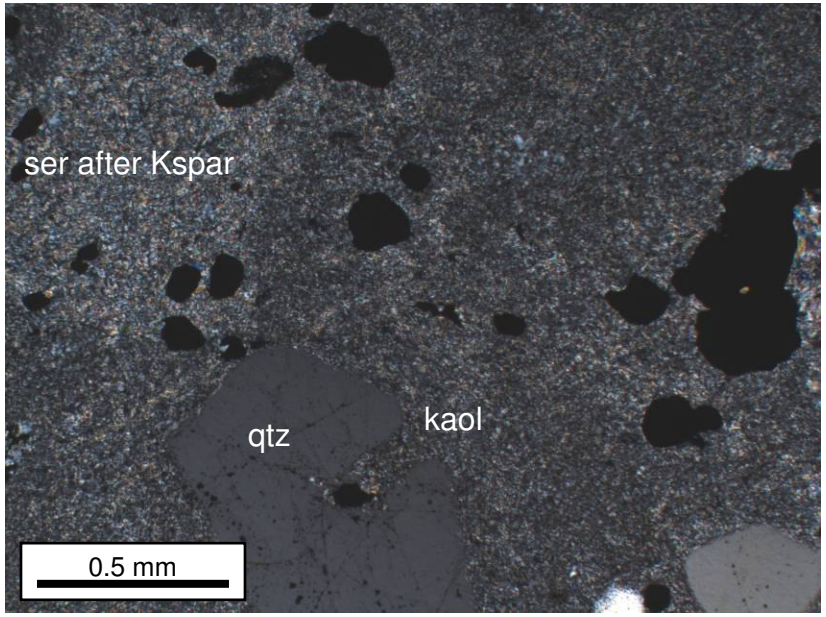


# RES-2A 1415m; QEP- phyllic

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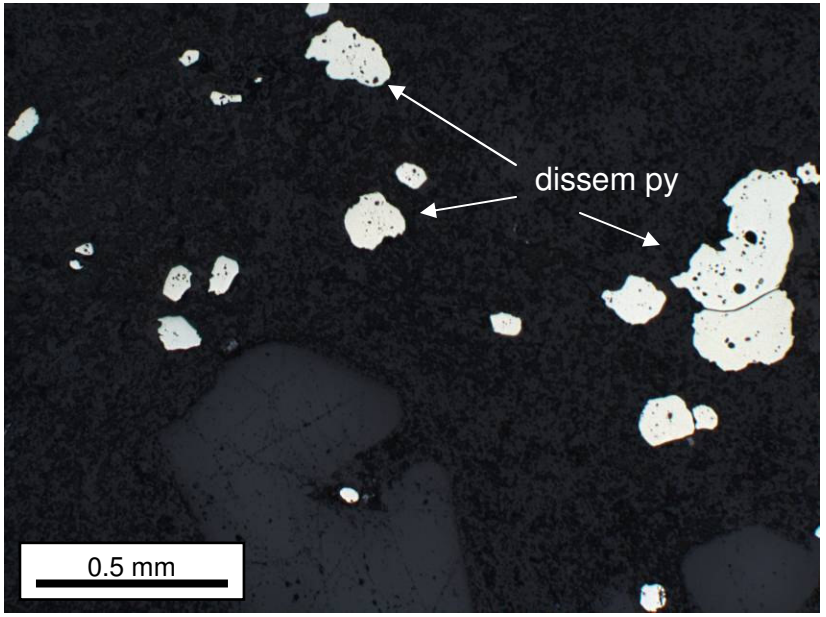
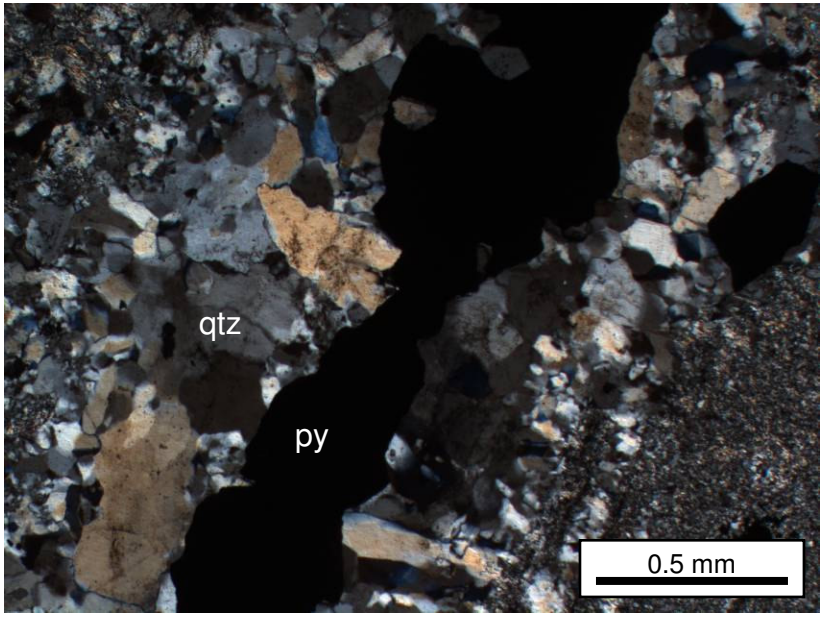


RES-2A 1415m; QEP- phyllic

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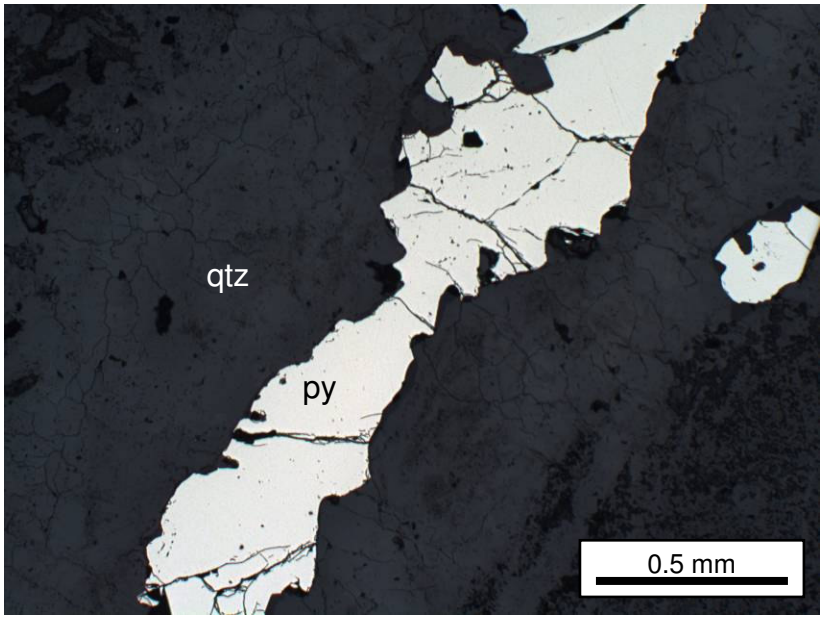
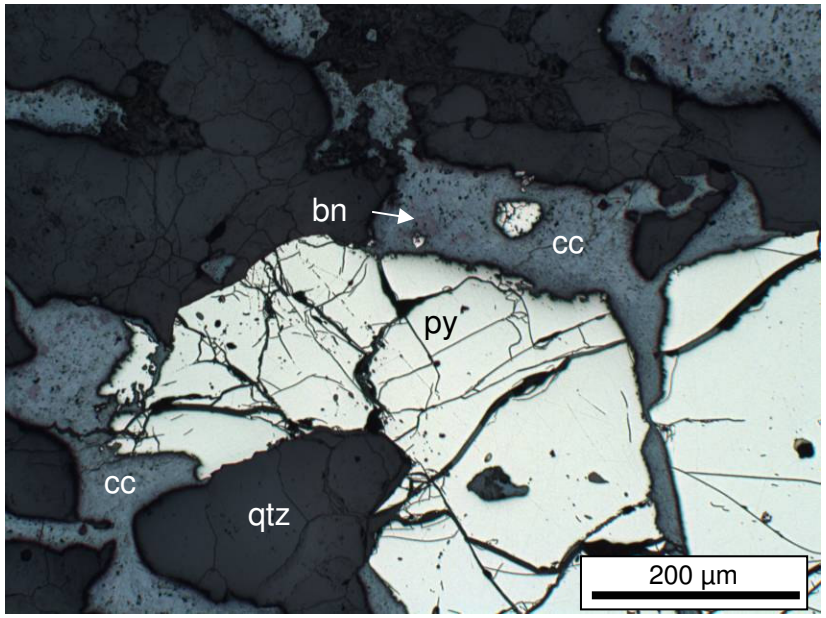
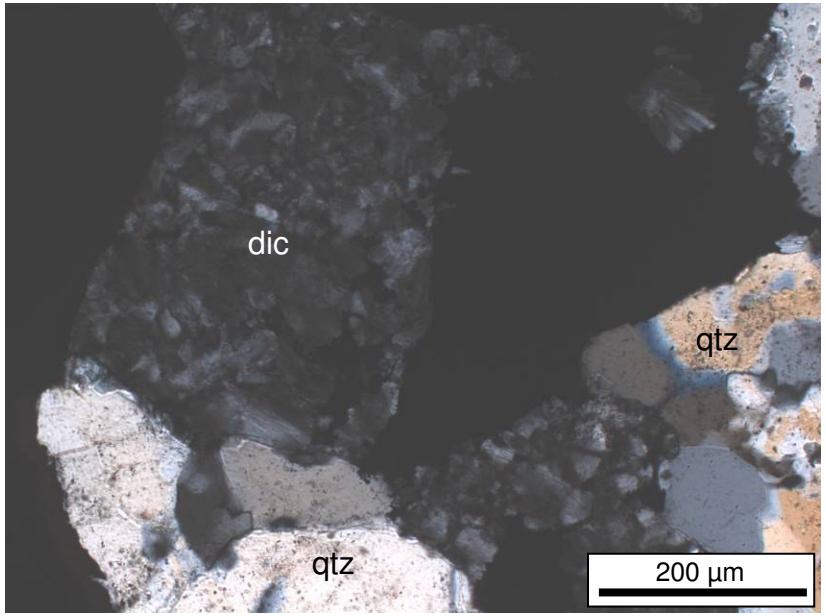


# RES-2A 1454m; Kvs- phyllic

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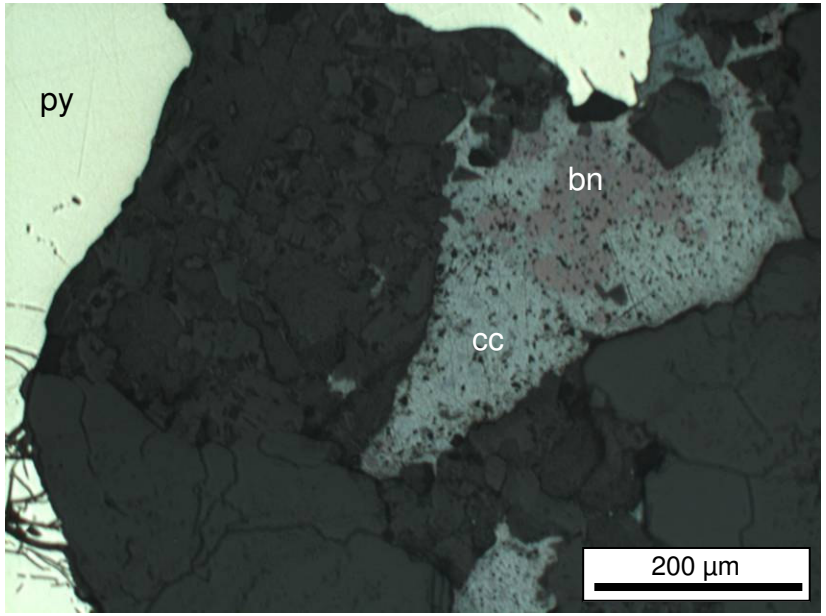
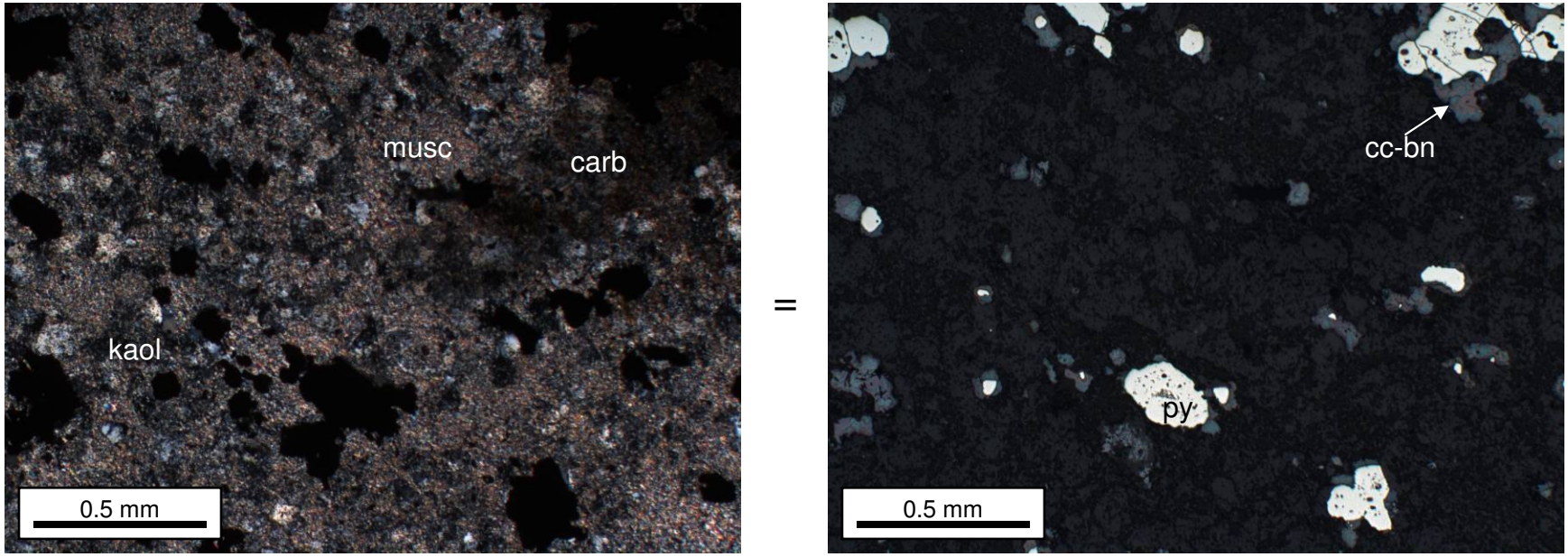
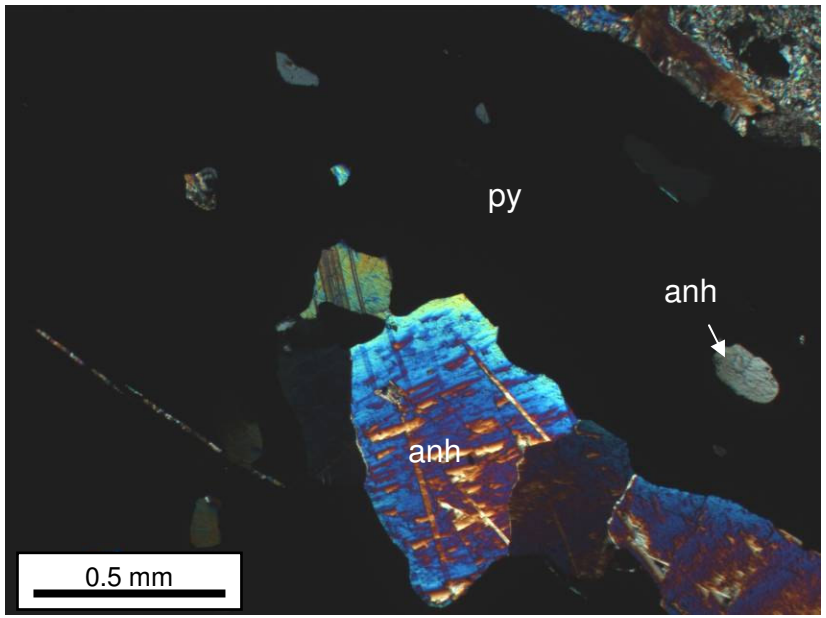


RES-2A 1454m; Kvs- phyllic



RES-2A 1927m; Diabase- potassic

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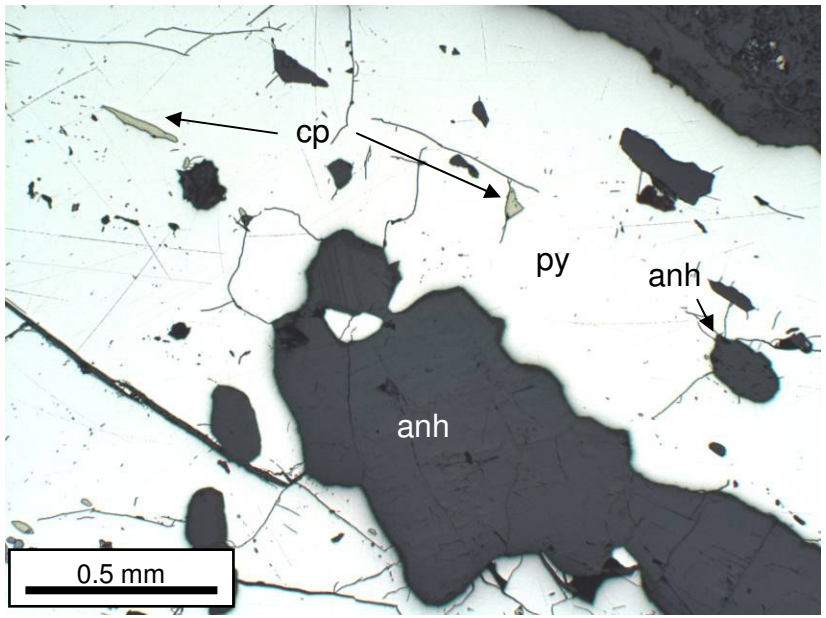

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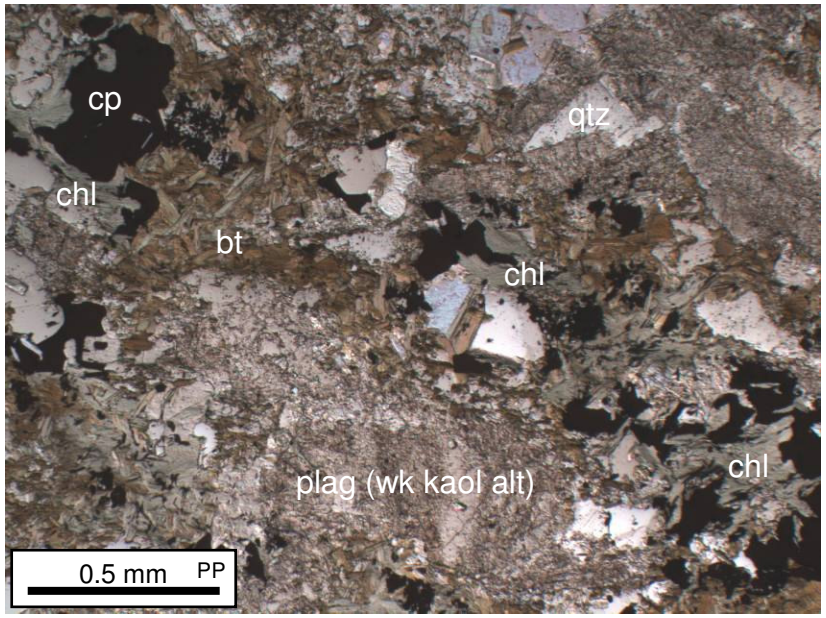


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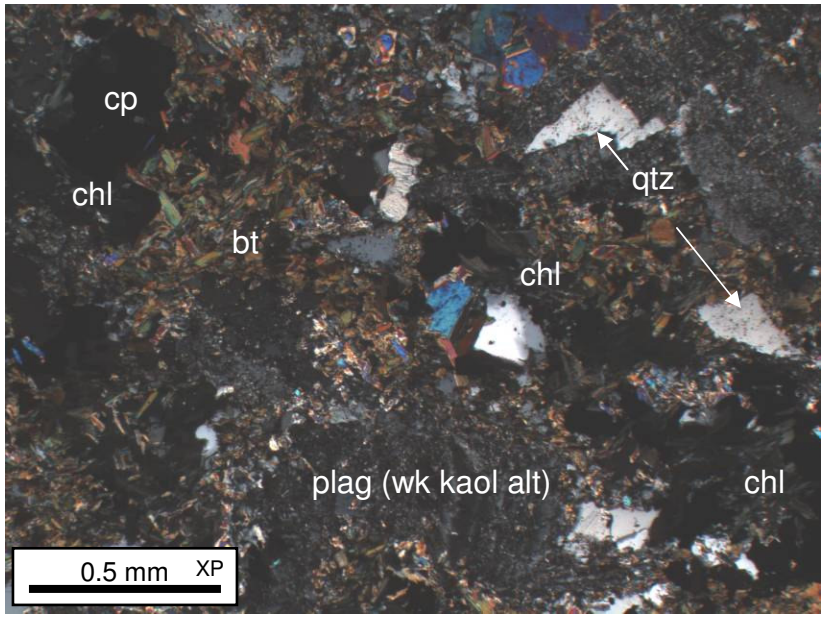


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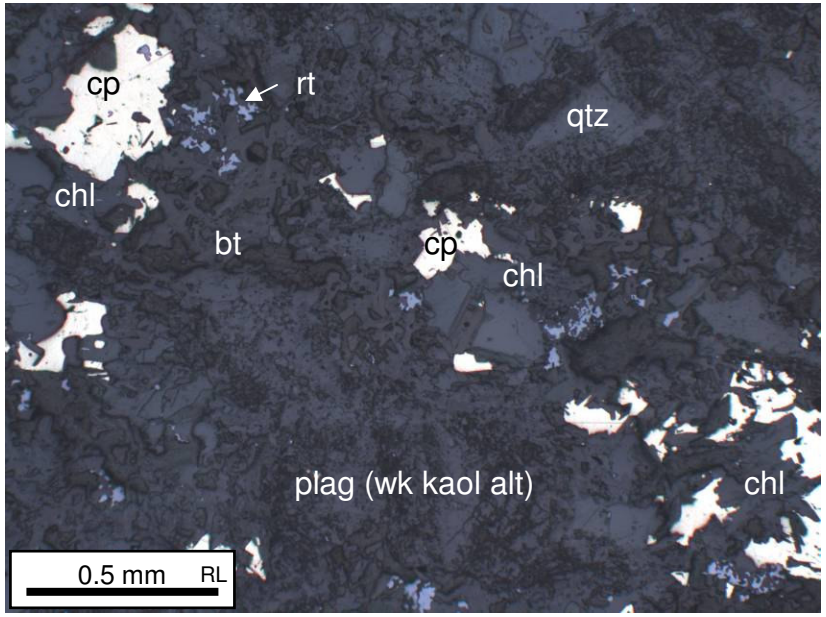
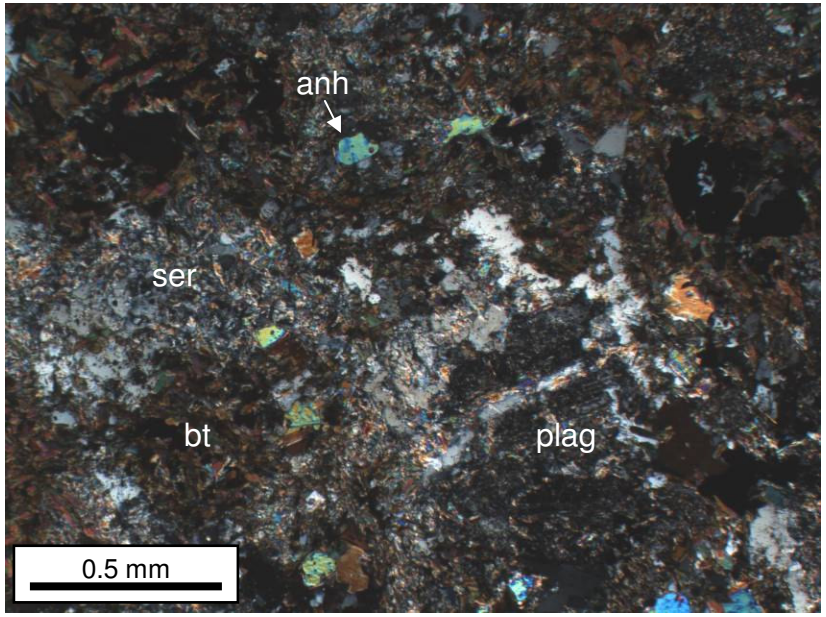
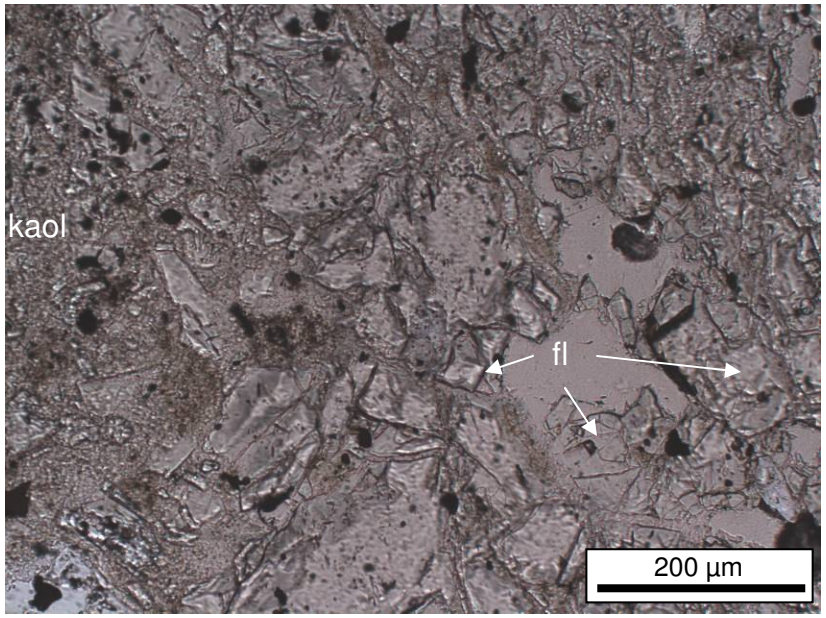
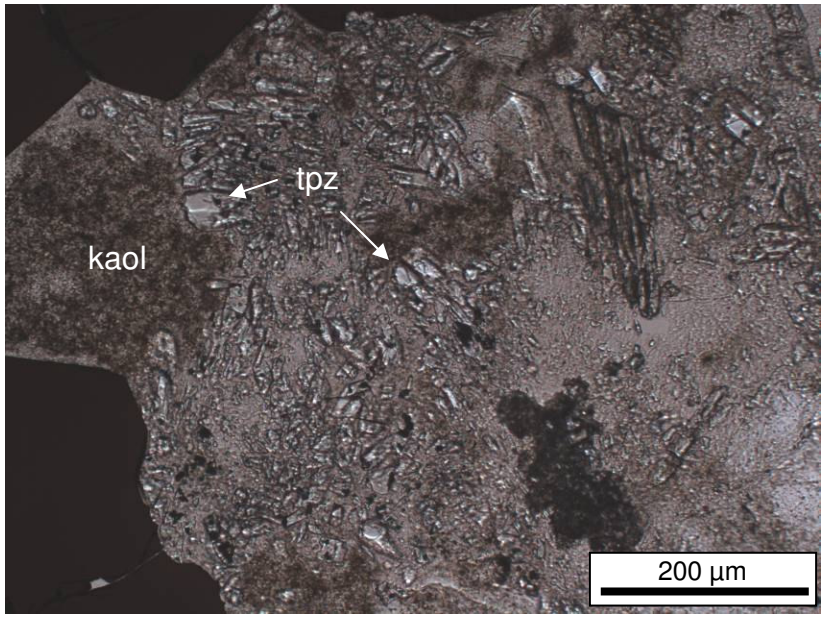
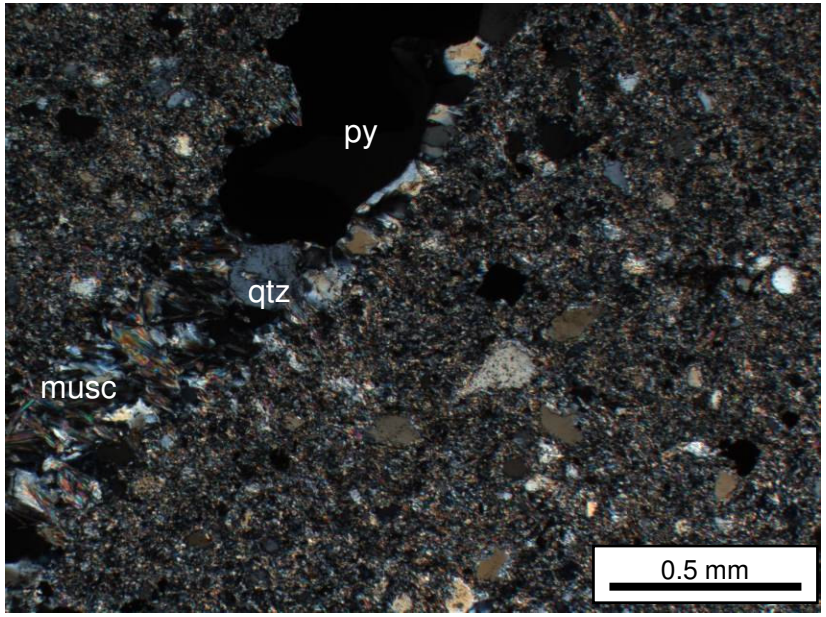


# RES-6D 1899m; Quartzite (Kqs)- phyllic

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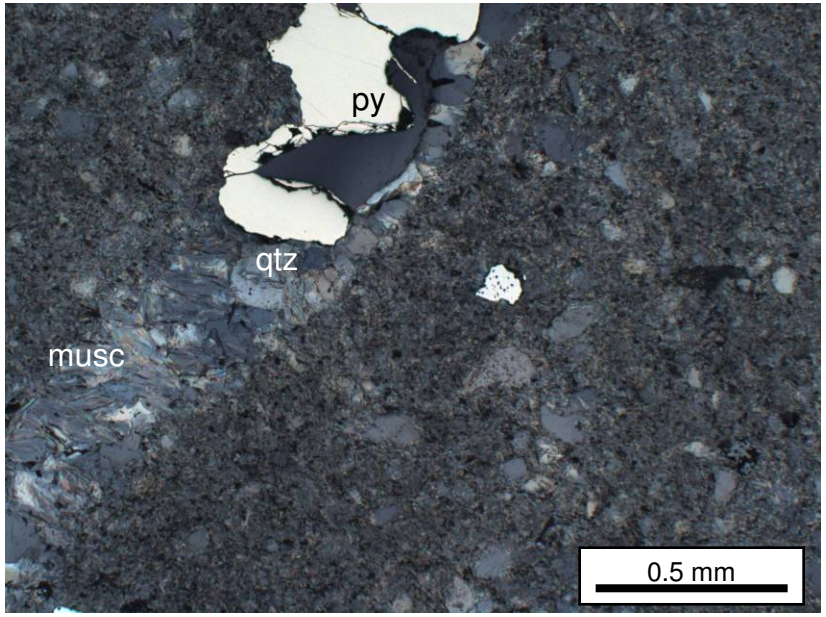
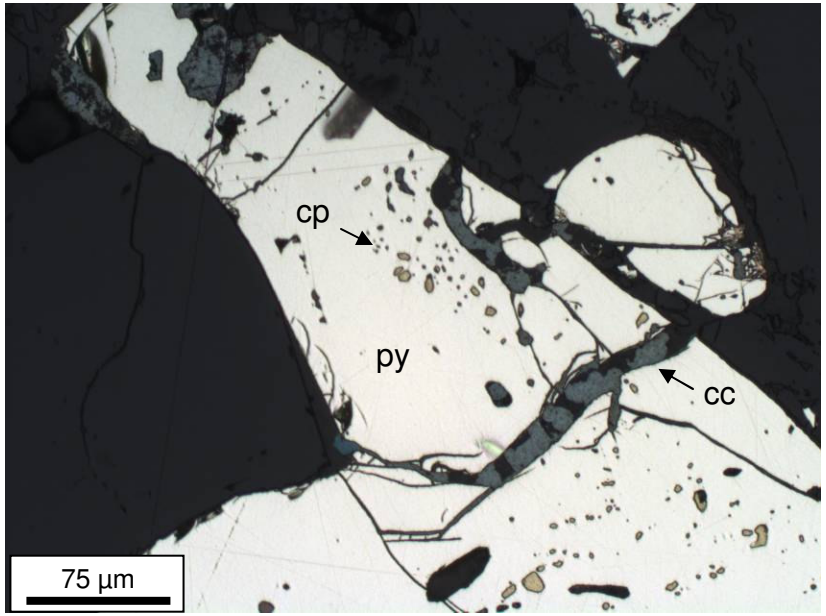
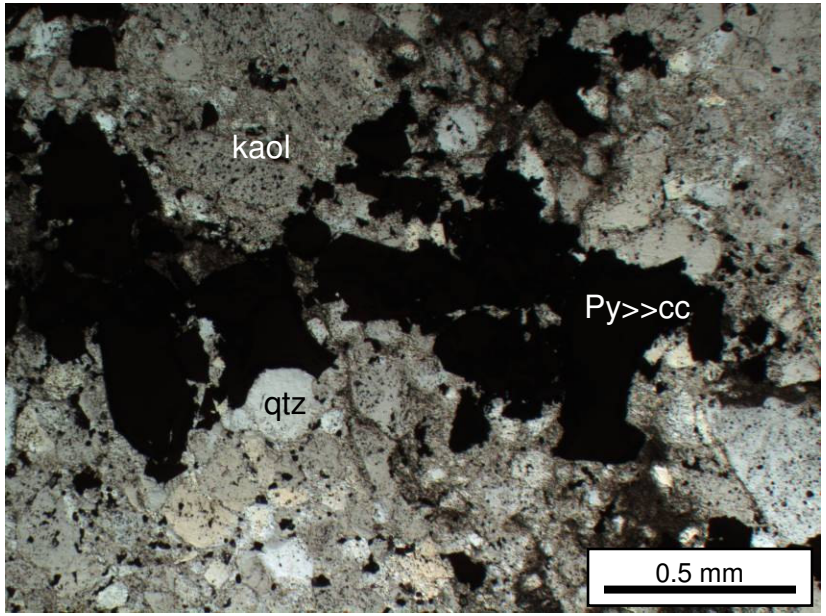


# RES-5I 1653m; QEP- phyllic

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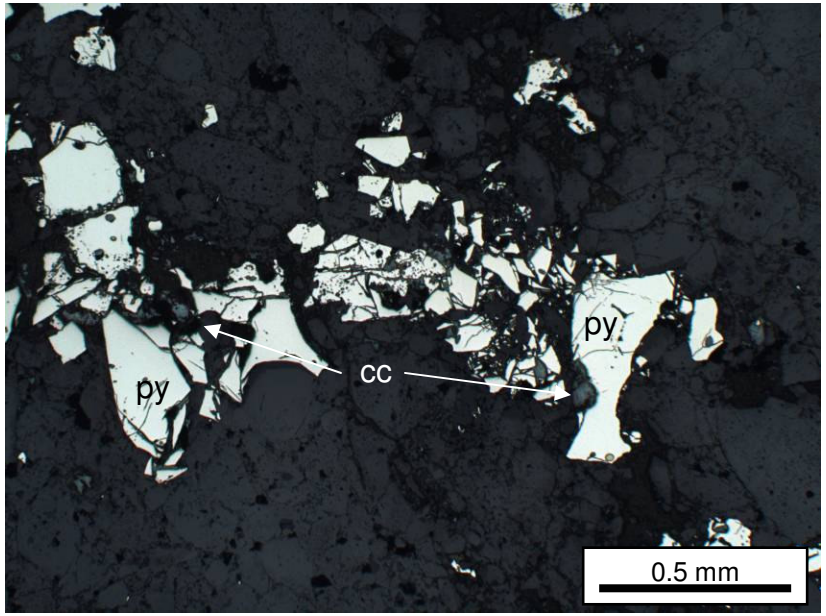
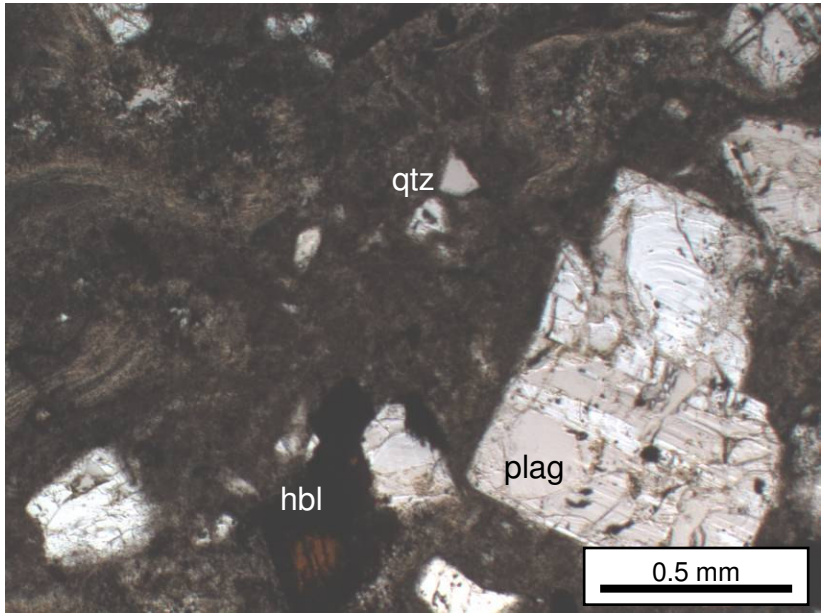
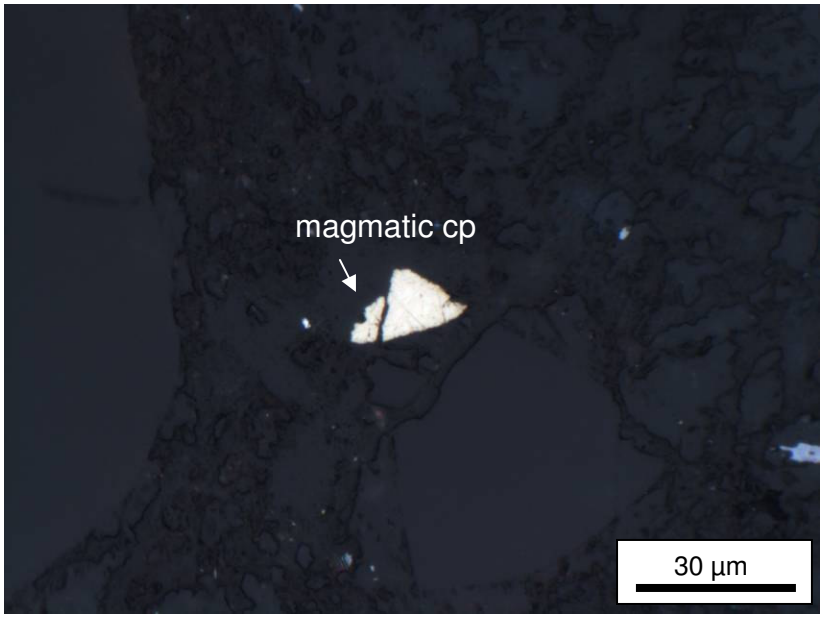
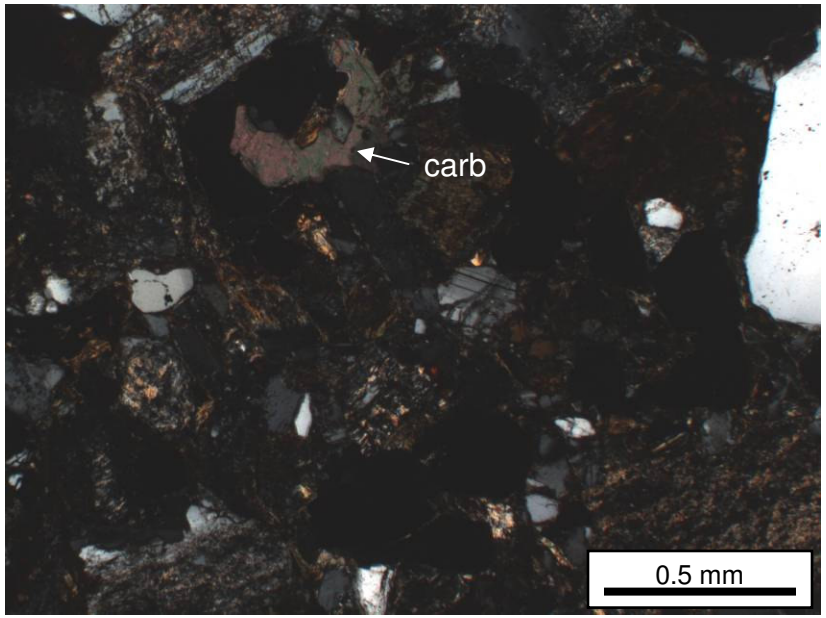


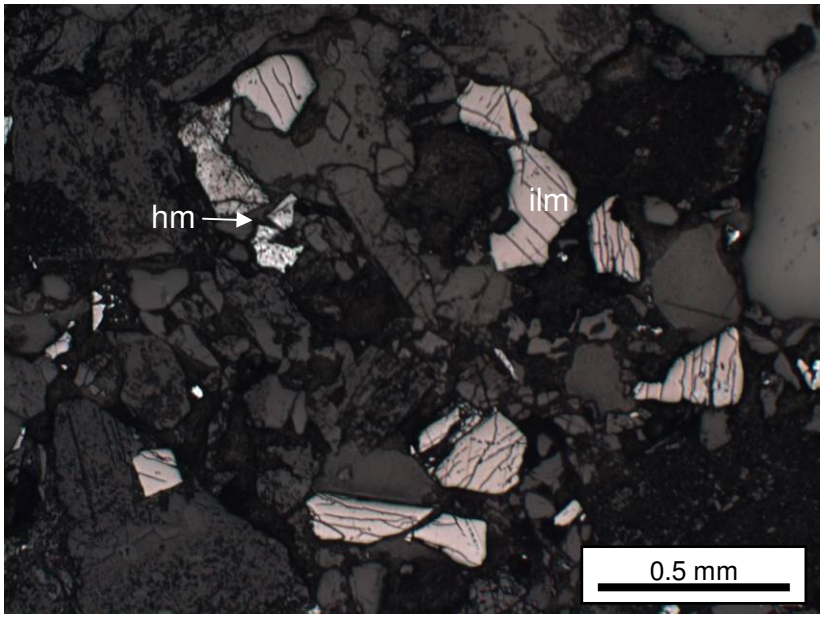
# RES-09 279m; Tal- unaltered



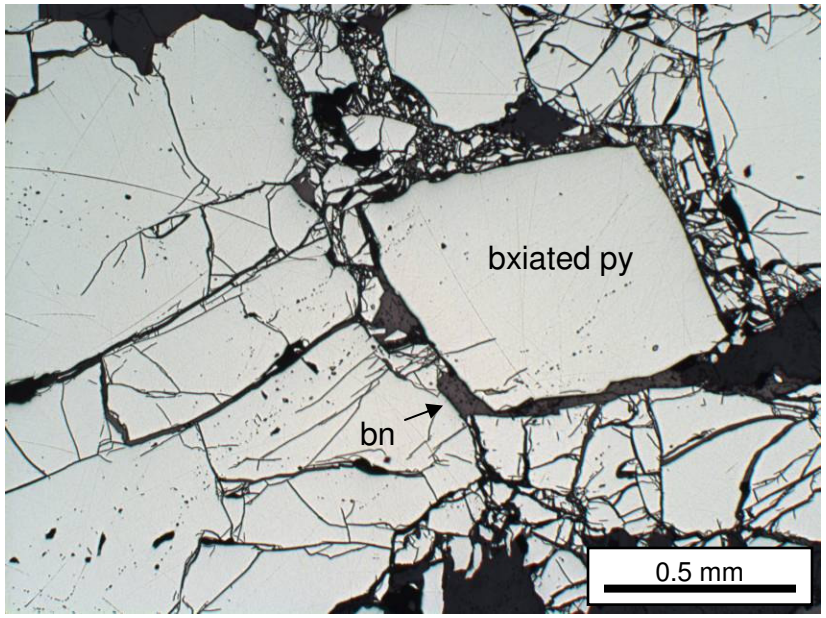



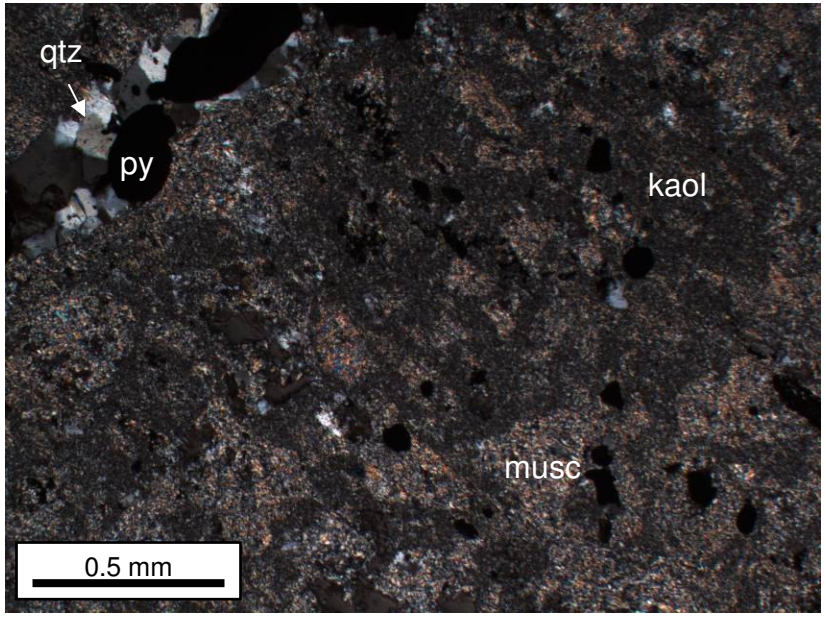
# RES-09 645m; Tw- unaltered



# RES-9E 1512m; Kvs- phyllic

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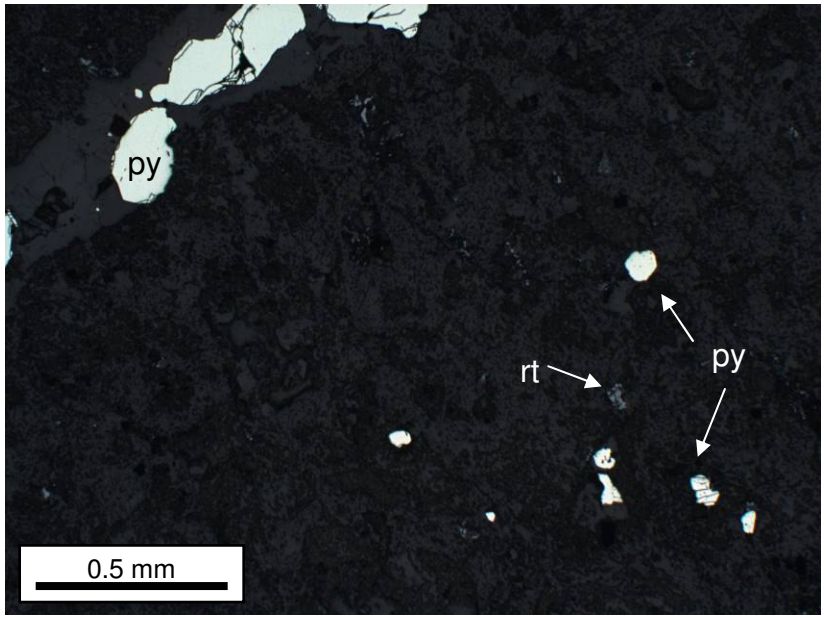
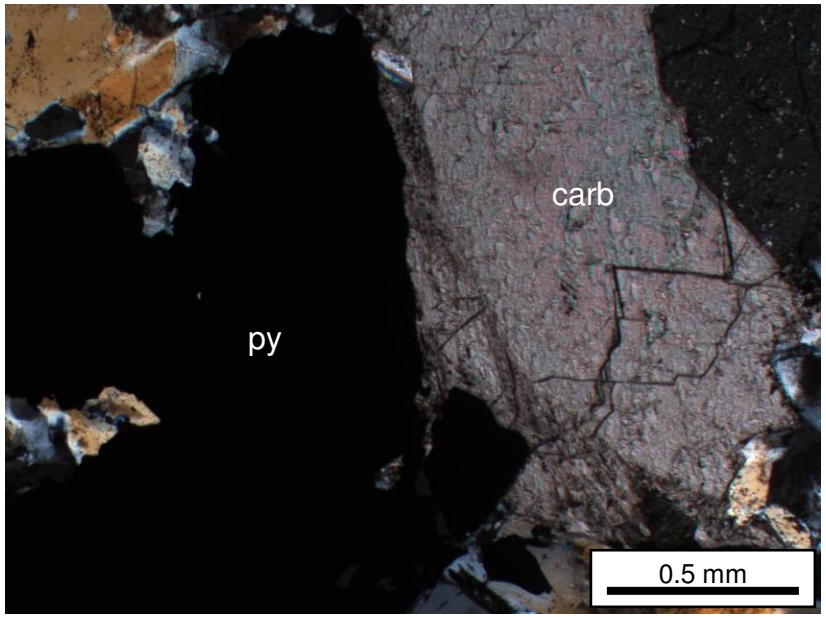
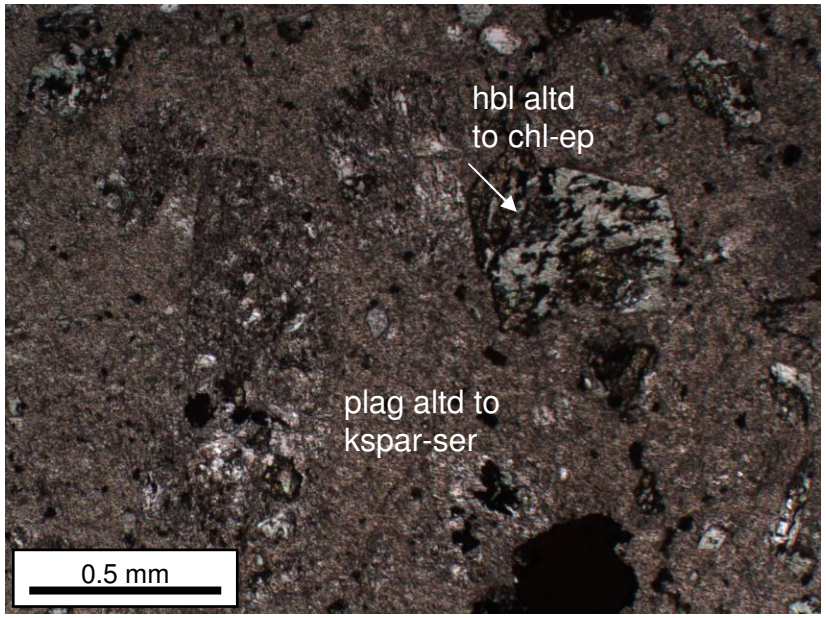
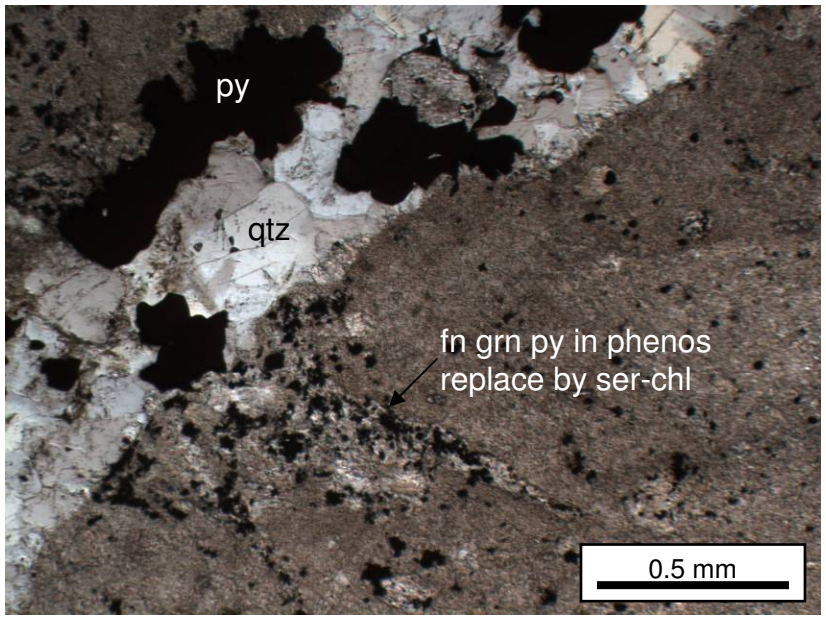


# RES-8A 1717m; Kvs- propylitic

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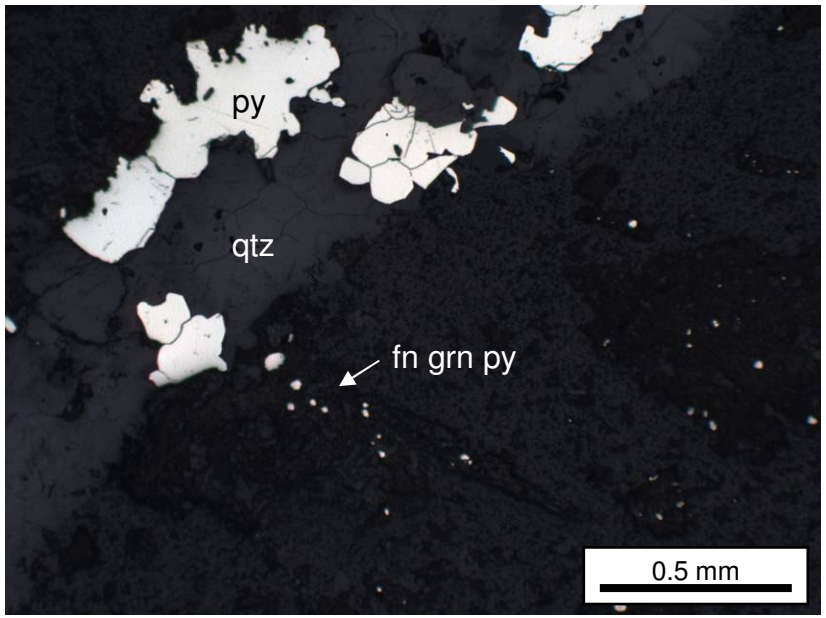
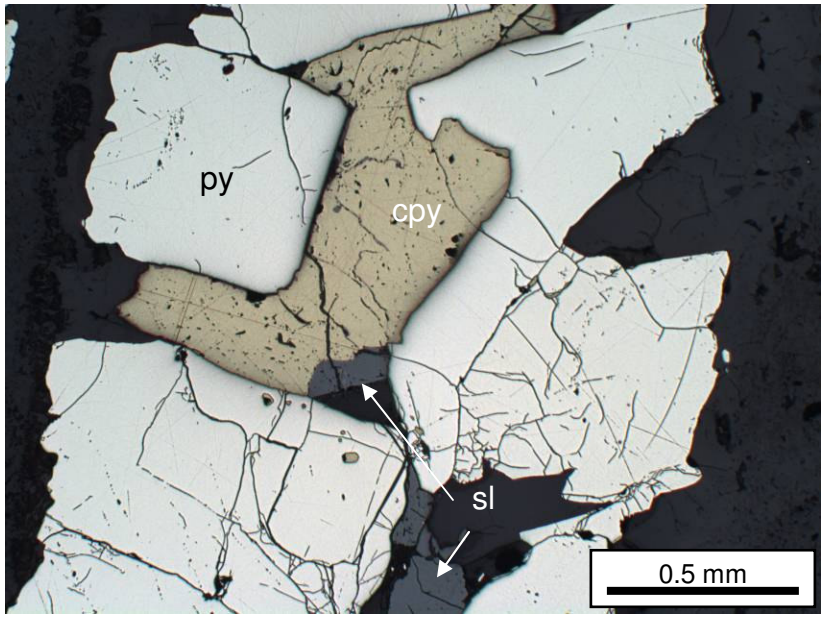
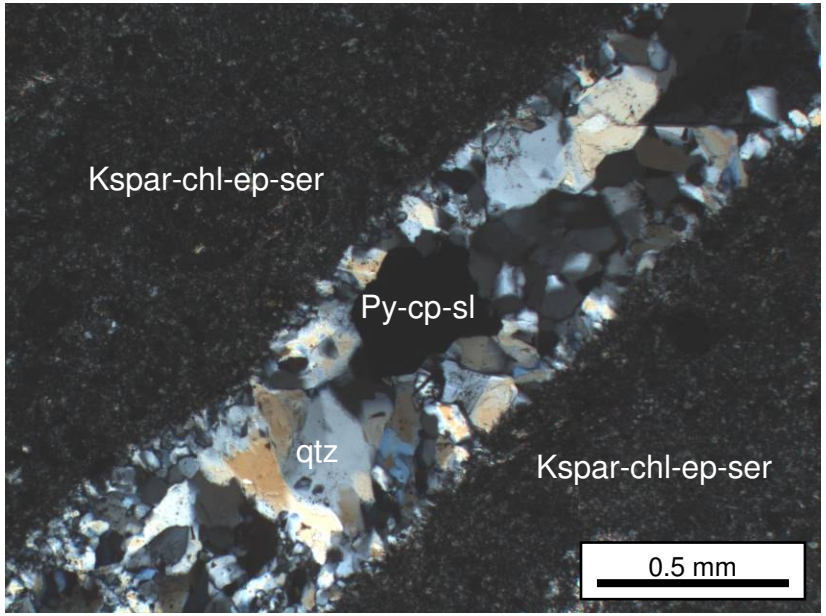


# RES-8A 1717m; Kvs- propylitic

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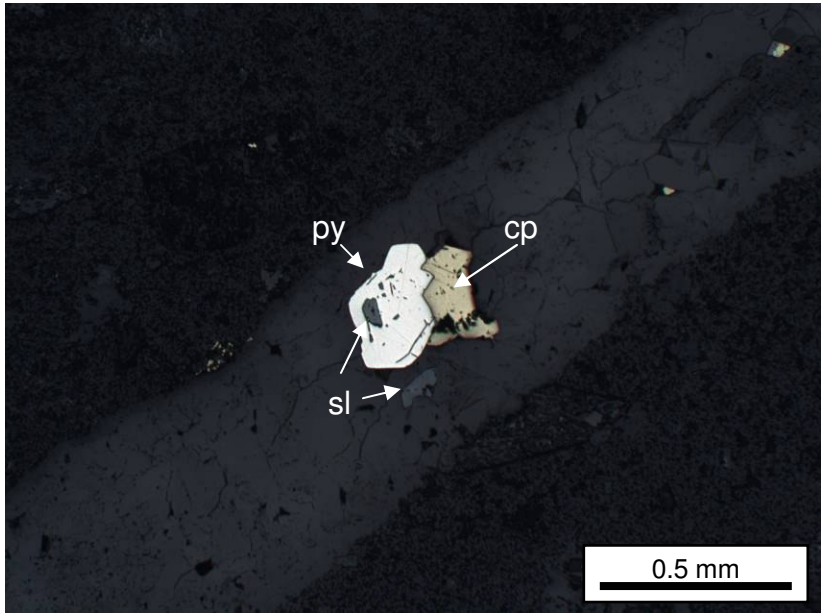
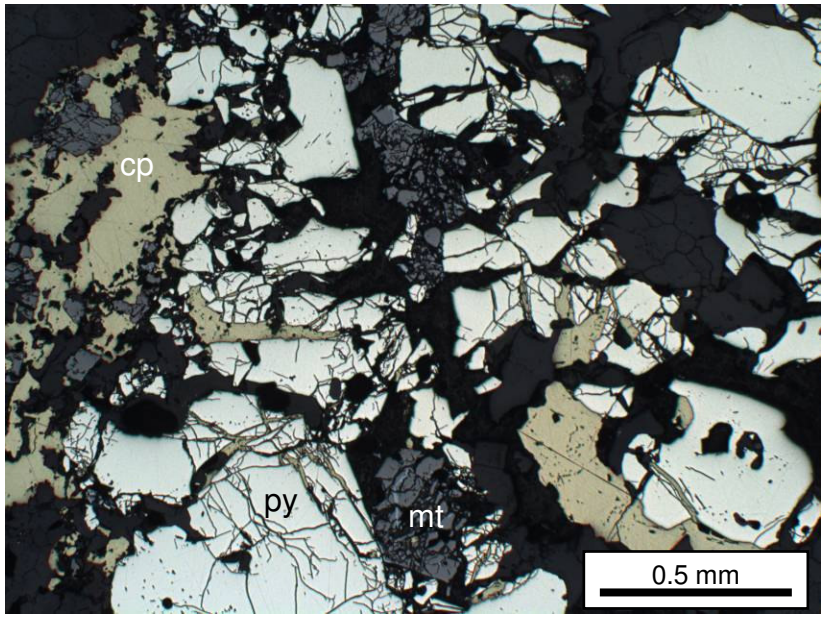
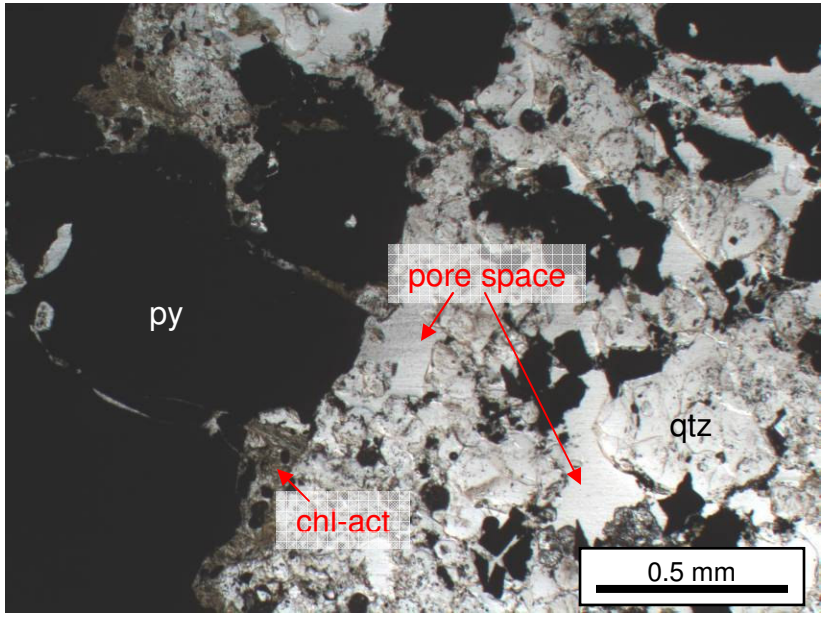


# RES-9E 1830m; Dm- retrograde skarn

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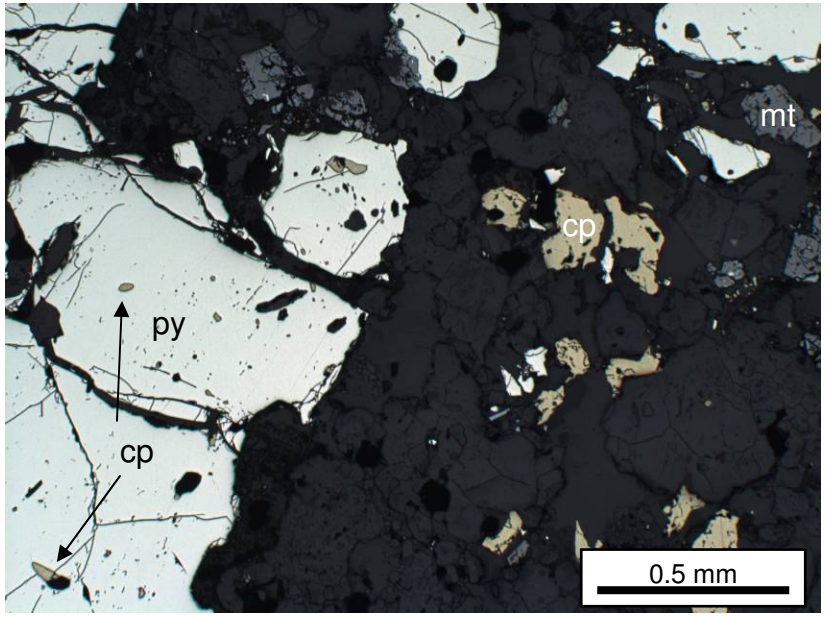
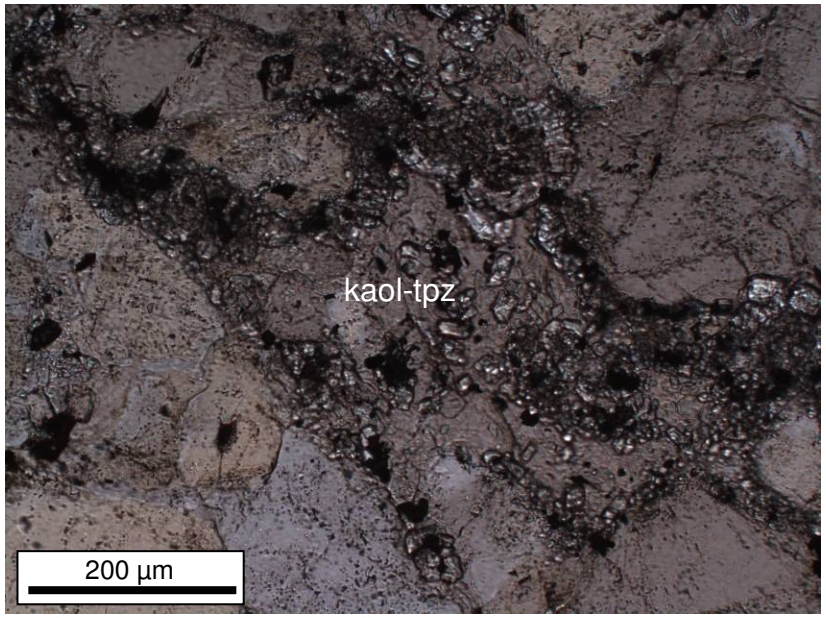
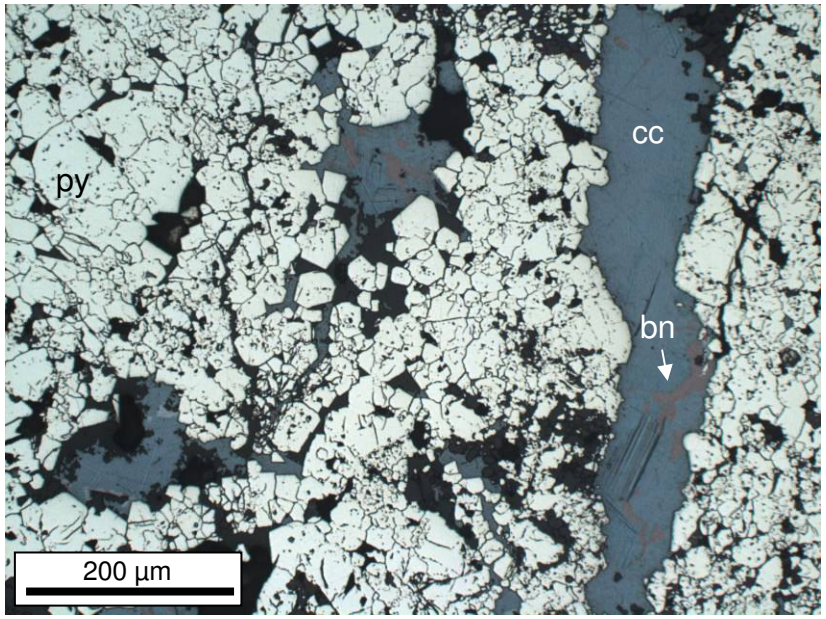
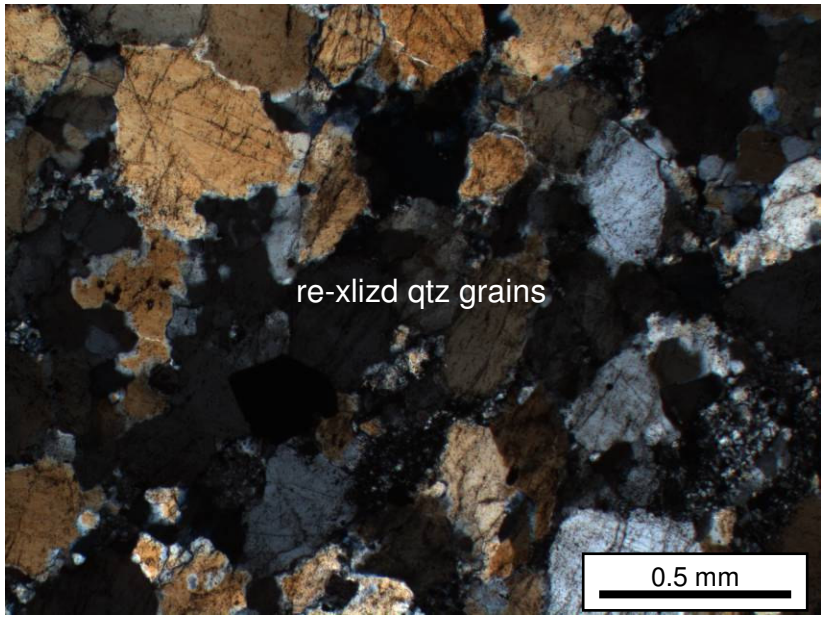


# RES-9E 1741m; Quartzite (Kqs)- advanced argillic

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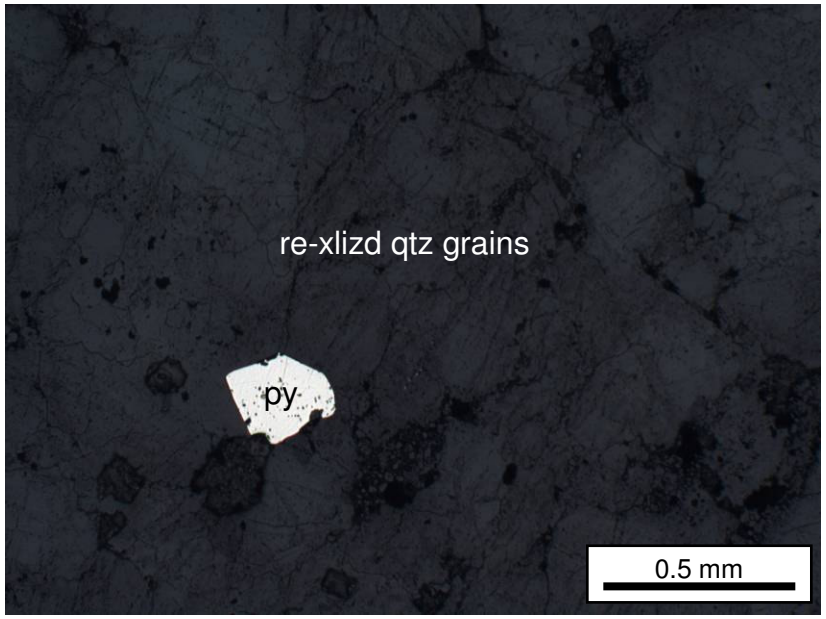
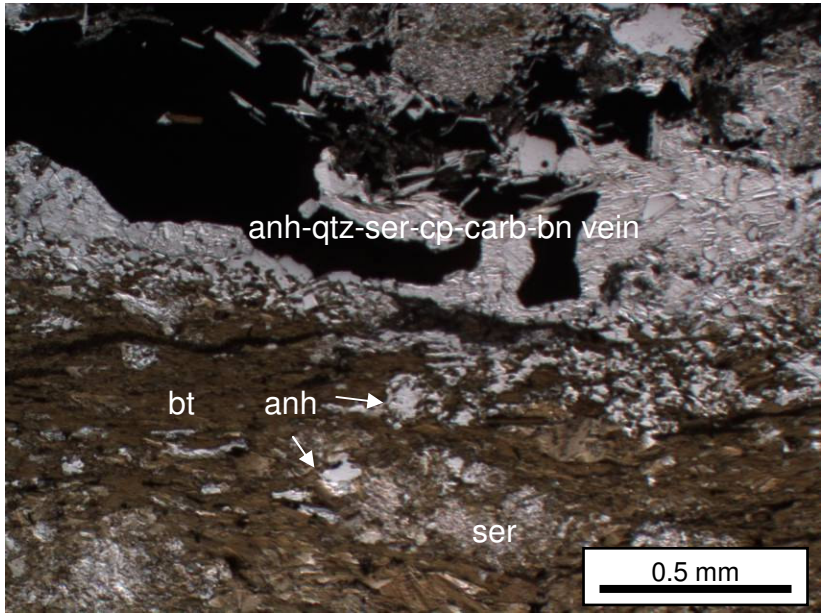


RES-9E 2071m; Diabase- potassic

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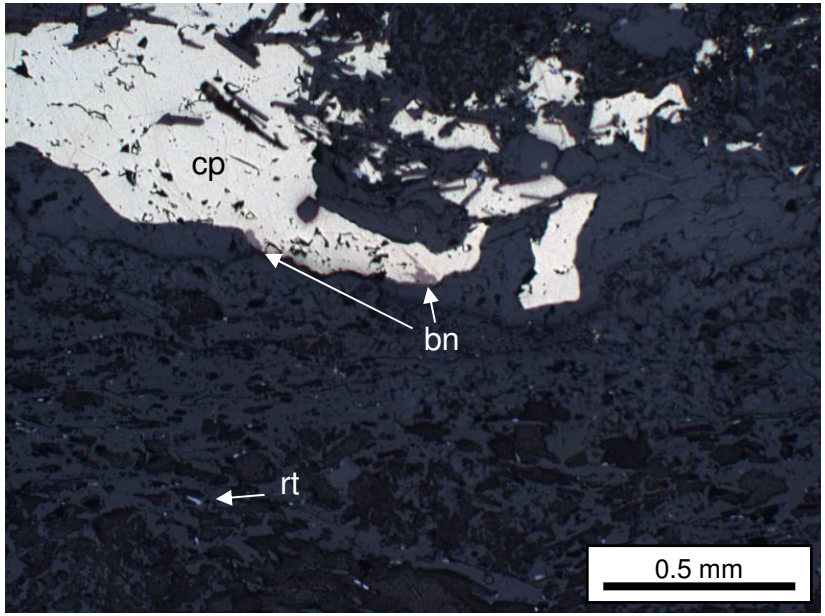
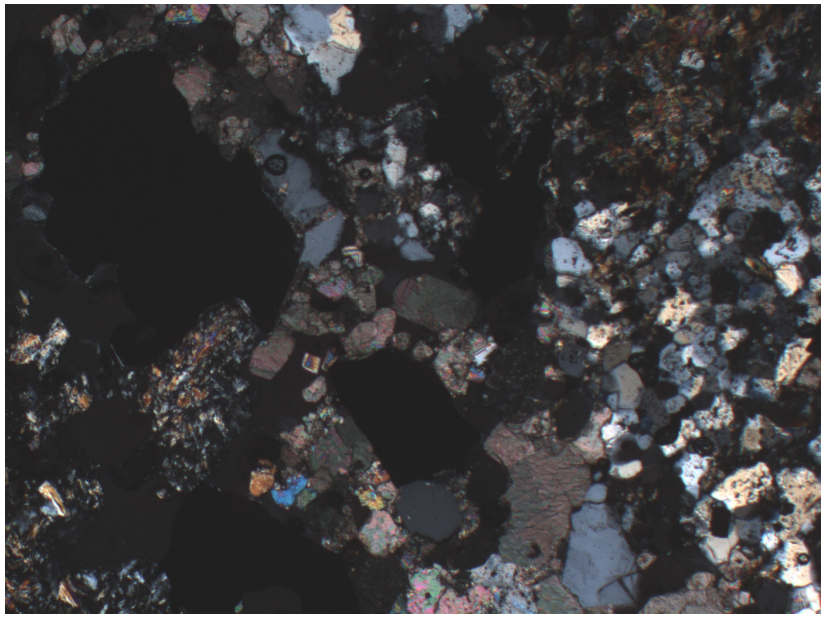
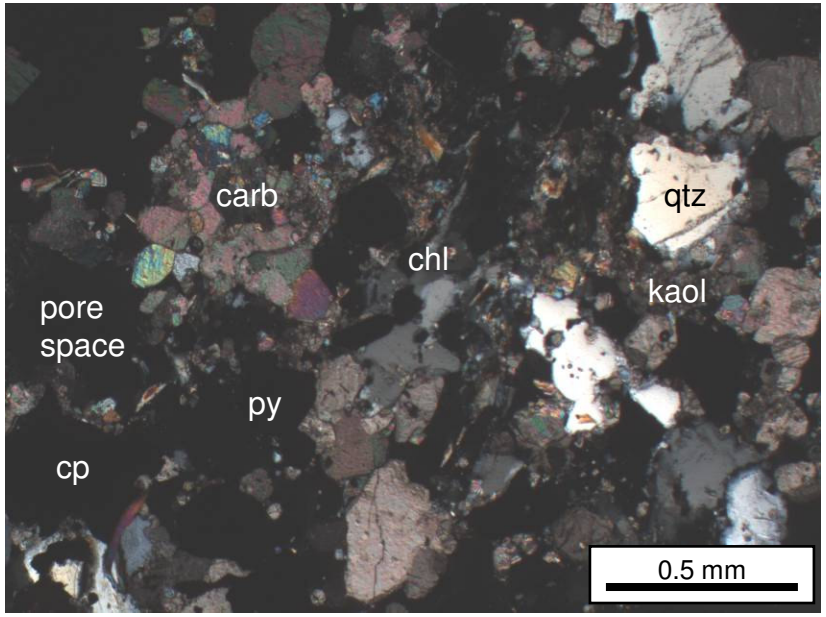


# RES-9E 1899m; Dm- retrograde skarn



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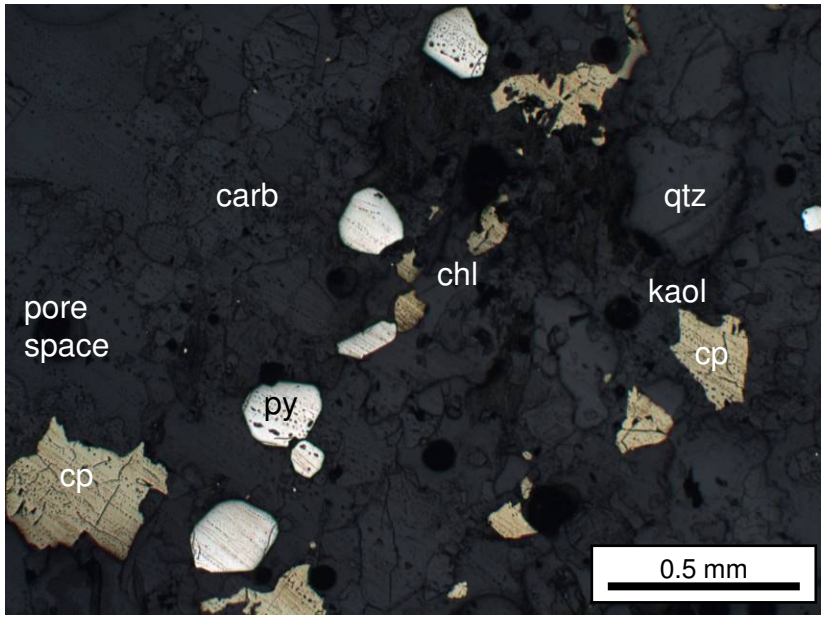
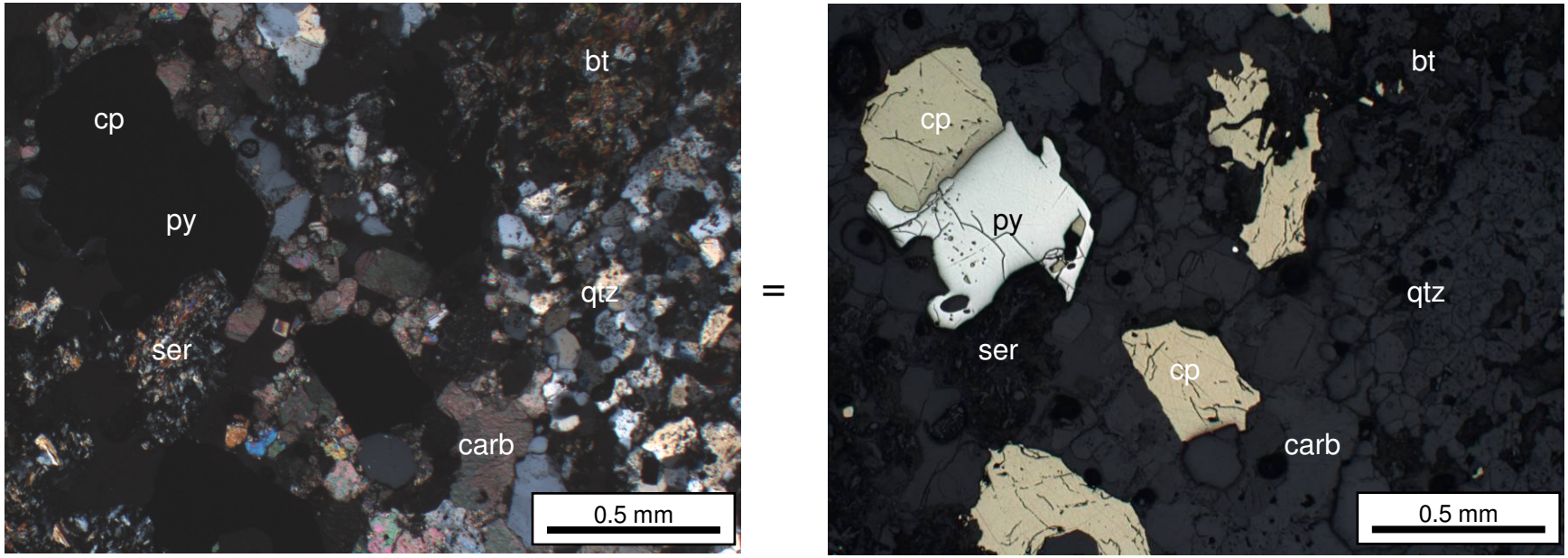


RES-9E 1899m; Dm- retrograde skarn



**APPENDIX J**
**MINERALOGIC RESULTS FROM X-RAY DIFFRACTION AND PETROGRAPHIC ANALYSIS**
**(HUMIDITY CELL TESTING STARTING MATERIAL)**

**TABLE J-1**
**ELEMENTAL CONCENTRATIONS IN PRE-HUMIDITY CELL TESTS DETERMINED WITH PETROGRAPHIC EXAMINATION BY RESOLUTION COPPER**

| Test ID | Major Elements | Minor Elements | Trace Elements |
|---|---|---|---|
| 2 | quartz, biotite, K-feldspar, anhydrite | epidote, actinolite, pyrite (vein) | plagioclase, chlorite, carbonate, pyrite (diss), chalcopyrite (diss), chalcopyrite (vein), magnetite |
| 11 | quartz, kaolinite, muscovite (ser) | pyrite (diss), pyrite (vein) | dickite, rutile, chalcopyrite (vein), bornite, chalcocite |
| 12 | quartz, kaolinite, muscovite (ser) | pyrite (diss), pyrite (vein), chalcocite | carbonate, dickite, chalcopyrite (vein), bornite |
| 14 | biotite, plagioclase | quartz, anhydrite, muscovite (ser), chalcopyrite (vein) | chlorite, rutile, pyrite (diss), pyrite (vein), chalcopyrite (diss), bornite, molybdenite |
| 21 | quartz | pyrite (vein) | topaz, kaolinite, muscovite (ser), bornite, chalcocite |
| 28 | quartz, muscovite (ser) | kaolinite | dickite, topaz, fluorite, rutile, pyrite (diss), pyrite (vein), chalcopyrite (diss), molybdenite |
| 34 | K-feldspar, muscovite (ser) | quartz, epidote, chlorite, pyrite (vein) | carbonate, rutile, kaolinite, pyrite (diss), chalcopyrite (diss), chalcopyrite (vein), sphalerite |
| 38 | quartz, plagioclase | hornblende | rutile, chalcopyrite (diss), magnetite, hematite |
| 39 | - | carbonate, illite | rutile, magnetite, hornblende |
| 44 | kaolinite, muscovite (ser) | quartz, pyrite (diss), pyrite (vein) | dickite, chalcopyrite (diss), bornite |
| 49s | quartz | kaolinite, pyrite (vein) | dickite, topaz, pyrite (diss), bornite, chalcocite |
| 50 | quartz | chlorite, pyrite (vein), chalcopyrite (diss) | actinolite, muscovite (ser), pyrite (diss), chalcopyrite (vein), magnetite, hornblende |
| 52s | quartz, biotite, carbonate | kaolinite, muscovite (ser) | chlorite, fluorite, pyrite (diss), pyrite (vein), chalcopyrite (diss), chalcopyrite (vein), molybdenite, magnetite, hornblende |
| 54 | biotite, muscovite (ser) | quartz, anhydrite | carbonate, rutile, kaolinite, chalcopyrite (diss), chalcopyrite (vein), bornite |

Notes: Major elements represent concentrations ≥15%. Minors elements represent concentrations <15% but ≥5%. Trace elements represent concentrations <5%. ser = sericite; diss = disseminated

**TABLE J-2**
**PYRITE GRAIN SIZES AND COMMENTS RECORDED DURING PETROGRAPHIC EXAMINATION BY RESOLUTION COPPER**

| Test ID | Comments | Pyrite Grain Size Range (microns) | Pyrite Grain Size Average (microns) |
|---|---|---|---|
| 2 | py occurs as relatively coarse grains in veins, doesn't appear to be encapsulated, but shares grain boundaries with epi-anh-qtz-Kspar; epi-act-Kspar alt of matrix and phenocrysts, o/p by bt; some veins contain epi-act; local cp-po "eggs" in py; py in veins generally coarser than disseminated grains | 10-2000 | 500 |
| 11 | Fspar and bt phenos altered to musc; groundmass altered to kaol>>musc>dic; coarse disseminated py; py in veins is very coarse, locally as centerlines in fine qtz, but should liberate easily with crushing; local cp and bn "eggs" in py; minor cc-bn | 20-2500 | 1500 (vein)<br>500 (dissem) |
| 12 | Patchy very fine grained (Fe?)-carbonate alteration replacing possible fspar grains with ser-kaol; complex intergrowths of cc-bn are definitely getting their sulfur from and replacing py, and in veins are associated with dickite; disseminated py grains are ragged and commonly in contact with bn-cc grains; py in veins is coarse; minor suspected carbonate may have effect on acid generation | 30-2500 | 1000 (vein)<br>250 (dissem) |
| 14 | anhydrite grains commonly trapped in coarse vein py, though locally there are fractures in the py letting anh in (this vein is late and imparts ser after plag in wall rock); chl locally in contact with sulfides; cp rich veins are in equilibrium with bt, minor chl; very weak dissem py, thick py vein cuts across one corner of sample | 200-1500 | 1000 (vein)<br>250 (dissem) |
| 21 | Appears to be a piece of brecciated massive quartz vein; two episodes of qtz formation, the second is much finer grained and introducted kaol>>ser and sulfides in certain fractures; py is brecciated and locally very fine grained, full of cp-bn-cc inclusions, and rimmed by cc>>bn; how was Cu recovery in this area?; there's another mineral associated with the sulfides and kaolinite that I can't identify (might be topaz) | 5-1500 | 200 |
| 28 | qtz-kaol-fl-py vein contains unidentified gray opaque; qtz grains are angular to subangular and only make up ~30% of Kqs (matrix supported) | 15-2500 | 1000 (vein)<br>200 (dissem) |
| 34 | most py in quartz veins; coarseness of py grains depends on vein thickness (coarser with increasing vein thickness); much fine kspar alteration; fine grained disseminated py commonly associated with phenos replaced by ser-chl; minor calcite in qtz-sulfide vein | 10-1750 | 600 (vein)<br>150 (dissem) |
| 38 | traces of po-cp!; phenocrysts (qtz-plag-hbl) add up to ~65% of rock mass, the rest is flattened fine (plag-rich?) groundmass; hematite partially replaces octahedral mt; thin seams of fine plag-qtz-welded groundmass define foliation | NA | |
| 39 | Clast and grain supported sandy cgl; clasts of diabase(commonly with act replacing cpx)>>schist>qtzite in a sandy matrix of plag>opaques (il-mt-hm)>qtz>hbl, locally cemented by carbonate (<5%); heavy mineral grains locally define bedding | NA | |

**TABLE J-2**
**PYRITE GRAIN SIZES AND COMMENTS RECORDED DURING PETROGRAPHIC EXAMINATION BY RESOLUTION COPPER (continued)**

| Test ID | Comments | Pyrite Grain Size Range (microns) | Pyrite Grain Size Average (microns) |
|---|---|---|---|
| 44 | bn commonly fills fracs and brecciated zones in vein py; some variation in disseminated py grain sizes, but most pretty round and coarse, not trapped, and liberatable; brecciation of py in vein produces some very fine particles; assymetric qtz-dic selvedge on this qtz-py-(bn) vein; fspar grain shapes in matrix altered to musc, and groundmass to kaol (py mostly in kaolinitic groundmass); very few qtz grains, most quartz in veins | 5-2500 | 750 (vein)<br>200 (dissem) |
| 49s | qtz grain boundaries are recrystallized in this sample, with kaol-dic-tpz and sulfides filling local interstices; a couple of zircon grains present; py in a vein is finely brecciated (and locally recrystalized?-funky texture) and filled with cc>bn mixture | 10-1000 | 150 (vein)<br>200 (dissem) |
| 50 | pore space comprises ~15% of sample; the rest consists of granular qtz, chl-act mixtures, and sulfides+mt and minor hm; there are a couple of ribbons/veins of coarse grained py and cp, but much of the sulfide is fine grained and disseminated; no carbonate or anh (pore space is likely to be sites of dissolved anh); paragenesis appears to be py-->mt-->cp; py and mt are commonly brecciated with fracture space filled with cp; strong brecciation limits py grain size and produces angular fragments | 5-1200 | 300 |
| 52s | 5% pore space likely from dissolved anh; qtz-carb-sulfide-bt veins with py-cp in contact with carb; abundant carb and hardly any py; should generate alkaline tailings; abundant fine grained cubes of fluorite | 20-750 | 200 |
| 54 | Strong foliation imparted by aligned bt grains; minor apatite in relict plag sites replaced by ser; patchy Fe-carb in veins with cp and locally replacing bt; no py in sample | NA | NA |

**TABLE J-3**
**ELEMENTAL CONCENTRATIONS IN PRE-HUMIDITY CELL TESTS DETERMINED WITH X-RAY DIFFRACTION BY MWH**

| Test ID | Major Elements | Minor Elements | Trace Elements |
|---|---|---|---|
| 2 | quartz, plagioclase (labradorite) | K-Feldspar (microcline), biotite, muscovite | plagioclase (albite), plagioclase (anorthite), ankerite, alunite, illite, chlorite |
| 11 | quartz, muscovite | biotite | K-feldspar (microcline), plagioclase (albite), plagioclase (anorthite), pyrite, alunite, kaolinite, chlorite |
| 12 | NA | NA | NA |
| 14 | quartz, muscovite | plagioclase (albite), biotite | K-feldspar (microcline), plagioclase (labradorite), plagioclase (anorthite), pyrite, chalcopyrite, chlorite |
| 21 | quartz, muscovite | - | pyrite, kaolinite |
| 28 | quartz, muscovite | kaolinite | plagioclase (albite), pyrite, alunite |
| 34 | quartz, muscovite | biotite | K-feldspar (microcline), plagioclase (albite), plagioclase (anorthite), pyrite, alunite, chalcopyrite, kaolinite, illite, chlorite |
| 38 | quartz, plagioclase (labradorite) | K-feldspar (microcline), plagioclase (anorthite), illite | plagioclase (albite), ankerite, alunite, goethite, celestine, muscovite |
| 39 | quartz, muscovite | biotite | K-feldspar (microcline), plagioclase (albite), plagioclase (labradorite), plagioclase (anorthite), magnesite, pyrite, alunite, chalcopyrite, kaolinite, illite, chlorite |
| 44 | quartz, muscovite | kaolinite | plagioclase (albite), pyrite, alunite, sphalerite |
| 49s | quartz | pyrite | plagioclase (albite), kaolinite |
| 50 | quartz | - | pyrite, chalcopyrite, kaolinite, illite, chlorite, muscovite |
| 52s | quartz, muscovite | plagioclase (albite), biotite | K-feldspar (microcline), plagioclase (labradorite), plagioclase (anorthite), magnesite, pyrite, chalcopyrite, kaolinite, chlorite, brucite |
| 54 | quartz, muscovite | biotite | K-feldspar (microcline), plagioclase (albite), plagioclase (anorthite), pyrite, alunite, rutile, chalcopyrite, kaolinite, chlorite |

Note: Major elements represent concentrations ≥15%. Minors elements represent concentrations <15% but ≥5%. Trace elements represent concentrations <5% but ≥1%. Detection limit is about 1% so minerals reported at lower concentrations were not included. NA = not analyzed

**APPENDIX K**
**MINERALOGIC RESULTS FROM X-RAY DIFFRACTION AND PETROGRAPHIC ANALYSIS**
**(HUMIDITY CELL TESTING POST-MORTEM MATERIAL)**

**APPENDIX K**
**ELEMENTAL CONCENTRATIONS IN POST-HUMIDITY CELL TESTS DETERMINED WITH X-RAY DIFFRACTION BY MWH**

| Test ID | Major Elements | Minor Elements | Trace Elements |
|---|---|---|---|
| 2 | quartz, muscovite | biotite | K-feldspar (microcline), plagioclase (albite), plagioclase (oligoclase), plagioclase (labradorite), plagioclase (anorthite), pyrite, anhydrite, alunite, sphalerite, ferrihydrite, hornblende, chalcopyrite |
| 11 | quartz, muscovite | - | plagioclase (albite), pyrite, alunite, hornblende, kaolinite |
| 11 (crust) | quartz, muscovite | - | plagioclase (oligoclase), pyrite, alunite, hornblende, kaolinite |
| 12 | quartz, biotite | muscovite | K-feldspar (microcline), plagioclase (labradorite), plagioclase (anorthite), calcite, anhydrite, gypsum, alunite, hematite, sphalerite, ferrihydrite, chalcopyrite, halloysite, kaolinite, smectite, chlorite |
| 12 (crust) | quartz, muscovite | biotite | K-feldspar (microcline), pyrite, anhydrite, alunite, sphalerite, ferrihydrite, hornblende, kaolinite, illite |
| 14 | quartz, biotite | muscovite, gypsum | K-feldspar (microcline), plagioclase (albite), plagioclase (labradorite), plagioclase (anorthite), calcite, anhydrite, hematite, ferrihydrite, chalcopyrite, smectite, chlorite |
| 21 | quartz, muscovite | illite | pyrite, anhydrite, alunite, sphalerite, ferrihydrite, chlorite |
| 21 (crust) | quartz, muscovite | illite | plagioclase (albite), plagioclase (oligoclase), plagioclase (anorthite), pyrite, anhydrite, alunite, ferrihydrite, smectite, chlorite |
| 28 | quartz, muscovite | illite | K-feldspar (microcline), pyrite, sphalerite, ferrihydrite, halloysite, kaolinite, |
| 28 (crust) | quartz | illite, muscovite | K-feldspar (microcline), plagioclase (albite), plagioclase (oligoclase), plagioclase (labradorite), calcite, pyrite, alunite, hematite, ferrihydrite, chalcopyrite, halloysite, kaolinite, smectite, biotite, chlorite |
| 34 | quartz | illite, muscovite, chlorite | K-feldspar (microcline), plagioclase (albite), plagioclase (oligoclase), plagioclase (labradorite), dolomite, pyrite, anhydrite, alunite, hematite, ferrihydrite, chalcopyrite, halloysite, kaolinite, smectite |
| 34 (wall ppt) | quartz | illite, muscovite, chlorite | K-feldspar (microcline), plagioclase (albite), plagioclase (oligoclase), plagioclase (labradorite), plagioclase (anorthite), dolomite, pyrite, hematite, ferrihydrite, chalcopyrite |

**APPENDIX K**
**ELEMENTAL CONCENTRATIONS IN POST-HUMIDITY CELL TESTS DETERMINED WITH X-RAY DIFFRACTION BY MWH (continued)**

| Test ID | Major Elements | Minor Elements | Trace Elements |
|---|---|---|---|
| 38 | quartz, muscovite | illite | K-feldspar (microcline), plagioclase (albite), plagioclase (oligoclase), plagioclase (labradorite), plagioclase (anorthite), pyrite, alunite, sphalerite, ferrihydrite, halloysite, kaolinite, |
| 39 | plagioclase (albite), plagioclase (labradorite), ferrihydrite, muscovite | quartz, plagioclase (anorthite), hornblende | K-feldspar (microcline), calcite, sphalerite, smectite, chlorite |
| 44 | quartz, muscovite | ferrihydrite, illite | plagioclase (oligoclase), dolomite, pyrite, anhydrite, alunite, sphalerite, halloysite, kaolinite, smectite |
| 49s | quartz | ferrihydrite, kaolinite | K-feldspar (microcline), plagioclase (albite), pyrite, sphalerite, halloysite |
| 50 | quartz | chalcopyrite, illite, chlorite, muscovite | K-feldspar (microcline), calcite, pyrite, hematite, ferrihydrite, kaolinite, biotite |
| 52s | quartz | plagioclase (labradorite), plagioclase (anorthite), calcite, hornblende, muscovite | K-feldspar (microcline), ferrihydrite, chalcopyrite, biotite, chlorite |
| 54 | quartz, muscovite | ferrihydrite, biotite | K-feldspar (microcline), plagioclase (labradorite), calcite, anhydrite, chalcopyrite, kaolinite |

Notes: Major elements represent concentrations ≥15%. Minors elements represent concentrations <15% but ≥5%. Trace elements represent concentrations <5% but ≥1%. Detection limit is about 1% so minerals reported at lower concentrations were not included. ppt = precipitate.

# APPENDIX L
# SCANNING ELECTRON MICROSCOPE PHOTOGRAPHS

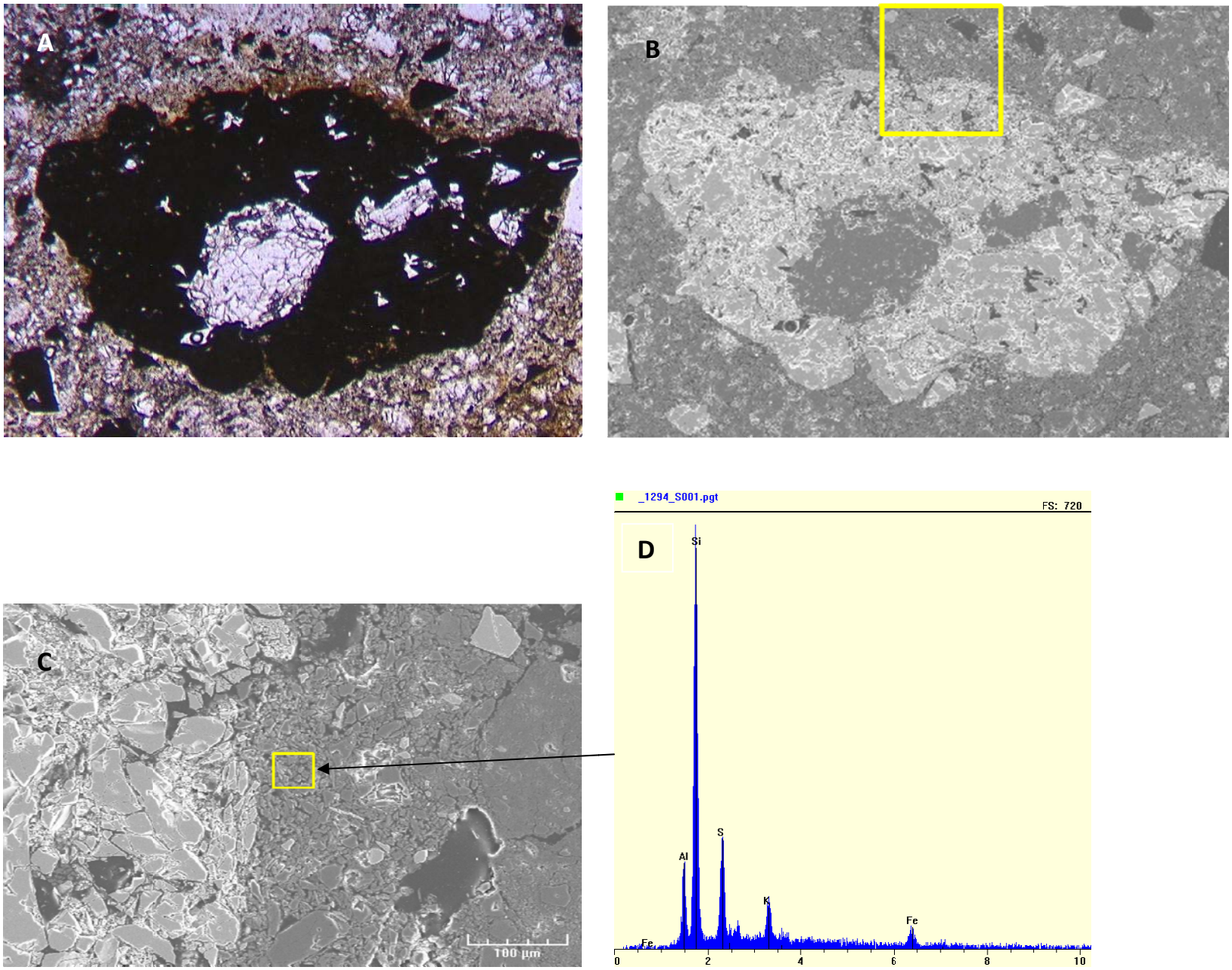



Figure L-1 Quartzite with phyllic alteration. (A) Transmitted light photograph of sulfide grain showing staining from oxidation; (B) SEM image of same grain with highlighted area containing staining expanded in (C). (D) EDX spectra of stained area showing a chemical signature consistent with jarosite.

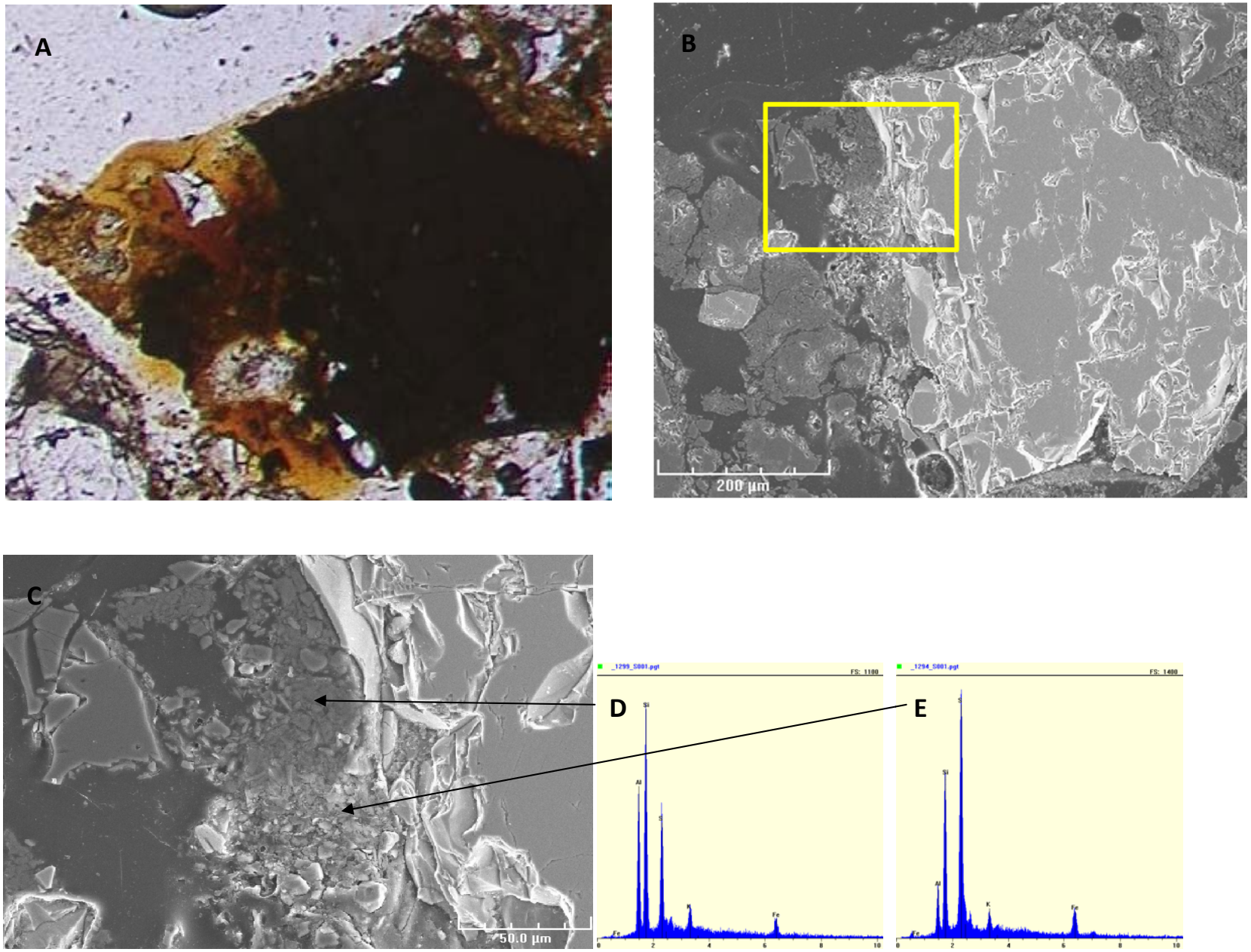



Figure L-2 Quartzite with phyllic alteration. (A) Transmitted light photograph of sulfide grain showing staining from oxidation. (B) SEM image of same grain with highlighted area containing staining expanded in (C). (D) EDX spectra of darker stained area showing a chemical signature consistent with jarosite with a higher alumina and silica content than the lighter area which contains more sulfur (E).

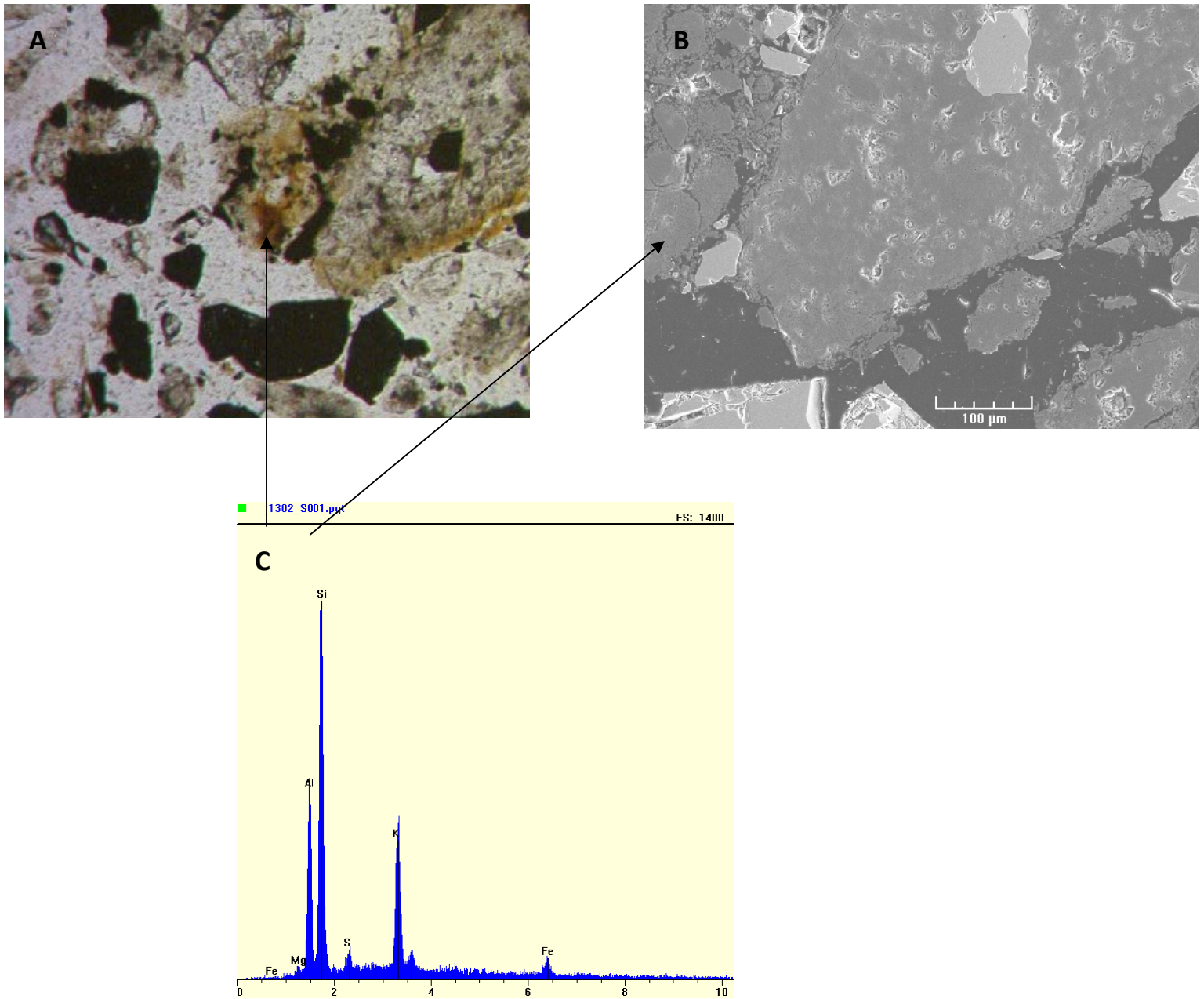



Figure L-3 Cretaceous volcanic sediments with phyllic alteration. (A) Transmitted light photograph of silicate grain showing staining. (B) SEM image of same grain. (C) EDX spectra of stained area showing a chemical signature consistent with jarosite.

**APPENDIX M**
**SUMMARY OF DATA VERIFICATION**

# APPENDIX M

# SUMMARY OF DATA VERIFICATION

## INTRODUCTION

This appendix presents a summary of the data verification results for samples collected to support the Resolution Copper Mining, LLC (RCML) Pre-Feasibility Study (PFS). The samples addressed in this verification were collected between August 2008 and May 2010.

Samples were analyzed as whole rock, acid-base accounting (ABA), net acid generation (NAG), synthetic precipitation leaching procedure (SPLP), and/or humidity cell tests (HCTs) and/or saturation column testing (SCT) for one or more of the following:

- Metals
- Anions
- Gross alpha and/or beta
- Acidity
- Alkalinity
- pH
- Percent solids
- Electrical conductivity
- Radium
- Sulfur, variety of forms

The results of the sample analyses are summarized in Appendices A though F and Appendix H. Originally, there were 54 humidity cells, but after 10 weeks, 18 were switched to shoebox containers due to limited flow through the columns. An "S" was added to the field identification to indicate the change in Appendix F. Samples were analyzed by ACZ Laboratories, Inc. of Steamboat Springs, Colorado, Chemac Environmental Services of Centennial, Colorado, (Chemac). Humidity cells and shoeboxes were set up, maintained, and sampled by Chemac Environmental Services. The following quality assurance items were reviewed as part of the data verification and compared with acceptance

criteria documented in the project quality assurance project plan (QAPP) based on the Arizona Department of Health Services (ADHS) Lab Data Qualifiers (ADHS, 2003):

- Sample collection and sample extract holding times
- Internal standard (IS)
- Continuing calibration blank sample results (CCB)
- Laboratory method blank sample results (MB)
- Laboratory fortified blank (LFB) percent recoveries
- Laboratory replicate (LR)
- Matrix spike/matrix spike duplicate (MS/MSD) sample percent recoveries (where applicable)
- MS/MSD relative percent differences (RPDs) (where applicable)
- Serial dilutions
- Inductively coupled plasma (ICP) interference check standard (ICS)
- Post-digestion spike
- Field duplicate sample RPDs
- Laboratory observations

## DATA VERIFICATION RESULTS

**Sample Collection and Sample and Sample Extract Holding Times.** All samples were properly collected with one exception listed in Table M-1 with "PRES" as the QC type. All sample analyses were performed within the method specified holding times with the following exceptions. Samples that were not within method specified holding times are listed in the attached table with "HT" as the QC type.

**Internal Standard Recoveries Evaluation.** Internal standards are used to assess accuracy and to determine the concentration of target analytes in samples for some metals analyses. All IS recoveries met method acceptance criteria with the exceptions listed in the attached table with "IS" as the QC type.

**Initial and Continuing Calibration Blank Sample Evaluation.** Initial and continuing calibration blank samples were analyzed with each sample batch for metals analyses to determine whether metals were introduced into samples during preparation and/or analysis by the laboratory. No sample data were qualified due to ICB/CCB results with the exceptions listed in the attached table with "CCB" as the QC type.

**Laboratory Method Blank Sample Results.** Laboratory method blanks were analyzed for each method according the laboratory SOPs. No target analytes were detected in the method blank samples with the exceptions listed in the attached table with "MB" as the QC type.

**Laboratory Fortified Blank Samples Percent Recoveries.** Laboratory fortified blank samples were prepared and analyzed with each method and laboratory sample batch according to the laboratory SOPs. All LFB recoveries were within laboratory acceptance criteria with the exceptions listed in the attached table with "LFB" as the QC type.

**Laboratory Replicate Sample Evaluation.** For metals and water quality analyses the laboratory prepared and analyzed a replicate sample. The RPD was calculated between the parent and laboratory replicate sample. All laboratory replicates RPDs were within acceptance criteria with the exceptions listed in the attached table with "LR" as the QC type.

**MS/MSD Sample Percent Recoveries.** Matrix spike and matrix spike duplicate samples were prepared and analyzed with each method and laboratory sample batch according to the laboratory SOPs. All MS/MSD recoveries were within laboratory acceptance criteria with the exceptions listed in the attached table with "MS" and/or "MSD" as the QC type.

**MS/MSD RPDs.** All MS/MSD RPDs were within laboratory acceptance criteria with the exceptions listed in the attached table with "RPD" as the QC type.

**Serial Dilution Percent Difference Evaluation.** For metals analysis, if a sample contains a metal above the RL and the concentration is high enough that when diluted five-fold the concentration is still above the RL then a serial dilution was analyzed to evaluate precision. All serial dilution RPDs met acceptance criteria with the exceptions listed in the attached table with "SD" as the QC type.

**Inductively Coupled Plasma Interference Check Samples.** The ICP ICS verifies the laboratory inter-element and background correction factors. All ICS met acceptance criteria with the exceptions listed in the attached table with "ICS" as the QC type.

**Post-Digestion Spike.** For metals analysis, a post-digestion spike is also performed in addition to the MS/MSD sample analysis. For a post-digestion spike, the sample is spiked after digestion but before

analysis. The same criteria used to evaluate the MS/MSD samples were used to evaluate the post digestion spike results. All PDS recoveries were within acceptance criteria.

**Field Duplicate Sample RPDs.** Two field duplicate samples were collected during this sampling event. The RPDs for all analytes detected above the reporting limit were within the work plan acceptance criteria with the exceptions listed in the attached table with "FD" as the QC type.

**Laboratory Observations.** Data were qualified based on laboratory observations which were noted in the laboratory reports. Calibration standards which did not meet acceptance criteria were noted. Calibrations were not reviewed as part of the verification performed on the analyses addressed in this report. If the laboratory noted initial calibration verification (ICV) or continuation calibration verifications (CCV) outside acceptance criteria the outliers were confirmed and the data were qualified. The qualified data are listed in the attached table with "ICV" or "CCV" as the QC type. The laboratory also noted matrix interference in one sample which is listed in the table with "MI" as the QC type.

Some whole rock samples were analyzed for gross beta, which was not requested. Once this was discovered the analysis was stopped. The samples analyzed for gross beta (some RES-001C and all RES-002A) were reported in Appendix D.

Humidity cell test samples were initially analyzed weekly for all parameters. As time progressed, some HCT samples were discontinued while others were changed to monthly sampling for most analyses. Analyses performed by Chemac (acidity (total), alkalinity (total), iron (total), pH, specific conductance, and sulfate) continued to be analyzed weekly on samples that were not discontinued.

## SUMMARY

All sample data from this sampling program are usable as qualified and reported.

## REFERENCES

Arizona Department of Health Services (ADHS), 2003. *Lab Data Qualifiers*, Appendix E, November 26, 2003.

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-001C 1502-1505 | 5-Sep-08 | SM2310B | Acidity, Total | 8 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-001C 1502-1505 | 5-Sep-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1502-1505 | 5-Sep-08 | SW6020 | Lead | 0.0008 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1530-1533 | 5-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1530-1533 | 5-Sep-08 | SW6020 | Lead | 0.0008 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1557-1560 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1557-1560 | 5-Sep-08 | SW6020 | Lead | 00.0002 F | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1584-1587 | 5-Sep-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1584-1587 Dup | 5-Sep-08 | SW6010B | Zinc | 0.09 | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1584-1587 | 5-Sep-08 | SW6020 | Lead | 0.0038 | mg/l | MB | 0.00037 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-001C 1584-1587 | 5-Sep-08 | SW6020 | Lead | 0.0011 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1611-1614 | 5-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1611-1614 | 5-Sep-08 | SW6020 | Lead | 0.001 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1639-1642 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1639-1642 | 5-Sep-08 | SW6020 | Lead | 0.0007 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1666-1669 | 5-Sep-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1666-1669 | 5-Sep-08 | SW6020 | Lead | 0.0011 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1693-1696 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-001C 1693-1696 | 5-Sep-08 | SW6020 | Lead | 0.0009 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1711-1714.96 | 5-Sep-08 | E300 | Sulfate (as SO4) | 326 D1 | mg/l | MS | 83% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-001C 1711-1714.96 | 5-Sep-08 | M600 3. | Sulfur Sulfate | 0.57 | % | LR | 28% | R1 | None | RPD exceeded the method control limit. |
| RES-001C 1711-1714.96 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1711-1714.96 | 5-Sep-08 | SW6020 | Lead | 0.0005 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1711-1714.96 | 25-Sep-08 | E300 | Chloride (as Cl) | <30 D1 | mg/l | MS | 87% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-001C 1711-1714.96 | 25-Sep-08 | E300 | Sulfate (as SO4) | 157 D3 | mg/l | MS | 80% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-001C 1711-1714.96 | 25-Sep-08 | M200.7 | Aluminum | 1.2 D3 | mg/l | MS/MSD | 121%/131% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-001C 1745-1748 | 5-Sep-08 | SM2310B | Acidity, Total | 8 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-001C 1745-1748 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1745-1748 | 5-Sep-08 | SW6020 | Lead | 0.0009 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-001C 1771.75-1791.4 | 3-Oct-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-001C 1781-1784 | 12-Sep-08 | SW6010B | Calcium | 622 | mg/l | MB | 53% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-001C 1781-1784 | 12-Sep-08 | SW6010B | Silica | 29.2 | mg/l | MS/MSD | 39%/28% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-001C 1799-1802 | 12-Sep-08 | SM2310B | Acidity, Total | 7 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-001C 1799-1802 | 12-Sep-08 | SW9310 | alpha, Gross | 12 | pci/g | MS | 42% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-001C 1814-1817 | 12-Sep-08 | SW6010B | Zinc | 0.17 | mg/l | FD | 164% | R1 | None | RPD exceeded the method control limit. |
| RES-001C 1814-1817 | 12-Sep-08 | SW6020 | Lead | 0.0131 | mg/l | FD | 173.80% | R1 | None | RPD exceeded the method control limit. |
| RES-001C 1814-1817 | 26-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | MS | 83% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-001C 1837-1840 | 12-Sep-08 | SM2310B | Acidity, Total | 2 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-001C 1855-1858 | 12-Sep-08 | SM2310B | Acidity, Total | 4 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-001C 2041-2044 | 12-Sep-08 | SM2310B | Acidity, Total | 13 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-001C 2164.4-2166.3 | 12-Sep-08 | E300 | Fluoride | 48 D1 | mg/l | MS | 122% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-001C 2164.4-2166.3 | 12-Sep-08 | SM2310B | Acidity, Total | 562 | mg/l | MB | 12.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-001C 2214-2215 | 12-Sep-08 | SM2310B | Acidity, Total | 14 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-001C 2214-2215 | 26-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | MS/MSD | 83%/84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-001C 2242-2244 | 12-Sep-08 | SM2310B | Acidity, Total | 8 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A 858-861 | 5-Sep-08 | SW6010B | Iron | 0.16 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 858-861 | 23-Sep-08 | E300 | Fluoride | <5 D4 | mg/l | MS | 0% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-002A 858-861 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 562 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 888-891 | 5-Sep-08 | SW6010B | Iron | 0.03 F | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 888-891 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 20 | mg/l | MB | 12.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 927-930 | 5-Sep-08 | SM2310B | Acidity, Total | 2 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 927-930 | 5-Sep-08 | SW6010B | Iron | 0.04 F | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 927-930 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 12 | mg/l | MB | 12.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 965-968 | 5-Sep-08 | SM2310B | Acidity, Total | 6 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 965-968 | 23-Sep-08 | M200.8 | Selenium | 0.0096 | mg/l | MB | 0.0001 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 965-968 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 141 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 992-995 | 5-Sep-08 | SM2310B | Acidity, Total | 2 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 992-995 | 5-Sep-08 | SW6010B | Iron | 0.05 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 992-995 Dup | 5-Sep-08 | SW6010B | Iron | 0.04 F | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 992-995 | 23-Sep-08 | M200.8 | Selenium | 0.084 | mg/l | MB | 0.0001 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 992-995 Dup | 23-Sep-08 | M200.8 | Selenium | 0.0814 | mg/l | MB | 0.0001 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 992-995 | 23-Sep-08 | M200.8 | Thallium | <0.0005 | mg/l | CCV | 111% | V5 | High | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA method 8000B. |
| RES-002A 992-995 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 267 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 992-995 Dup | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 243 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1007-1010 | 23-Sep-08 | M200.8 | Selenium | 0.0601 | mg/l | MB | 0.0001 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A 1007-1010 | 23-Sep-08 | M200.8 | Thallium | <0.0005 | mg/l | CCV | 111% | V5 | High | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA method 8000B. |
| RES-002A 1007-1010 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 20 | mg/l | MB | 12.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1058-1061 | 5-Sep-08 | SM2310B | Acidity, Total | 16 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1058-1061 | 23-Sep-08 | M200.8 | Selenium | 0.0466 | mg/l | MB | 0.0001 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1058-1061 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 283 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1109-1112 | 5-Sep-08 | SM2310B | Acidity, Total | 6 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1109-1112 | 23-Sep-08 | E300 | Chloride (as Cl) | <30 D4 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-002A 1109-1112 | 23-Sep-08 | E300 | Fluoride | <5 D4 | mg/l | MS | 186% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-002A 1109-1112 | 23-Sep-08 | E300 | Sulfate (as SO4) | 667 D4 | mg/l | MS | 85% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-002A 1109-1112 | 23-Sep-08 | M200.7 | Copper | 15.4 D4 | mg/l | MS/MSD | 84%/84.7% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-002A 1109-1112 | 23-Sep-08 | M200.7 | Iron | 24.9 D4 | mg/l | MS/MSD | 51%/53% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-002A 1109-1112 | 23-Sep-08 | M200.8 | Selenium | 0.0351 D4 | mg/l | MB | 0.0001 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1109-1112 | 23-Sep-08 | M200.8 | Thallium | <0.0005 | mg/l | CCV | 111% | V5 | High | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA method 8000B. |
| RES-002A 1109-1112 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 374 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1154-1156 | 5-Sep-08 | SM2310B | Acidity, Total | 2 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1154-1156 | 5-Sep-08 | SW6010B | Iron | 0.5 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1154-1156 | 23-Sep-08 | M200.8 | Selenium | 0.0332 | mg/l | MB | 0.0001 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1154-1156 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 374 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1201-1203 | 5-Sep-08 | SM2310B | Acidity, Total | 119 | mg/l | MB | 10.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1201-1203 | 5-Sep-08 | SM2310B | Acidity, Total | 111 | mg/l | MB | 10.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A 1201-1203 | 5-Sep-08 | SW6010B | Iron | 12.6 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1201-1203 Dup | 5-Sep-08 | SW6010B | Iron | 14.1 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1201-1203 | 23-Sep-08 | M200.7 | Iron | 131 D4 | mg/l | MS/MSD | 80%/70% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-002A 1201-1203 | 23-Sep-08 | M200.8 | Thallium | <0.0005 | mg/l | CCV | 111% | V5 | High | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA method 8000B. |
| RES-002A 1201-1203 | 23-Sep-08 | M200.8 | Thallium | <0.0005 | mg/l | CCV | 111% | V5 | High | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA method 8000B. |
| RES-002A 1201-1203 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 748 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1201-1203 Dup | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 695 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1246-1249 | 5-Sep-08 | SM2310B | Acidity, Total | 16 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1246-1249 | 5-Sep-08 | SW6010B | Iron | 0.28 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1246-1249 | 23-Sep-08 | M200.8 | Thallium | <0.0005 | mg/l | CCV | 111% | V5 | High | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA method 8000B. |
| RES-002A 1246-1249 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 406 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1291-1292 | 5-Sep-08 | SM2310B | Acidity, Total | 51 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1291-1292 | 5-Sep-08 | SW6010B | Iron | 4.02 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1291-1292 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 543 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1325-1328 | 5-Sep-08 | SM2310B | Acidity, Total | 41 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1325-1328 | 5-Sep-08 | SW6010B | Iron | 0.38 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1325-1328 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 458 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1363-1366 | 5-Sep-08 | SM2310B | Acidity, Total | 14 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1363-1366 | 5-Sep-08 | SW6010B | Iron | 0.24 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A 1363-1366 | 23-Sep-08 | M200.8 | Thallium | <0.0005 | mg/l | CCV | 111% | V5 | High | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA method 8000B. |
| RES-002A 1363-1366 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 466 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1395-1397 | 5-Sep-08 | SM2310B | Acidity, Total | 97 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1395-1397 | 5-Sep-08 | SW6010B | Iron | 16.1 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1395-1397 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 716 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1414.6-1417 | 5-Sep-08 | SM2310B | Acidity, Total | 18 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1414.6-1417 | 5-Sep-08 | SW6010B | Iron | 3.05 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1414.6-1417 | 23-Sep-08 | M200.8 | Thallium | <0.0005 | mg/l | CCV | 111% | V5 | High | Calibration verification recovery after a group of samples was above acceptance limits. This target analyte was not detected in the sample. Acceptable per EPA method 8000B. |
| RES-002A 1414.6-1417 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 575 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1454-1457 | 5-Sep-08 | SM2310B | Acidity, Total | 12 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1454-1457 | 5-Sep-08 | SW6010B | Iron | 5.26 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1454-1457 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 374 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1538-1541 | 5-Sep-08 | SM2310B | Acidity, Total | 10 | mg/l | MB | 10.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1538-1541 | 5-Sep-08 | SW6010B | Iron | 0.05 | mg/l | MB | 0.2 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1538-1541 | 23-Sep-08 | SM2310B | Acidity as CaCO3 | 434 | mg/l | MB | 12.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-002A 1583-1586 | 5-Sep-08 | SM2310B | Acidity, Total | 8 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1583-1586 | 5-Sep-08 | SW6010B | Barium | 0.07 | mg/l | SD | 13% | N1 | None | Serial dilution outside acceptance criterion. Sample concentration not high enough to use. |
| RES-002A 1583-1586 | 5-Sep-08 | SW6010B | Potassium | 14.7 | mg/l | SD | 23% | N1 | None | Serial dilution outside acceptance criterion. Matrix interference suspected. |
| RES-002A 1583-1586 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB/SD | 0.045 mg/l/53% | B5N1 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. Serial dilution did not meet acceptance criterion but not used for evaluation because sample concentration too low. |
| RES-002A 1583-1586 | 5-Sep-08 | SW6020 | Cadmium | 0.0032 | mg/l | SD | 327% | N1 | None | Serial dilution outside acceptance criterion. Sample concentration too low to evaluate. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A 1583-1586 | 5-Sep-08 | SW6020 | Lead | 00.0003 F | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1583-1586 | 5-Sep-08 | SW6020 | Uranium | 00.0003 F | mg/l | SD | 250% | N1 | None | Serial dilution outside acceptance criterion. Matrix interference suspected. |
| RES-002A 1583-1586 | 5-Sep-08 | SW9310 | alpha, Gross | 0.49 | pci/g | LR | 3% | R1 | None | RPD exceeded the method control limit. |
| RES-002A 1583-1586 | 25-Sep-08 | M200.7 | Copper | 190 D3 | mg/l | MSD | 293% | M3 | High | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-002A 1627-1630 | 5-Sep-08 | SM2310B | Acidity, Total | 10 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1627-1630 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1627-1630 | 5-Sep-08 | SW6020 | Lead | 00.0002 F | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1732-1735 | 5-Sep-08 | SM2310B | Acidity, Total | 4 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1732-1735 Dup | 5-Sep-08 | SM2310B | Acidity, Total | 6 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1732-1735 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1732-1735 Dup | 5-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1732-1735 | 5-Sep-08 | SW6020 | Lead | 00.0003 F | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1732-1735 Dup | 5-Sep-08 | SW6020 | Lead | 00.0003 F | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1781-1784 | 5-Sep-08 | SM2310B | Acidity, Total | 8 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1781-1784 | 5-Sep-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1781-1784 | 5-Sep-08 | SW6020 | Lead | 00.0003 F | mg/l | MB | 0.00037 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1814-1817 | 5-Sep-08 | SM2310B | Acidity, Total | 8 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1814-1817 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1814-1817 | 5-Sep-08 | SW6020 | Lead | 00.0002 F | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1876-1879 | 5-Sep-08 | SM2310B | Acidity, Total | 37 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-002A 1876-1879 | 5-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-002A 1876-1879 | 5-Sep-08 | SW6020 | Lead | 00.0002 F | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1927-1930 | 5-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1927-1930 | 5-Sep-08 | SW6020 | Lead | 00.0003 F | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1981-1984 | 5-Sep-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.045 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-002A 1981-1984 | 5-Sep-08 | SW6020 | Lead | 0.0013 | mg/l | MB | 0.00037 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1011.88-1012.45 | 19-Sep-08 | SW9320 | Radium-228 | 4.6 | pci/g | LR | 2.48% | R1 | None | RPD exceeded the method control limit. |
| RES-005I 1370.93-1374 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 495 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1380-1383 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 217 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1389-1391.57 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 117 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1396.3-1399.3 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 8 F | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1405-1406.67 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 165 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1410.18-1413.18 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 20 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1419.18-1422.18 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 12 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1419.18-1422.18 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 8 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1428.18-1431.18 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 117 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1437.13-1440.13 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 165 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1446.13-1449.13 | 7-Oct-08 | E245.1 | Mercury | <0.05 D3 | mg/l | MS/MSD | 71%/73% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-005I 1446.13-1449.13 | 7-Oct-08 | M200.7 | Chromium, Total | <0.3 D3 | mg/l | MS/MSD | 117%/119% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-005I 1446.13-1449.13 | 7-Oct-08 | M200.7 | Manganese | <0.1 D3 | mg/l | MS/MSD | 118%/120% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-005I 1446.13-1449.13 | 7-Oct-08 | M200.7 | Silver | 0.1 D3 | mg/l | MS | 81% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-005I 1446.13-1449.13 | 7-Oct-08 | M200.7 | Vanadium | <0.1 D3 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-005I 1446.13-1449.13 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 595 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I 1455.13-1458.13 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 81 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1464.13-1467.13 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 551 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1473.13-1476.13 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 350 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1481-1482.66 | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 245 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1481-1482.66 Dup | 7-Oct-08 | SM2310B | Acidity as CaCO3 | 503 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1487.1-1490.1 | 9-Oct-08 | E245.1 | Mercury | <0.05 D2 | mg/l | MS/MSD | 76%/73% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-005I 1487.1-1490.1 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 740 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1487.1-1490.1 | 19-Sep-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1487.1-1490.1 | 19-Sep-08 | SW6010B | Aluminum | 0.55 | mg/l | MS/SD | 126%/25.5% | M1N1 | High | MS recovery was high. The method control sample recovery was acceptable. Serial dilution did not meet acceptance criterion. Sample concentration not high enough to use as serial dilution. |
| RES-005I 1487.1-1490.1 | 19-Sep-08 | SW6010B | Iron | 0.69 | mg/l | MS/LR | 69%/31% | M2R1 | Low | MS recovery was low. The method control sample recovery was acceptable. LR RPD exceeded the method control limit. |
| RES-005I 1487.1-1490.1 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.056 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1487.1-1490.1 | 19-Sep-08 | SW6020 | Lead | 0.0004 F | mg/l | MB | 0.0008 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1490.1-1493.1 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 766 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1490.1-1493.1 | 19-Sep-08 | SW6010B | Zinc | 0.03 F | mg/l | MB | 0.056 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1490.1-1493.1 | 19-Sep-08 | SW6020 | Lead | 0.0004 F | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1499-1502 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 766 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1499-1502 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.056 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1499-1502 | 19-Sep-08 | SW6020 | Lead | 0.0025 | mg/l | MB | 0.0007 mg.l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I 1506.56-1509.47 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 828 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1506.56-1509.47 | 19-Sep-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1506.56-1509.47 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.056 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1506.56-1509.47 | 19-Sep-08 | SW6020 | Lead | 0.0024 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1515.47-1518.47 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 822 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1515.47-1518.47 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.056 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1515.47-1518.47 | 19-Sep-08 | SW6020 | Lead | 0.0009 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1524.47-1527.47 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 603 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1524.47-1527.47 | 19-Sep-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1524.47-1527.47 | 19-Sep-08 | SW6010B | Zinc | 0.03 F | mg/l | MB | 0.005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1524.47-1527.47 | 19-Sep-08 | SW6020 | Lead | 0.0004 F | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1532.98-1534.97 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 374 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1532.98-1534.97 | 19-Sep-08 | SW6010B | Zinc | 0.03 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1532.98-1534.97 | 19-Sep-08 | SW6020 | Lead | 0.001 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1544-1546.55 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 585 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1544-1546.55 | 19-Sep-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1544-1546.55 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1544-1546.55 | 19-Sep-08 | SW6020 | Lead | 0.0057 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1552.55-1555.58 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 601 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I 1552.55-1555.58 | 19-Sep-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1552.55-1555.58 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1552.55-1555.58 | 19-Sep-08 | SW6020 | Lead | 0.0009 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1559.46-1562.46 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 820 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1559.46-1562.46 | 19-Sep-08 | SW6010B | Zinc | 0.03 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1559.46-1562.46 | 19-Sep-08 | SW6020 | Lead | 0.001 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1568.46-1571.46 | 9-Oct-08 | E245.1 | Mercury | <0.05 D2 | mg/l | MS/MSD | 80%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-005I 1568.46-1571.46 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 844 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1568.46-1571.46 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1568.46-1571.46 | 19-Sep-08 | SW6020 | Lead | 0.0007 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1577.46-1580.46 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 599 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1577.46-1580.46 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 686 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1577.46-1580.46 | 19-Sep-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1577.46-1580.46 | 19-Sep-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1577.46-1580.46 | 19-Sep-08 | SW6010B | Zinc | 0.03 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1577.46-1580.46 Dup | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1577.46-1580.46 | 19-Sep-08 | SW6020 | Lead | 0.0018 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1577.46-1580.46 Dup | 19-Sep-08 | SW6020 | Lead | 0.0022 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1586.46-1589.46 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 706 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I 1586.46-1589.46 | 19-Sep-08 | SW6010B | Zinc | 0.03 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1586.46-1589.46 | 19-Sep-08 | SW6020 | Lead | 0.0003 F | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1595.46-1598.46 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 862 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1595.46-1598.46 | 19-Sep-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1595.46-1598.46 | 19-Sep-08 | SW6010B | Zinc | 0.03 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1595.46-1598.46 | 19-Sep-08 | SW6020 | Lead | 0.0015 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1604.46-1607.46 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 659 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1604.46-1607.46 | 19-Sep-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1604.46-1607.46 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1604.46-1607.46 | 19-Sep-08 | SW6020 | Lead | 0.0023 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1613.46-1616.46 | 9-Oct-08 | E300 | Fluoride | <10 D2 | mg/l | MS | 0% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-005I 1613.46-1616.46 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 710 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1613.46-1616.46 Dup | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 745.8 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1613.46-1616.46 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1613.46-1616.46 | 19-Sep-08 | SW6020 | Lead | 0.0013 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1616.46-1619 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 848 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1616.46-1619 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1616.46-1619 | 19-Sep-08 | SW6020 | Lead | 0.0016 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1626.54-1627.16 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 99 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I 1626.54-1627.16 | 19-Sep-08 | E300 | Sulfate (as SO4) | <100 D2 | mg/l | MS | 86% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-005I 1626.54-1627.16 | 19-Sep-08 | SW6010B | Zinc | 0.03 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1626.54-1627.16 | 19-Sep-08 | SW6020 | Lead | 0.0015 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1627.16-1630 | 9-Oct-08 | SM2310B | Acidity as CaCO3 | 219 | mg/l | MB | 10.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1627.16-1630 | 19-Sep-08 | SW6010B | Zinc | 0.04 F | mg/l | MB | 0.0005 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1627.16-1630 | 19-Sep-08 | SW6020 | Lead | 0.0007 | mg/l | MB | 0.0007 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-005I 1630.5-1631.5 | 10-Oct-08 | SM2310B | Acidity, Total | 6 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1630.5-1631.5 | 10-Oct-08 | SW6010B | Boron | 00.04 F | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1630.5-1631.5 | 10-Oct-08 | SW6010B | Sodium | 3.2 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1630.5-1631.5 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1630.5-1631.5 | 10-Oct-08 | SW9320 | Radium-228 | 10 | pci/g | LR | 130.6%/3.69% | R1 | None | RPD exceeded the method control limit. |
| RES-005I 1632.56-1635.56 | 10-Oct-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1632.56-1635.56 | 10-Oct-08 | SW6010B | Boron | 0.08 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1632.56-1635.56 | 10-Oct-08 | SW6010B | Sodium | 3.8 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1632.56-1635.56 | 10-Oct-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1652-1654.93 | 10-Oct-08 | SW6020 | Lead | <0.0005 | mg/l | ICS | 0.00102mg/l | N1 | None | Analyte detected in interference check standard but not detected in sample. |
| RES-005I 1677.8-1680.8 | 10-Oct-08 | M600 3. | Sulfur Sulfate | 0.56 | % | FD | 73% | R1 | None | RPD exceeded the method control limit. |
| RES-005I 1677.8-1680.8 | 10-Oct-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1677.8-1680.8 | 10-Oct-08 | SW6010B | Boron | 0.09 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1677.8-1680.8 | 10-Oct-08 | SW6010B | Sodium | 3.9 | mg/l | MB/LR | 3 mg/l/28.7 RPD | B1R1 | None | Target analyte detected in method blank at or above the method reporting limit. LR RPD exceeded the method control limit. |
| RES-005I 1677.8-1680.8 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1677.8-1680.8 | 10-Oct-08 | SW9320 | Radium-228 | 9.7 | pci/g | FD | 96.2%/3.17% | R1 | None | RPD exceeded the method control limit. |
| RES-005I 1677.8-1680.8 | 29-Oct-08 | E300 | Fluoride | <5 D1 | mg/l | MS | 127% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-005I 1677.8-1680.8 | 29-Oct-08 | M200.7 | Copper | 80 D3 | mg/l | MS/MSD | -28%/13% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-005I 1677.8-1680.8 | 29-Oct-08 | M200.7 | Iron | 7.8 D3 | mg/l | MS/MSD | 152%/151% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-005I 1695.23-1697.23 | 10-Oct-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1695.23-1697.23 | 10-Oct-08 | SW6010B | Boron | 0.08 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I 1695.23-1697.23 | 10-Oct-08 | SW6010B | Sodium | 4.7 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1695.23-1697.23 | 10-Oct-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1711.23-1713.23 | 10-Oct-08 | SW6010B | Boron | 0.08 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1711.23-1713.23 | 10-Oct-08 | SW6010B | Sodium | 3 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1711.23-1713.23 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1727.23-1729.23 | 10-Oct-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1727.23-1729.23 | 10-Oct-08 | SW6010B | Boron | 0.09 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1727.23-1729.23 | 10-Oct-08 | SW6010B | Sodium | 4.7 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1727.23-1729.23 | 10-Oct-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1727.23-1729.23 Dup | 29-Oct-08 | M200.7 | Copper | 70.5 D3 | mg/l | MS/MSD | 38%/35% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-005I 1727.23-1729.23 | 29-Oct-08 | M200.7 | Zinc | 0.85 D3 | mg/l | MS/MSD | 77%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-005I 1730.5-1731.5 | 10-Oct-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1730.5-1731.5 | 10-Oct-08 | SW6010B | Boron | 0.07 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1730.5-1731.5 | 10-Oct-08 | SW6010B | Sodium | 3.1 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1730.5-1731.5 | 10-Oct-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1743.23-1745.23 | 10-Oct-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1743.23-1745.23 | 10-Oct-08 | SW6010B | Boron | 0.08 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1743.23-1745.23 | 10-Oct-08 | SW6010B | Sodium | 3.3 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1743.23-1745.23 | 10-Oct-08 | SW6010B | Zinc | 0.07 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1759.23-1761.23 | 10-Oct-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1759.23-1761.23 | 10-Oct-08 | SW6010B | Boron | 0.1 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1759.23-1761.23 | 10-Oct-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1759.23-1761.23 | 10-Oct-08 | SW6010B | Boron | 0.1 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1759.23-1761.23 | 10-Oct-08 | SW6010B | Sodium | 4.2 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1759.23-1761.23 | 10-Oct-08 | SW6010B | Zinc | 0.07 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1775.23-1778.23 | 10-Oct-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1775.23-1778.23 | 10-Oct-08 | SW6010B | Boron | 0.23 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1775.23-1778.23 | 10-Oct-08 | SW6010B | Sodium | 8.1 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1775.23-1778.23 | 10-Oct-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1794.36-1796.3 | 10-Oct-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1794.36-1796.3 | 10-Oct-08 | SW6010B | Boron | 00.04 F | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1794.36-1796.3 | 10-Oct-08 | SW6010B | Sodium | 2.6 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1794.36-1796.3 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1794.36-1796.3 | 10-Oct-08 | SW9315 | Radium 226 with alpha emitting isotopes | 0.42 | pci/g | MI | NA | N1 | High | High barium tracer recovery due to matrix effect. Noted result would still be undetected if 100% recovery assumed. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I 1811.3-1814.3 | 10-Oct-08 | SM2310B | Acidity, Total | 8 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1811.3-1814.3 | 10-Oct-08 | SW6010B | Boron | 0.09 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1811.3-1814.3 | 10-Oct-08 | SW6010B | Sodium | 3.8 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1811.3-1814.3 | 10-Oct-08 | SW6010B | Zinc | 0.1 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1830.5-1831.5 | 10-Oct-08 | SM2310B | Acidity, Total | 14 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1830.5-1831.5 | 10-Oct-08 | SW6010B | Boron | 0.05 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1830.5-1831.5 | 10-Oct-08 | SW6010B | Sodium | 3.4 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1830.5-1831.5 | 10-Oct-08 | SW6010B | Zinc | 0.08 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1830.5-1831.5 | 10-Oct-08 | SW6020 | Lead | <0.0005 | mg/l | ICS | 0.00102 mg/l | N1 | None | Analyte detected in interference check standard but not detected in sample. |
| RES-005I 1835.3-1838.3 | 10-Oct-08 | SM2310B | Acidity, Total | 6 F | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1835.3-1838.3 | 10-Oct-08 | SW6010B | Boron | 0.06 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1835.3-1838.3 | 10-Oct-08 | SW6010B | Sodium | 3.6 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1835.3-1838.3 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1855.91-1858.91 | 10-Oct-08 | SM2310B | Acidity, Total | 14 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1855.91-1858.91 | 10-Oct-08 | SW6010B | Boron | 0.06 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1855.91-1858.91 | 10-Oct-08 | SW6010B | Sodium | 3.8 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1855.91-1858.91 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1872.9-1875.38 | 10-Oct-08 | SM2310B | Acidity, Total | 32 | mg/l | MB | 10.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1872.9-1875.38 | 10-Oct-08 | SW6010B | Boron | 0.05 | mg/l | MB | 0.105 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1872.9-1875.38 | 10-Oct-08 | SW6010B | Sodium | 3.1 | mg/l | MB | 3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1872.9-1875.38 | 10-Oct-08 | SW6010B | Zinc | 0.07 | mg/l | MB | 0.054 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1875.38-1878.2 | 10-Oct-08 | E300 | Fluoride | 0.3 F | mg/l | MS | 113% | M1 | None | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-005I 1875.38-1878.2 | 10-Oct-08 | SW6010B | Boron | 0.04 F | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1875.38-1878.2 | 10-Oct-08 | SW6010B | Sodium | 1.4 F | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1875.38-1878.2 | 10-Oct-08 | SW6010B | Zinc | 2.87 | mg/l | MB | 0.061 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1875.38-1878.2 | 31-Oct-08 | E300 | Fluoride | <5 D1 | mg/l | MS | 121% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-005I 1875.38-1878.2 | 31-Oct-08 | M200.7 | Copper | 108 D3 | mg/l | MS/MSD | -169%/-155% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-005I 1875.38-1878.2 | 31-Oct-08 | M200.7 | Iron | 30.7 D3 | mg/l | MS/MSD | 36%/37% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I 1875.38-1878.2 | 31-Oct-08 | M200.7 | Zinc | 19.1 D3 | mg/l | MS/MSD | 72%/59% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-005I 1875.38-1878.2 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 509 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1884-1887 | 10-Oct-08 | SW6010B | Silica | 7 | mg/l | RPD | 28% | R4 | None | MS/MSD RPD exceeded the method control limit. Recoveries met acceptance criteria. |
| RES-005I 1884-1887 | 10-Oct-08 | SW6010B | Sodium | 2.8 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1884-1887 | 10-Oct-08 | SW6010B | Zinc | 0.07 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1895-1897.06 | 10-Oct-08 | SW6010B | Boron | 0.07 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1895-1897.06 | 10-Oct-08 | SW6010B | Sodium | 3.1 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1895-1897.06 | 10-Oct-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1895-1897.06 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 342 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1901.49-1902.36 | 10-Oct-08 | SW6010B | Boron | 0.1 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1901.49-1902.36 | 10-Oct-08 | SW6010B | Sodium | 4.4 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1901.49-1902.36 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1901.49-1902.36 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 429 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1917.29-1919.1 | 10-Oct-08 | SW6010B | Boron | 0.22 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1917.29-1919.1 | 10-Oct-08 | SW6010B | Sodium | 10.2 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1917.29-1919.1 | 10-Oct-08 | SW6010B | Zinc | 0.07 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1917.29-1919.1 | 10-Oct-08 | SW9320 | Radium-228 | 5.8 | pci/g | LR | 208% | R1 | None | RPD exceeded the method control limit. |
| RES-005I 1917.29-1919.1 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 348 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1923.1-1925.3 | 10-Oct-08 | SW6010B | Boron | 0.09 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1923.1-1925.3 | 10-Oct-08 | SW6010B | Sodium | 4.4 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1923.1-1925.3 | 10-Oct-08 | SW6010B | Zinc | 0.07 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1923.1-1925.3 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 576 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 1955.06-1958.06 | 10-Oct-08 | SW6010B | Boron | 0.13 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1955.06-1958.06 | 10-Oct-08 | SW6010B | Sodium | 6.6 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1955.06-1958.06 | 10-Oct-08 | SW6010B | Zinc | 0.12 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1955.06-1958.06 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 131 | mg/l | MB | 28.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1960.5-1961.5 | 10-Oct-08 | SW6010B | Boron | 0.14 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1960.5-1961.5 | 10-Oct-08 | SW6010B | Sodium | 7.7 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-005I 1960.5-1961.5 | 10-Oct-08 | SW6010B | Zinc | 0.07 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1960.5-1961.5 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 134 | mg/l | MB | 28.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 1979.06-1982.06 | 10-Oct-08 | SW6010B | Boron | 0.14 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1979.06-1982.06 | 10-Oct-08 | SW6010B | Sodium | 9.1 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1979.06-1982.06 | 10-Oct-08 | SW6010B | Zinc | 0.09 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 1979.06-1982.06 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 107 | mg/l | MB | 28.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 2008.11-2011.11 | 10-Oct-08 | SW6010B | Boron | 0.12 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2008.11-2011.11 | 10-Oct-08 | SW6010B | Sodium | 6.9 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2008.11-2011.11 | 10-Oct-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2008.11-2011.11 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 221 | mg/l | MB | 28.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 2032.11-2035.11 | 10-Oct-08 | SW6010B | Boron | 0.1 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2032.11-2035.11 | 10-Oct-08 | SW6010B | Sodium | 6.6 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2032.11-2035.11 | 10-Oct-08 | SW6010B | Zinc | 0.07 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2032.11-2035.11 | 31-Oct-08 | M200.7 | Copper | 161 D3 | mg/l | MS/MSD | -13%/-84% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-005I 2032.11-2035.11 | 31-Oct-08 | M200.7 | Silver | 0.27 D3 | mg/l | MS/MSD | 77%/75% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-005I 2032.11-2035.11 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 452 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005I 2049.84-2052.84 | 10-Oct-08 | SW6010B | Boron | 0.04 F | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2049.84-2052.84 | 10-Oct-08 | SW6010B | Sodium | 2.4 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2049.84-2052.84 | 10-Oct-08 | SW6010B | Zinc | 0.15 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2049.84-2052.84 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 281 | mg/l | MB | 28.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-005I 2061.84-2064.84 | 10-Oct-08 | SW6010B | Boron | 0.09 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2061.84-2064.84 | 10-Oct-08 | SW6010B | Sodium | 4 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2061.84-2064.84 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005I 2061.84-2064.84 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 308 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-005J 1660.4-1668.47 | 10-Oct-08 | SW6010B | Boron | 0.17 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005J 1660.4-1668.47 | 10-Oct-08 | SW6010B | Sodium | 6 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005J 1660.4-1668.47 | 10-Oct-08 | SW6010B | Zinc | 0.07 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-005J 1660.4-1668.47 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 312 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1247.48-1250.48 | 3-Oct-08 | SW6010B | Boron | 0.13 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1247.48-1250.48 | 3-Oct-08 | SW6010B | Silica | 20.7 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-006D 1247.48-1250.48 | 3-Oct-08 | SW6010B | Sodium | 17.1 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1247.48-1250.48 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 16 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1405.47-1408.44 | 3-Oct-08 | SW6010B | Boron | 0.11 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1405.47-1408.44 | 3-Oct-08 | SW6010B | Silica | 13.2 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1405.47-1408.44 | 3-Oct-08 | SW6010B | Sodium | 8.1 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1405.47-1408.44 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 197 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1450.44-1453.44 | 3-Oct-08 | SW6010B | Boron | 0.11 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1450.44-1453.44 | 3-Oct-08 | SW6010B | Silica | 6.1 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1450.44-1453.44 | 3-Oct-08 | SW6010B | Sodium | 7.5 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1450.44-1453.44 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 784 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1495.44-1498.44 | 3-Oct-08 | SW6010B | Boron | 0.1 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1495.44-1498.44 | 3-Oct-08 | SW6010B | Silica | 5.4 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1495.44-1498.44 | 3-Oct-08 | SW6010B | Sodium | 4.8 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1495.44-1498.44 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 503 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1532.81-1535.81 | 3-Oct-08 | SM2310B | Acidity, Total | 6 F | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1532.81-1535.81 | 3-Oct-08 | SW6010B | Boron | 0.1 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1532.81-1535.81 | 3-Oct-08 | SW6010B | Silica | 7.3 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1532.81-1535.81 | 3-Oct-08 | SW6010B | Sodium | 7.1 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1532.81-1535.81 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 631 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1577.43-1580.43 | 3-Oct-08 | SW6010B | Boron | 0.11 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1577.43-1580.43 | 3-Oct-08 | SW6010B | Boron | 0.11 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1577.43-1580.43 | 3-Oct-08 | SW6010B | Silica | 9.5 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1577.43-1580.43 | 3-Oct-08 | SW6010B | Sodium | 4.8 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1577.43-1580.43 | 23-Oct-08 | E300 | Fluoride | <5 D1 | mg/l | MS | 143% | M1 | Low | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-006D 1577.43-1580.43 | 23-Oct-08 | M200.7 | Copper | 45.3 D3 | mg/l | MS/MSD | 53%/-116% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-006D 1577.43-1580.43 | 23-Oct-08 | M200.7 | Iron | 61.1 D3 | mg/l | MS/MSD | 162%/76% | M3 | HL | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-006D 1577.43-1580.43 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 354 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-006D 1577.43-1580.43 Dup | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 338 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1600.5-1601.5 | 3-Oct-08 | SW6010B | Boron | 0.1 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1600.5-1601.5 | 3-Oct-08 | SW6010B | Silica | 9.3 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1600.5-1601.5 | 3-Oct-08 | SW6010B | Sodium | 4.3 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1622.43-1625.43 | 3-Oct-08 | SW6010B | Boron | 0.09 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1622.43-1625.43 | 3-Oct-08 | SW6010B | Silica | 7 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1622.43-1625.43 | 3-Oct-08 | SW6010B | Sodium | 3.3 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1622.43-1625.43 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 543 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1667.43-1670.43 | 3-Oct-08 | SM2310B | Acidity, Total | 18 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1667.43-1670.43 | 3-Oct-08 | SW6010B | Boron | 0.13 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1667.43-1670.43 | 3-Oct-08 | SW6010B | Silica | 6.6 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1667.43-1670.43 | 3-Oct-08 | SW6010B | Sodium | 3.9 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1667.43-1670.43 | 23-Oct-08 | M200.7 | Iron | 102 D3 | mg/l | MS/MSD | 131%/149% | M3 | High | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-006D 1667.43-1670.43 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 683 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1705.4-1708.4 | 3-Oct-08 | SM2310B | Acidity, Total | 58 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1705.4-1708.4 | 3-Oct-08 | SW6010B | Boron | 0.16 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1705.4-1708.4 | 3-Oct-08 | SW6010B | Silica | 6.6 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1705.4-1708.4 | 3-Oct-08 | SW6010B | Sodium | 4.8 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1705.4-1708.4 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 1050 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1750.4-1753.4 | 3-Oct-08 | SM2310B | Acidity, Total | 62 | mg/l | MB | 16.1 mg/L | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1750.4-1753.4 | 3-Oct-08 | SW6010B | Aluminum | 7.26 | mg/l | SD | 10.10% | N1 | NA | Serial dilution outside acceptance criterion. |
| RES-006D 1750.4-1753.4 | 3-Oct-08 | SW6010B | Iron | 9.28 | mg/l | MSD | 71% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-006D 1798.4-1801.4 | 3-Oct-08 | SM2310B | Acidity, Total | 64 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1843.4-1846.4 | 3-Oct-08 | SM2310B | Acidity, Total | 76 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1898.21-1901.09 | 3-Oct-08 | SM2310B | Acidity, Total | 26 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1927.23-1930.23 | 3-Oct-08 | SM2310B | Acidity, Total | 20 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1927.23-1930.23 | 3-Oct-08 | SM2310B | Acidity, Total | 24 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-006D 1952.56-1954.83 | 3-Oct-08 | SM2310B | Acidity, Total | 8 F | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 1954.83-197 | 10-Oct-08 | SW6010B | Boron | 0.12 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1954.83-197 | 10-Oct-08 | SW6010B | Sodium | 4.6 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1954.83-197 | 10-Oct-08 | SW6010B | Zinc | 0.08 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-006D 1954.83-197 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 432 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1980.6-1983.6 | 3-Oct-08 | SM2310B | Acidity, Total | 177 | mg/l | MB | 16.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 1995.6-1998.6 | 3-Oct-08 | SM2310B | Acidity, Total | 203 | mg/l | MB | 16.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-006D 2022.66-2025.66 | 3-Oct-08 | SM2310B | Acidity, Total | 85 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 2040.66-2043.66 | 3-Oct-08 | E300 | Fluoride | 6.8 D2 | mg/l | MSD | 118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-006D 2040.66-2043.66 | 3-Oct-08 | SM2310B | Acidity, Total | 36 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 2091.13-2094.13 | 3-Oct-08 | SM2310B | Acidity, Total | 27 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 2115.47-2118.47 | 3-Oct-08 | SM2310B | Acidity, Total | 8 F | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 2125.45-2128.42 | 3-Oct-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-006D 2137.08-2138.5 | 3-Oct-08 | SM2310B | Acidity, Total | 117 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 199.78-200.3 | 12-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 199.78-200.3 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 193 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 281.14-281.64 | 12-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 281.14-281.64 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 4 F | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 348.3-348.83 | 12-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 348.3-348.83 | 12-Sep-08 | SW9320 | Radium-228 | 6.6 | pci/g | MS | 36.50% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009 348.3-348.83 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 410 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 447.23-447.8 | 12-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 447.23-447.8 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | <10 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 485.12-485.71 | 12-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 485.12-485.71 | 28-Sep-08 | E300 | Fluoride | <5 D1 | mg/l | MS | 0% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009 485.12-485.71 | 28-Sep-08 | E300 | Sulfate (as SO4) | <30 D1 | mg/l | MS | 88% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009 485.12-485.71 | 28-Sep-08 | M200.7 | Aluminum | <0.8 D3 | mg/l | MS/MSD | 149%/149% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-009 485.12-485.71 | 28-Sep-08 | M200.7 | Copper | 00.11 FD3 | mg/l | MSD | 79% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009 485.12-485.71 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | MS | 81% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009 485.12-485.71 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | <10 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 557.06-557.56 | 12-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 557.06-557.56 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 157 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 647.52-648.1 | 12-Sep-08 | SW6010B | Zinc | 00.02 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 647.52-648.1 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | <10 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 718-718.58 | 12-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 718-718.58 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 507 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 718-718.58 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 422 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 718-718.58 Dup | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 507 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 810.42-810.98 | 12-Sep-08 | SW6010B | Zinc | 00.03 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 810.42-810.98 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | <10 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 906.08-906.58 | 12-Sep-08 | SW6010B | Zinc | 00.02 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 906.08-906.58 | 28-Sep-08 | E245.1 | Mercury | <0.01 | mg/l | PRES | NA | Q3 | None | Improper sample preservation; alternate sample container used. |
| RES-009 906.08-906.58 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 906.08-906.58 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | <10 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 987.9-988.45 | 12-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 987.9-988.45 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 987.9-988.45 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | <10 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 994.67-997.67 | 12-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 994.67-997.67 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 994.67-997.67 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 161 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 1012.16-1014.16 | 12-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 1012.16-1014.16 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 1012.16-1014.16 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 77 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-009 1027.38-1030.3 | 12-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 1027.38-1030.3 | 12-Sep-08 | SW6020 | Lead | <0.0005 | mg/l | LR | 92% | R1 | None | RPD exceeded the method control limit. |
| RES-009 1027.38-1030.3 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 1027.38-1030.3 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 1027.38-1030.3 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | <10 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 1045.3-1048.3 | 12-Sep-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 1045.3-1048.3 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 1045.3-1048.3 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 44 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 1063.3-1066.3 | 12-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 1063.3-1066.3 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 1063.3-1066.3 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 44 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 1081.3-1084.3 | 12-Sep-08 | SW6010B | Zinc | 00.04 F | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 1081.3-1084.3 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 1081.3-1084.3 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 52 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009 1098.34-1100.96 | 12-Sep-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009 1098.34-1100.96 | 28-Sep-08 | M200.7 | Silver | 0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009 1098.34-1100.96 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 97 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009D 1119.32-1122.42 | 12-Sep-08 | SW6010B | Zinc | 0.05 | mg/l | MB | 0.033 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009D 1119.32-1122.42 | 26-Sep-08 | SW6010B | Silica | 16.5 | mg/l | MS | 74.5%/58% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009D 1119.32-1122.42 | 28-Sep-08 | M200.7 | Silver | <0.1 D3 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| RES-009D 1119.32-1122.42 | 28-Sep-08 | SM2310B | Acidity as CaCO3 | 92 | mg/l | MB | 44.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1307.1-1310.1 | 26-Sep-08 | SM2310B | Acidity, Total | 16 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1319.1-1322.1 | 26-Sep-08 | SM2310B | Acidity, Total | 6 F | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1335.41-1338.16 | 26-Sep-08 | SM2310B | Acidity, Total | 6 F | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1351.03-1354.03 | 26-Sep-08 | SM2310B | Acidity, Total | 6 F | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1368.07-1370.69 | 26-Sep-08 | SM2310B | Acidity, Total | 81 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1385.61-1388.61 | 26-Sep-08 | SM2310B | Acidity, Total | 36 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E 1402.22-1404.53 | 26-Sep-08 | SM2310B | Acidity, Total | 6 F | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1410.5-1411.5 | 26-Sep-08 | SM2310B | Acidity, Total | 10 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1418.16-1419.8 | 26-Sep-08 | SM2310B | Acidity, Total | 6 F | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1431.42-1433.8 | 14-Oct-08 | M200.7 | Copper | 66.8 D3 | mg/l | MS/MSD | -1.8%/-4.1% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-009E 1431.42-1433.8 | 14-Oct-08 | M200.7 | Iron | 57 D3 | mg/l | MS/MSD | 73%/75% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-009E 1431.42-1433.8 | 26-Sep-08 | SM2310B | Acidity, Total | 10 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1446.41-1449.41 | 26-Sep-08 | SM2310B | Acidity, Total | 54 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1464.41-1467.41 | 26-Sep-08 | SM2310B | Acidity, Total | 34 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1478.13-1481.13 | 26-Sep-08 | SM2310B | Acidity, Total | 12 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1478.13-1481.13 | 26-Sep-08 | SW6020 | Cadmium | 0.0008 | mg/l | SD | 12.50% | N1 | None | Serial dilution outside acceptance criterion. Sample concentration not high enough to use. |
| RES-009E 1478.13-1481.13 | 26-Sep-08 | SW6020 | Selenium | 0.0008 | mg/l | SD | 19% | N1 | None | Serial dilution outside acceptance criterion. Sample concentration not high enough to use. |
| RES-009E 1496.13-1499.13 | 26-Sep-08 | SM2310B | Acidity, Total | 26 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1510.74-1527.19 | 3-Oct-08 | SM2310B | Acidity, Total | 16 | mg/l | MB | 16.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1514.13-1517.13 | 26-Sep-08 | SM2310B | Acidity, Total | 60 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1532.4-1534.49 | 26-Sep-08 | SM2310B | Acidity, Total | 36 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1540.5-1541.5 | 26-Sep-08 | SM2310B | Acidity, Total | 36 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1547.47-1550.47 | 26-Sep-08 | SM2310B | Acidity, Total | 42 | mg/l | MB | 18.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1565.47-1568.47 | 26-Sep-08 | E300 | Sulfate (as SO4) | 259 D2 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1565.47-1568.47 | 26-Sep-08 | SM2310B | Acidity, Total | 155 | mg/l | MB | 12.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1565.47-1568.47 | 26-Sep-08 | SW6020 | Lead | 0.0029 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1597.32-1599.88 | 26-Sep-08 | E300 | Sulfate (as SO4) | 187 D2 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1597.32-1599.88 | 26-Sep-08 | SM2310B | Acidity, Total | 121 | mg/l | MB | 12.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1597.32-1599.88 | 26-Sep-08 | SW6020 | Lead | 0.0006 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1597.32-1599.88 | 26-Sep-08 | SW9315 | Radium 226 with | 0.49 | pci/g | MS | 41% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E 1602.44-1605 | 26-Sep-08 | E300 | Sulfate (as SO4) | 146 D2 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1602.44-1605 | 26-Sep-08 | SM2310B | Acidity, Total | 76 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1602.44-1605 | 26-Sep-08 | SW6020 | Lead | 0.0023 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1617.38-1619.14 | 26-Sep-08 | E300 | Sulfate (as SO4) | 55.3 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1617.38-1619.14 | 26-Sep-08 | SM2310B | Acidity, Total | 12 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1617.38-1619.14 | 26-Sep-08 | SW6010B | Iron | <0.05 | mg/l | MB | 0.081 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1617.38-1619.14 | 26-Sep-08 | SW6020 | Lead | 0.0005 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1634.46-1637.47 | 26-Sep-08 | E300 | Sulfate (as SO4) | 73.8 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1634.46-1637.47 | 26-Sep-08 | SM2310B | Acidity, Total | 42 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1634.46-1637.47 | 26-Sep-08 | SW6020 | Lead | 0.0006 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1650.14-1652.81 | 26-Sep-08 | E300 | Sulfate (as SO4) | 171 D2 | mg/l | MB | 3.58 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1650.14-1652.81 Dup | 26-Sep-08 | E300 | Sulfate (as SO4) | 191 D2 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1650.14-1652.81 | 26-Sep-08 | SM2310B | Acidity, Total | 80 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1650.14-1652.81 | 26-Sep-08 | SM2310B | Acidity, Total | 76 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1650.14-1652.81 | 26-Sep-08 | SW6020 | Lead | 0.0008 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1650.14-1652.81 Dup | 26-Sep-08 | SW6020 | Lead | 0.0011 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1669.07-1672.07 | 26-Sep-08 | E300 | Sulfate (as SO4) | 69.3 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1669.07-1672.07 | 26-Sep-08 | SM2310B | Acidity, Total | 14 | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1669.07-1672.07 | 26-Sep-08 | SW6010B | Iron | 0.99 | mg/l | MB | 0.081 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1669.07-1672.07 | 26-Sep-08 | SW6020 | Lead | 0.001 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1685.09-1687.47 | 15-Oct-08 | E300 | Fluoride | <5 D1 | mg/l | MS | 139% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| RES-009E 1685.09-1687.47 | 15-Oct-08 | E300 | Sulfate (as SO4) | 315 D1 | mg/l | MS | 113% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E 1685.09-1687.47 | 15-Oct-08 | M200.7 | Copper | 70.7 D3 | mg/l | MS/MSD | -76%/-70% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-009E 1685.09-1687.47 | 15-Oct-08 | M200.7 | Silver | <0.1 D3 | mg/l | MS/MSD | 78%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009E 1685.09-1687.47 | 26-Sep-08 | E300 | Fluoride | 1.4 | mg/l | MS | 87% | M2 | None | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009E 1685.09-1687.47 | 26-Sep-08 | E300 | Sulfate (as SO4) | 20 | mg/l | MB | 3.58 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1685.09-1687.47 | 26-Sep-08 | M600 3. | Sulfur Sulfate | 0.34 | % | LR | 21% | R1 | None | RPD exceeded the method control limit. |
| RES-009E 1685.09-1687.47 | 26-Sep-08 | SM2310B | Acidity, Total | 2 F | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1685.09-1687.47 | 26-Sep-08 | SW6010B | Barium | 0.115 | mg/l | LR | 149% | R1 | None | RPD exceeded the method control limit. |
| RES-009E 1685.09-1687.47 | 26-Sep-08 | SW6010B | Iron | <0.05 | mg/l | MB/LR | 0.081 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1685.09-1687.47 | 26-Sep-08 | SW6020 | Lead | 0.0023 | mg/l | MB/LR | 0.00035 mg/l/23% | B5R1 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. LR RPD exceeded the method control limit. |
| RES-009E 1697.61-1700.61 | 26-Sep-08 | E300 | Sulfate (as SO4) | 35.7 | mg/l | MB | 3.58 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1697.61-1700.61 | 26-Sep-08 | SM2310B | Acidity, Total | 8 F | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1697.61-1700.61 | 26-Sep-08 | SW6020 | Lead | 00.0002 F | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1718.61-1721.61 | 26-Sep-08 | SW6010B | Iron | <0.05 | mg/l | MB | 0.081 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1718.61-1721.61 | 26-Sep-08 | SW6020 | Lead | 0.0012 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1739.63-1742.63 | 15-Oct-08 | M200.7 | Copper | 34.9 D3 | mg/l | MS/MSD | 59%/44% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-009E 1739.63-1742.63 | 15-Oct-08 | M200.7 | Silver | <0.1 D3 | mg/l | MSD | 82% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009E 1739.63-1742.63 | 26-Sep-08 | SM2310B | Acidity, Total | 26 | mg/l | MB | 24.1 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1739.63-1742.63 | 26-Sep-08 | SW6020 | Lead | 00.0003 F | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1760.86-1763.86 | 26-Sep-08 | E300 | Sulfate (as SO4) | 20.4 | mg/l | MB | 3.58 mg/L | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1760.86-1763.86 | 26-Sep-08 | E300 | Sulfate (as SO4) | 19.3 | mg/l | MB | 3.58 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1760.86-1763.86 | 26-Sep-08 | SM2310B | Acidity, Total | 14 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1760.86-1763.86 | 26-Sep-08 | SM2310B | Acidity, Total | 8 F | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1760.86-1763.86 | 26-Sep-08 | SW6010B | Iron | 00.02 F | mg/l | MB | 0.081 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E 1760.86-1763.86 | 26-Sep-08 | SW6020 | Lead | 00.0004 F | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1760.86-1763.86 | 26-Sep-08 | SW6020 | Lead | 00.0004 F | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1789.83-1792.31 | 26-Sep-08 | E300 | Sulfate (as SO4) | 12.5 | mg/l | MB | 3.58 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1789.83-1792.31 | 26-Sep-08 | SW6010B | Barium | <0.02 | mg/l | CCV | 111% | V1 | None | Calibration verification recovery above method acceptance limits. Analyte not detected. |
| RES-009E 1789.83-1792.31 | 26-Sep-08 | SW6010B | Iron | 0.07 | mg/l | MB | 0.081 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1789.83-1792.31 | 26-Sep-08 | SW6020 | Lead | 0.0008 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1798.16-1799.79 | 26-Sep-08 | E300 | Sulfate (as SO4) | 30.6 | mg/l | MB | 3.58 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1798.16-1799.79 | 26-Sep-08 | SM2310B | Acidity, Total | 42 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1798.16-1799.79 | 26-Sep-08 | SW6010B | Barium | <0.02 | mg/l | CCV | 111% | V1 | None | Calibration verification recovery above method acceptance limits. Analyte not detected. |
| RES-009E 1798.16-1799.79 | 26-Sep-08 | SW6010B | Iron | <0.05 | mg/l | MB | 0.081 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1798.16-1799.79 | 26-Sep-08 | SW6020 | Lead | 00.0004 F | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1801.42-1804.15 | 26-Sep-08 | E300 | Sulfate (as SO4) | 144 D2 | mg/l | MB | 3.58 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1801.42-1804.15 | 26-Sep-08 | SM2310B | Acidity, Total | 73 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1801.42-1804.15 | 26-Sep-08 | SW6020 | Lead | 0.0005 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1818.62-1821.62 | 26-Sep-08 | E300 | Sulfate (as SO4) | 114 D2 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1818.62-1821.62 | 26-Sep-08 | SM2310B | Acidity, Total | 38 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1818.62-1821.62 | 26-Sep-08 | SW6020 | Lead | 00.0002 F | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1829.95-1832.47 | 15-Oct-08 | M200.7 | Iron | 50.8 D3 | mg/l | MS/MSD | 64%/69% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| RES-009E 1829.95-1832.48 | 26-Sep-08 | E300 | Sulfate (as SO4) | 213 D2 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1829.95-1832.48 | 26-Sep-08 | SM2310B | Acidity, Total | 44 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1829.95-1832.48 | 26-Sep-08 | SW6020 | Lead | 00.0003 F | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E 1846.66-1849.66 | 26-Sep-08 | E300 | Sulfate (as SO4) | 152 D2 | mg/l | MB | 3.58 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1846.66-1849.66 | 26-Sep-08 | SW6010B | Iron | 00.03 F | mg/l | MB | 0.081 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1846.66-1849.66 | 26-Sep-08 | SW6020 | Lead | 0.0006 | mg/l | MB | 0.00035 mg/l | B5 | None | Target analyte detected in method blank at or above the method reporting limit, but below trigger level or MCL. |
| RES-009E 1862.15-1865.15 | 3-Oct-08 | SW6010B | Boron | 00.03 F | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1862.15-1865.15 | 3-Oct-08 | SW6010B | Silica | 4 | mg/l | MB | 2.18 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1862.15-1865.15 | 3-Oct-08 | SW6010B | Sodium | 20.3 | mg/l | MB | 20.3 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1867.87-1882.37 | 10-Oct-08 | SW6010B | Boron | 0.08 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1867.87-1882.37 | 10-Oct-08 | SW6010B | Sodium | 5.2 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1867.87-1882.37 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1867.87-1882.37 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 27 | mg/l | MB | 28.2 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1880.15-1882.37 | 3-Oct-08 | SW6010B | Boron | 0.05 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1880.15-1882.37 | 3-Oct-08 | SW6010B | Silica | 4.2 | mg/l | MB | 2.18 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1880.15-1882.37 | 3-Oct-08 | SW6010B | Sodium | 4.9 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1880.15-1882.37 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 16 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1885.5-1886.5 | 3-Oct-08 | SW6010B | Boron | 0.15 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1885.5-1886.5 | 3-Oct-08 | SW6010B | Silica | 6 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1885.5-1886.5 | 3-Oct-08 | SW6010B | Sodium | 11.1 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1899-1901.88 | 3-Oct-08 | SW6010B | Boron | 0.1 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1899-1901.88 | 3-Oct-08 | SW6010B | Silica | 5.4 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1899-1901.88 | 3-Oct-08 | SW6010B | Sodium | 9.4 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1899-1901.88 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 270 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1929.76-1932.58 | 3-Oct-08 | SW6010B | Boron | 0.09 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1929.76-1932.58 | 3-Oct-08 | SW6010B | Silica | 5.8 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1929.76-1932.58 | 3-Oct-08 | SW6010B | Sodium | 8.2 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1929.76-1932.58 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 265 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1947.67-1950.67 | 3-Oct-08 | SW6010B | Boron | 0.12 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1947.67-1950.67 | 3-Oct-08 | SW6010B | Silica | 8.7 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1947.67-1950.67 | 3-Oct-08 | SW6010B | Sodium | 8.7 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1947.67-1950.67 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 12 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1954.6-1956 | 3-Oct-08 | SW6010B | Boron | 0.13 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| RES-009E 1954.6-1956 | 3-Oct-08 | SW6010B | Silica | 10.2 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1954.6-1956 | 3-Oct-08 | SW6010B | Sodium | 4.8 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1967.76-1969.72 | 3-Oct-08 | SW6010B | Boron | 0.14 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1967.76-1969.72 | 3-Oct-08 | SW6010B | Silica | 22.2 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1967.76-1969.72 | 3-Oct-08 | SW6010B | Sodium | 7.2 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1967.76-1969.72 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 245 | mg/l | MB | 24.1 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| RES-009E 1974.78-1977.89 | 3-Oct-08 | E300 | Fluoride | 1.1 | mg/l | MS | 86% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009E 1974.78-1977.89 | 3-Oct-08 | M600 3. | Sulfur Sulfate | 0.18 | % | LR | 143% | R1 | None | RPD exceeded the method control limit. |
| RES-009E 1974.78-1977.89 | 3-Oct-08 | SW6010B | Boron | 0.11 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1974.78-1977.89 | 3-Oct-08 | SW6010B | Silica | 16.7 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1974.78-1977.89 | 3-Oct-08 | SW6010B | Sodium | 7.7 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1974.78-1977.89 | 3-Oct-08 | SW9310 | alpha, Gross | 5.3 | pci/g | MS | 37% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| RES-009E 1984.74-1987.74 | 3-Oct-08 | SM2310B | Acidity, Total | 4 F | mg/l | MB | 12.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 1984.74-1987.74 | 3-Oct-08 | SW6010B | Boron | 0.11 | mg/l | MB | 0.136 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1984.74-1987.74 | 3-Oct-08 | SW6010B | Silica | 12.6 | mg/l | MB | 2.15 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1984.74-1987.74 | 3-Oct-08 | SW6010B | Sodium | 6.6 | mg/l | MB | 5.37 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 1984.74-1987.74 | 23-Oct-08 | SM2310B | Acidity as CaCO3 | 237 | mg/l | MB | 24.1 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| RES-009E 2056.38-2075 | 10-Oct-08 | SW6010B | Boron | 0.15 | mg/l | MB | 0.161 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 2056.38-2075 | 10-Oct-08 | SW6010B | Sodium | 4.2 | mg/l | MB | 3.94 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 2056.38-2075 | 10-Oct-08 | SW6010B | Zinc | 0.06 | mg/l | MB | 0.061 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| RES-009E 2056.38-2075 | 31-Oct-08 | SM2310B | Acidity as CaCO3 | 305 | mg/l | MB | 28.2 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 1 | 4-Nov-08 | M200.7 | Silica | 3.4 | mg/l | MS/MSD | 135%/133% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1 | 4-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 68%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1 | 7-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 82%/70% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1 | 9-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MSD | 84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1 | 14-Oct-08 | E325.2 | Chloride (as Cl) | 2 F | mg/l | MS | 137% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1 | 14-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD/ RPD | 35%/53%/ 40 RPD | M2R1 | Low | MS recovery was low. The method control sample recovery was acceptable. MS/MSD RPD exceeded the method control limit. |
| TEST 1 | 21-Oct-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1 | 21-Oct-08 | M200.7 | Silica | 4.4 | mg/l | MS/MSD | 135%/138% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1 | 21-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 70%/71% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1 | 23-Sep-08 | M200.7 | Silica | 5.5 | mg/l | MS/MSD | 144%/145% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1 | 23-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 77%/71% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 1 | | 26-Aug-08 | M200.8 | Arsenic | 0.0012 | mg/l | LFB | 130% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 1 | | 30-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 74%/71% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1 | | 30-Sep-08 | M200.7 | Zinc | <0.05 | mg/l | MS | 124% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 3-Feb-09 | E200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 122%/122% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 9-Dec-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 9-Dec-08 | E340.2 | Fluoride | 00.3 F | mg/l | MS | 0.60% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1S | | 10-Feb-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 78%/82% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1S | | 10-Feb-09 | E200.8 | Selenium | 0.0007 | mg/l | MS/MSD | 134%/138% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 1S | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 1S | | 10-Feb-09 | E340.2 | Fluoride | 00.2 F | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 1S | | 11-Nov-08 | E340.2 | Fluoride | 1.9 | mg/l | MS | 111% | M1 | Low | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 11-Nov-08 | M200.7 | Silica | 6.5 | mg/l | MS/MSD | 117%/117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 11-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 50%/60% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1S | | 13-Jan-09 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 64%/57% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1S | | 18-Nov-08 | E340.2 | Fluoride | 0.6 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 1S | | 18-Nov-08 | M200.7 | Molybdenum | <0.05 | mg/l | MSD | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 18-Nov-08 | M200.7 | Silica | 2.7 | mg/l | MSD | 118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 18-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 76%/77% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1S | | 20-Jan-09 | E200.7 | Magnesium | 0.3 F | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 123%/119% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 23-Dec-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 25-Nov-08 | E340.2 | Fluoride | 0.5 | mg/l | MS | 117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 1S | | 25-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 80%/82% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 1S | | 27-Jan-09 | E200.8 | Selenium | 00.0004 F | mg/l | MS/MSD | 132%/137% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 2-Jun-09 | E200.7 | Calcium | 191 | mg/l | MS/MSD | 75%/80% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 2-Jun-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 65%/65% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 2-Sep-08 | M200.7 | Calcium | 419 | mg/l | MS/MSD | 55%/56% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 2 | | 2-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 83%/80% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 5-May-09 | E200.7 | Calcium | 202 | mg/l | MSD | 81% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 5-May-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 61%/59% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 7-Apr-09 | E200.7 | Calcium | 207 | mg/l | MS/MSD | 84%/75% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 7-Apr-09 | E200.7 | Silica | 4.5 | mg/l | MS/MSD | 127%/1245% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 2 | | 7-Apr-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 77%/93% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 9-Dec-08 | M200.7 | Silver | <0.05 D1 | mg/l | MS | 84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 9-Sep-08 | M200.7 | Calcium | 425 | mg/l | MS/MSD | 60%/67.5% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 2 | | 10-Feb-09 | M200.7 | Silica | 6.1 | mg/l | MS/MSD | 140%/139% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 10-Mar-09 | E200.7 | Calcium | 224 | mg/l | MS/MSD | 82%/83% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 2 | | 10-Mar-09 | E200.7 | Silica | 4.5 | mg/l | MSD | 118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 10-Mar-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 82%/82% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 10-Mar-09 | E200.7 | Zinc | <0.05 | mg/l | LFB | 124% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 2 | | 10-Mar-09 | E300 | Chloride (as Cl) | <3 | mg/l | MS | 111% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 10-Mar-09 | E300 | Fluoride | 00.4 F | mg/l | MS | 115% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 18-Nov-08 | E340.2 | Fluoride | 00.1 F | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 2 | | 25-Aug-09 | E200.7 | Calcium | 265 | mg/l | MS/MSD | 54%/62% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 2 | | 25-Aug-09 | E200.7 | Nickel | 0.01 F | mg/l | MS/MSD | 116%/116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 25-Aug-09 | E200.7 | Silica | 8 | mg/l | MS/MSD | 146%/145% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 25-Aug-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 73%/75% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 26-Aug-08 | M200.8 | Arsenic | 0.0007 | mg/l | MS | 82% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 28-Jul-09 | E200.7 | Magnesium | 00.8 F | mg/l | MS/MSD | 116%/116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 28-Jul-09 | E200.7 | Silica | 7.7 | mg/l | MS/MSD | 142%/144% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 28-Jul-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 83%/82% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 28-Jul-09 | E200.7 | Vanadium | <0.03 | mg/l | MS/MSD | 117%/116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 28-Jul-09 | E200.7 | Zinc | <0.05 | mg/l | MS/MSD | 120%/122% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 28-Oct-08 | M200.7 | Silica | 6.3 | mg/l | MS/MSD | 122%/116.5% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 28-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 73%/73% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 2 | | 30-Jun-09 | E200.7 | Silica | 5.1 | mg/l | MS/MSD | 122%/123%/ | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 2 | | 30-Jun-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 79%/79% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 3 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 3 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 3 | | 10-Feb-09 | E340.2 | Fluoride | 00.4 F | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 3 | | 14-Oct-08 | E340.2 | Fluoride | 0.4 F | mg/l | MS | 63% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 3 | | 18-Nov-08 | E340.2 | Fluoride | 0.6 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 3 | | 18-Nov-08 | M200.8 | Selenium | 0.0048 | mg/l | MS/MSD | 132%/132% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 3 | | 21-Oct-08 | M200.8 | Selenium | 0.0044 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 4 | | 21-Oct-08 | M200.8 | Selenium | 0.0114 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 5 | | 18-Nov-08 | E340.2 | Fluoride | 00.4 F | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 5 | | 21-Oct-08 | M200.8 | Selenium | 0.0086 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 6 | | 7-Apr-09 | E200.7 | Molybdenum | 00.01 F | mg/l | MS/MSD | 119%/118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 6 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | 3 F | mg/l | MS | 120% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 6 | | 10-Mar-09 | E200.7 | Zinc | <0.05 | mg/l | LFB | 124% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 6 | | 18-Nov-08 | E340.2 | Fluoride | 00.2 F | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 6 | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 6 | | 21-Oct-08 | M200.8 | Selenium | 0.0065 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 6 | | 26-Aug-08 | M200.8 | Selenium | 0.213 | mg/l | MB | 0.0011 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 6 | | 30-Jun-09 | E200.8 | Selenium | 0.0084 | mg/l | CCB | 0.0039 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| TEST 7 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 7 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | 9 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 7 | | 10-Feb-09 | E340.2 | Fluoride | 00.3 F | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 7 | | 18-Nov-08 | E340.2 | Fluoride | 00.4 F | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 7 | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 7 | | 26-Aug-08 | M200.8 | Selenium | 0.0316 | mg/l | MB | 0.0011 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 8 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 8 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | 16 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 8 | | 10-Feb-09 | E340.2 | Fluoride | 00.4 F | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 8 | | 18-Nov-08 | E340.2 | Fluoride | 0.7 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 8 | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 8 | | 26-Aug-08 | M200.8 | Selenium | 0.0655 | mg/l | MB | 0.0011 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 9 | | 9-Sep-08 | E340.2 | Fluoride | 0.6 | mg/l | MS | 84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 9 | | 21-Oct-08 | M200.8 | Selenium | 0.0335 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 9 | | 26-Aug-08 | M200.8 | Selenium | 0.0452 | mg/l | MB | 0.0011 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 9S | | 9-Dec-08 | M200.8 | Selenium | 0.0097 | mg/l | CCB | 0.00013 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 9S | | 18-Nov-08 | E340.2 | Fluoride | 00.2 F | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 9S | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 10 | | 16-Sep-08 | M200.7 | Copper | 9.13 | mg/l | MS/MSD | -1.2%/-7.8% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 10 | | 21-Oct-08 | M200.8 | Selenium | 0.0122 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 10 | | 26-Aug-08 | M200.8 | Selenium | 1.6 D2 | mg/l | MB | 0.0011 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 10S | | 18-Nov-08 | E340.2 | Fluoride | 00.3 F | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 10S | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 11 | | 4-Nov-08 | M200.7 | Copper | 127 D2 | mg/l | MS/MSD | -1951%/2016% | M3 | LH | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 4-Nov-08 | M200.7 | Iron | 4.56 | mg/l | MS/MSD | 75%/77% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 4-Nov-08 | M200.7 | Silica | 23.7 | mg/l | MS/MSD | 127%/130% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 4-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 68%/65% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 11 | | 7-Oct-08 | M200.7 | Copper | 247 D1 | mg/l | MS/MSD | -160%-21% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 9-Dec-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 9-Dec-08 | M200.7 | Aluminum | 2.07 | mg/l | MS | 84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 11 | | 9-Dec-08 | M200.7 | Copper | 66.3 | mg/l | MS/MSD | -1096%/-1241% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 9-Dec-08 | M200.7 | Silica | 6.2 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 9-Dec-08 | M200.7 | Silver | <0.05 D1 | mg/l | MS/MSD | 82%/81% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |

| | | | |
|---|---|---|---|
| CCB | continuing calibration blank | MB | method blank |
| CCV | continuing calibration verification | MCL | maximum contaminant level. |
| FD | field duplicate | MI | matrix interference |
| HT | holding time | MS/MSD | matrix spike/matrix spike duplicate. |
| ICS | interference check sample | PRES | preservative |
| ICV | initial calibration verification | RPD | relative percent difference. |
| IS | internal standard | SC | Saturated Cell Test |
| LFB | laboratory fortified blank | SD | serial dilution |
| LR | laboratory replicate | | |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 11 | | 9-Dec-08 | M200.8 | Selenium | 0.0095 | mg/l | CCB | 0.00013 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 11 | | 9-Sep-08 | M200.7 | Copper | 196 | mg/l | MS/MSD | -2089%/-2864% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 9-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MSD | 81% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 11 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 11 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 11 | | 10-Feb-09 | E340.2 | Fluoride | <10 D2 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 11 | | 11-Nov-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 113% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 11-Nov-08 | M200.7 | Copper | 31.1 | mg/l | MS/MSD | -452%/-284% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 11-Nov-08 | M200.7 | Iron | 19.2 | mg/l | MS/MSD | -58%/-10% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 11-Nov-08 | M200.7 | Molybdenum | <0.05 | mg/l | MSD | 117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 11-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 61%/72% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 11 | | 18-Nov-08 | E340.2 | Fluoride | <10 D2 | mg/l | ICV | 105.4% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 11 | | 18-Nov-08 | M200.7 | Copper | 39.9 | mg/l | MS/MSD | -638%/529% | M3 | HL | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 18-Nov-08 | M200.7 | Silica | 12.6 | mg/l | MS/MSD | 139%/141% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 18-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 75%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 11 | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 11 | | 18-Nov-08 | M200.8 | Selenium | 0.0076 | mg/l | MS/MSD | 134%/135% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 21-Oct-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 21-Oct-08 | M200.7 | Copper | 76.9 | mg/l | MS/MSD | -675%/-1123% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 21-Oct-08 | M200.7 | Silica | 14.6 | mg/l | MS/MSD | 128.5%/126% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 21-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 63%/57% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 11 | | 21-Oct-08 | M200.8 | Selenium | 0.008 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 11 | | 23-Sep-08 | M200.7 | Copper | 243 D1 | mg/l | MS/MSD | -4444%/-4217% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 23-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 62%/64% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 11 | | 25-Nov-08 | M200.7 | Chromium, Total | <0.05 | mg/l | MS | 120% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 25-Nov-08 | M200.7 | Cobalt | 00.02 F | mg/l | MS | 120% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 25-Nov-08 | M200.7 | Copper | 39.8 | mg/l | MS/MSD | -68%/-297% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 25-Nov-08 | M200.7 | Manganese | 0.147 | mg/l | MS/MSD | 125%/119% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 25-Nov-08 | M200.7 | Nickel | 00.02 F | mg/l | MS | 120% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 25-Nov-08 | M200.7 | Silica | 5.2 | mg/l | MS | 120% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 25-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 72%/77% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 11 | | 25-Nov-08 | M200.7 | Vanadium | <0.03 | mg/l | MS | 118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 25-Nov-08 | M200.7 | Zinc | <0.05 | mg/l | MS/MSD | 126%/118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 30-Sep-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 114% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 11 | | 30-Sep-08 | M200.7 | Copper | 169 | mg/l | MS/MSD | 0%/0% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 11 | | 30-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 59%/64% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 12 | | 2-Sep-08 | M200.7 | Copper | 1.8 | mg/l | MS | 84% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 12 | | 2-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 78%/73% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 12 | | 12-Jan-10 | E200.7 | Silver | <0.03 | mg/l | MSD | 83% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 12 | | 14-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 47%/72% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 12 | | 16-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 57%/57% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 12 | | 17-Nov-09 | E200.7 | Boron | <0.3 D1 | mg/l | MS/MSD | -172%/-503% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 12 | | 17-Nov-09 | E300 | Chloride (as Cl) | <3 | mg/l | MS | 111% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 12 | | 18-Nov-08 | E340.2 | Fluoride | 00.1 F | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 12 | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |

| | | | |
|---|---|---|---|
| CCB | continuing calibration blank | MB | method blank |
| CCV | continuing calibration verification | MCL | maximum contaminant level. |
| FD | field duplicate | MI | matrix interference |
| HT | holding time | MS/MSD | matrix spike/matrix spike duplicate. |
| ICS | interference check sample | PRES | preservative |
| ICV | initial calibration verification | RPD | relative percent difference. |
| IS | internal standard | SC | Saturated Cell Test |
| LFB | laboratory fortified blank | SD | serial dilution |
| LR | laboratory replicate | | |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 12 | | 20-Oct-09 | E200.7 | Sodium | 00.8 F | mg/l | MS/MSD | 55%/63% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 12 | | 20-Oct-09 | E300 | Fluoride | <0.5 | mg/l | MS | 87% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 12 | | 25-Nov-08 | M200.8 | Selenium | 00.0003 F | mg/l | MS/MSD | 134%/133% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 12 | | 26-Aug-08 | M200.7 | Chromium, Total | <0.3 D1 | mg/l | MS | 117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 12 | | 26-Aug-08 | M200.7 | Copper | 170 D1 | mg/l | MS/MSD | 73%/-224.5% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 12 | | 26-Aug-08 | M200.7 | Iron | 1.5 D1 | mg/l | MS | 121% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 12 | | 26-Aug-08 | M200.7 | Manganese | 2 D1 | mg/l | MS | 141% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 12 | | 26-Aug-08 | M200.7 | Silica | 8 FD1 | mg/l | MS | 118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 12 | | 26-Aug-08 | M200.7 | Vanadium | <0.1 D1 | mg/l | MS | 119% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 12 | | 26-Aug-08 | M200.8 | Selenium | 0.0082 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 12 | | 28-Oct-08 | M200.7 | Silica | 1.6 F | mg/l | MS/MSD | 116%/116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 12 | | 28-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 68%/67% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 12 | | 30-Dec-08 | M200.7 | Copper | 1.69 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 12 | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 12 | | 30-Jun-09 | E200.8 | Cadmium | 0.0008 | mg/l | CCV | 112% | V2 | High | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| TEST 13 | | 2-Sep-08 | E325.2 | Chloride (as Cl) | 3 F | mg/l | MS | 111% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 13 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 13 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 13 | | 10-Feb-09 | E340.2 | Fluoride | <0.5 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 13 | | 11-Nov-08 | M200.8 | Selenium | 00.0002 F | mg/l | MS/MSD | 142%/142% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 13 | | 14-Oct-08 | E340.2 | Fluoride | 0.3 F | mg/l | MS | 65% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 13 | | 18-Nov-08 | E340.2 | Fluoride | 00.2 F | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 13 | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 13 | | 26-Aug-08 | M200.8 | Selenium | 0.007 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 13 | | 28-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 82%/72% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 13 | | 30-Dec-08 | M200.7 | Copper | 0.87 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |

| | | | |
|---|---|---|---|
| CCB | continuing calibration blank | MB | method blank |
| CCV | continuing calibration verification | MCL | maximum contaminant level. |
| FD | field duplicate | MI | matrix interference |
| HT | holding time | MS/MSD | matrix spike/matrix spike duplicate. |
| ICS | interference check sample | PRES | preservative |
| ICV | initial calibration verification | RPD | relative percent difference. |
| IS | internal standard | SC | Saturated Cell Test |
| LFB | laboratory fortified blank | SD | serial dilution |
| LR | laboratory replicate | | |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 13 | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 14 | | 7-Apr-09 | E200.8 | Selenium | 0.006 | mg/l | CCB | 0.004 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 14 | | 9-Dec-08 | M200.8 | Selenium | 0.0042 | mg/l | CCB | 0.00013 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 14 | | 18-Nov-08 | E340.2 | Fluoride | 1.7 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 14 | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 14 | | 26-Aug-08 | M200.8 | Selenium | 0.0645 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 14 | | 30-Dec-08 | M200.7 | Copper | 8.4 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 14 | | 30-Jun-09 | E200.8 | Cadmium | 0.0025 | mg/l | CCV | 112% | V3 | High | Calibration verification recovery was above method acceptance limits. The target analyte was detected in the sample, but the sample was not reanalyzed. |
| TEST 14 | | 30-Jun-09 | E200.8 | Selenium | 0.0111 | mg/l | CCB | 0.0039 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| TEST 15 | | 18-Nov-08 | E340.2 | Fluoride | 0.5 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 15 | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 16 | | 9-Sep-08 | M200.7 | Barium | 0.155 | mg/l | MB | 0.0052 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 16 | | 21-Oct-08 | M200.8 | Selenium | 0.0484 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 16 | | 26-Aug-08 | M200.8 | Selenium | 0.244 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 16S | | 9-Dec-08 | M200.8 | Selenium | 0.0102 | mg/l | CCB | 0.00013 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 16S | | 18-Nov-08 | E340.2 | Fluoride | <0.5 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 16S | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 17 | | 16-Sep-08 | M200.7 | Manganese | <0.03 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 17 | | 21-Oct-08 | M200.8 | Selenium | 0.0295 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 17 | | 26-Aug-08 | E245.1 | Mercury | <0.001 | mg/l | MSD | 75% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 17 | | 26-Aug-08 | M200.8 | Selenium | 0.196 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 17S | | 9-Dec-08 | M200.8 | Selenium | 0.0195 | mg/l | CCB | 0.00013 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 17S | | 18-Nov-08 | E340.2 | Fluoride | <0.5 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 17S | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 18 | | 9-Sep-08 | M200.7 | Calcium | <1 | mg/l | CCV | 117% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 18 | | 16-Sep-08 | M200.7 | Manganese | <0.03 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 18 | | 21-Oct-08 | M200.8 | Selenium | 0.0103 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 18S | | 9-Dec-08 | M200.8 | Selenium | 0.0046 | mg/l | CCB | 0.00013 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 18S | | 18-Nov-08 | E340.2 | Fluoride | 0.5 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 18S | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 19 | | 2-Sep-08 | E340.2 | Fluoride | 3.4 | mg/l | MS | 66% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 19 | | 9-Sep-08 | M200.7 | Cobalt | <0.05 | mg/l | CCV | 116% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 19 | | 16-Sep-08 | M200.7 | Manganese | <0.03 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 19 | | 21-Oct-08 | M200.8 | Selenium | 0.025 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 19 | | 26-Aug-08 | M200.8 | Selenium | 0.166 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 19S | | 9-Dec-08 | M200.8 | Selenium | 0.0051 | mg/l | CCB | 0.00013 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 19S | | 18-Nov-08 | E340.2 | Fluoride | 00.2 F | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 19S | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 20 | | 9-Sep-08 | M200.7 | Molybdenum | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 20 | | 21-Oct-08 | M200.8 | Selenium | 0.0039 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 20 | | 26-Aug-08 | M200.8 | Selenium | 0.0734 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 20S | | 3-Feb-09 | E200.7 | Copper | 20.3 | mg/l | MS/MSD | -155%/-183% | M3 | High | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 20S | | 3-Feb-09 | E200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 127%/124% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 20S | | 6-Jan-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 20S | | 6-Jan-09 | M200.7 | Copper | 13.5 | mg/l | MS/MSD | -266%/-279% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 20S | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 20S | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 20S | | 10-Feb-09 | E340.2 | Fluoride | <3 D2 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 20S | | 13-Jan-09 | M200.7 | Aluminum | 00.18 F | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 20S | | 13-Jan-09 | M200.7 | Calcium | 1.5 | mg/l | MS/MSD | 117%/121.5% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 20S | | 13-Jan-09 | M200.7 | Copper | 14.1 | mg/l | MS/MSD | -243%/-267% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 20S | | 13-Jan-09 | M200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 122%/123% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 20S | | 13-Jan-09 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 46%/48% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 20S | | 13-Jan-09 | M200.7 | Zinc | 0.17 | mg/l | MS/MSD | 120%/144% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 20S | | 16-Dec-08 | M200.7 | Copper | 7.35 | mg/l | MS/MSD | -103%/-101% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 20S | | 18-Nov-08 | E340.2 | Fluoride | 00.1 F | mg/l | ICV | 105.4% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 20S | | 18-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 20S | | 20-Jan-09 | E200.7 | Copper | 16.2 | mg/l | MS/MSD | -102%/-123% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 20S | | 23-Dec-08 | M200.7 | Copper | 8.11 | mg/l | MS/MSD | -9%/-10% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 20S | | 27-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 120%/123% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 20S | | 27-Jan-09 | E200.7 | Zinc | 0.16 | mg/l | MSD | 117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 20S | | 27-Jan-09 | E200.8 | Selenium | 0.0046 | mg/l | MS/MSD | 141%/139% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 20S | | 30-Dec-08 | M200.7 | Copper | 12.1 | mg/l | CCB/ MS/MSD | 0.033 mg/l/ -261%/-244% | B7M3 | Low | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. The accuracy of the spike recovery values is reduced since the analyte concentration in the sample is disproportionate to spike level. The method controls ample recovery was acceptable. |
| TEST 20S | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 20S | | 30-Dec-08 | M200.7 | Silica | 4.1 | mg/l | MS | 116% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 21 | | 2-Dec-08 | M200.7 | Copper | 25.1 | mg/l | MS/MSD | -341%/-272% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 4-Nov-08 | M200.7 | Aluminum | 6.12 | mg/l | MS/MSD | 64%/64% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 21 | | 4-Nov-08 | M200.7 | Copper | 114 D2 | mg/l | MS/MSD | -2412%/-2351% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 4-Nov-08 | M200.7 | Silica | 28.5 | mg/l | MS/MSD | 133%/139% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 21 | | 4-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 76%/69% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 7-Oct-08 | M200.7 | Aluminum | 6.61 | mg/l | MS | 75% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 7-Oct-08 | M200.7 | Copper | 59.8 | mg/l | MS/MSD | -765%/-766% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 7-Oct-08 | M200.7 | Silica | 15.4 | mg/l | MS/MSD | 116%/117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 21 | | 7-Oct-08 | M200.7 | Silver | 00.01 F | mg/l | MS/MSD | 70%/72% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 9-Dec-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 21 | | 9-Dec-08 | M200.7 | Copper | 12.1 | mg/l | MS/MSD | -32%/-57% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 9-Dec-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 76%/75% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 9-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 38%/46% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 10-Mar-09 | E200.7 | Zinc | <0.05 | mg/l | LFB | 124% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 21 | | 10-Mar-09 | E200.8 | Selenium | 0.601 D2 | mg/l | CCB | 0.00038 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 21 | | 11-Nov-08 | M200.7 | Copper | 71.4 | mg/l | MS/MSD | -1319%/-1227% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 14-Oct-08 | M200.7 | Aluminum | 4.01 | mg/l | MS | 75% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 14-Oct-08 | M200.7 | Copper | 235 D1 | mg/l | MS/MSD | -2555%/-1973% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 16-Sep-08 | M200.7 | Copper | 9.41 | mg/l | MS | 25% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 16-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS | 81% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 21 | | 18-Nov-08 | M200.7 | Aluminum | 3.91 | mg/l | MS | 82% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 18-Nov-08 | M200.7 | Copper | 90.8 | mg/l | MS/MSD | -1444%/-1267% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 18-Nov-08 | M200.7 | Silica | 27.3 | mg/l | MS/MSD | 138%/142% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 21 | | 18-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 79%/81% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 21-Oct-08 | M200.7 | Copper | 26.7 | mg/l | MS/MSD | -286%/-358% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 21-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MB | 60%/59% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 21-Oct-08 | M200.8 | Selenium | 0.0666 | mg/l | MB | 0.00047 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 21 | | 23-Sep-08 | M200.7 | Copper | 11.8 | mg/l | MS/MSD | 70% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 23-Sep-08 | M200.7 | Iron | 0.03 | mg/l | MS/MSD | 18%/43.5% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 23-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 30%/22% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 21 | | 25-Nov-08 | M200.7 | Copper | 13.8 | mg/l | MS/MSD | -94%/-90% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 25-Nov-08 | M200.7 | Silica | 8 | mg/l | MS/MSD | 119.5%/118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 21 | | 25-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 77%/76% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 26-Aug-08 | E245.1 | Mercury | <0.001 | mg/l | MS | 83.5% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 26-Aug-08 | M200.8 | Selenium | 0.139 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 21 | | 27-Jan-09 | E200.7 | Copper | 61.9 | mg/l | MS/MSD | -423%/-262% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 27-Jan-09 | E200.7 | Silica | 16.2 | mg/l | MS/MSD | 138%/145% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 21 | | 28-Oct-08 | M200.7 | Aluminum | 4.37 | mg/l | MS | 80% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 28-Oct-08 | M200.7 | Copper | 75.9 | mg/l | MS/MSD | -837%/-642% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 28-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 48%/49% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 21 | | 30-Dec-08 | M200.7 | Copper | 52.5 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 21 | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 21 | | 30-Jun-09 | E200.8 | Cadmium | 00.0002 F | mg/l | CCV | 112% | V3 | High | Calibration verification recovery was above method acceptance limits. The target analyte was detected in the sample, but the sample was not reanalyzed. |
| TEST 21 | | 30-Sep-08 | M200.7 | Aluminum | 7.61 | mg/l | MS/MSD | 68%/72% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 30-Sep-08 | M200.7 | Copper | 47.3 | mg/l | MS/MSD | -524%/-479% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 21 | | 30-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 83%/80% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 22 | | 2-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 72%/76% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 22 | | 4-Nov-08 | M200.7 | Copper | 4.21 | mg/l | MS/MSD | 49%/46% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 22 | | 14-Oct-08 | M200.7 | Copper | 1.88 | mg/l | MS/MSD | 74%/65% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 22 | | 21-Oct-08 | E340.2 | Fluoride | 1.6 | mg/l | MS | 111% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 22 | | 21-Oct-08 | M200.8 | Selenium | 0.007 | mg/l | MB | 0.00047 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| TEST 22 | | 26-Aug-08 | M200.8 | Selenium | 0.131 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 22S | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 22S | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 22S | | 10-Feb-09 | E340.2 | Fluoride | 1.3 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 22S | | 18-Nov-08 | M200.7 | Copper | 2.26 | mg/l | MS | 80% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 22S | | 30-Dec-08 | M200.7 | Copper | 5.69 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 22S | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 23 | | 4-Nov-08 | M200.8 | Selenium | 0.0494 | mg/l | MS/MSD | 136%/136% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 23 | | 7-Apr-09 | E200.8 | Selenium | 0.0364 | mg/l | CCB | 0.004 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 23 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 23 | | 11-Nov-08 | M200.7 | Silica | 26.9 | mg/l | MS/MSD | 59%/60% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 23 | | 11-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 76%/74% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 23 | | 11-Nov-08 | M200.8 | Selenium | 0.0266 | mg/l | MS | 131% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 23 | | 18-Nov-08 | M200.8 | Selenium | 0.0364 | mg/l | MSD | 131% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 23 | | 21-Oct-08 | M200.8 | Selenium | 0.019 | mg/l | MB | 0.00047 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 23 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 23 | | 26-Aug-08 | E245.1 | Mercury | <0.001 | mg/l | MS | 83.50% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 23 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | MS | 25% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 23 | | 26-Aug-08 | M200.8 | Selenium | 0.0094 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 23 | | 30-Dec-08 | M200.7 | Nickel | <0.3 D1 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 23 | | 30-Dec-08 | M200.7 | Silica | 14.5 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 23 | | 30-Jun-09 | E200.8 | Selenium | 0.0796 | mg/l | CCB | 0.0039 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| TEST 24 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 24 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | 1 F | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 24 | | 10-Feb-09 | E340.2 | Fluoride | <5 D2 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 24 | | 16-Sep-08 | E340.2 | Fluoride | 3.8 | mg/l | MSD | 61% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 24 | | 21-Oct-08 | M200.8 | Selenium | 0.0129 | mg/l | MB | 0.00047 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 24 | | 25-Nov-08 | M200.8 | Arsenic | <0.004 D1 | mg/l | MS/MSD | 132%/133% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 24 | | 25-Nov-08 | M200.8 | Selenium | 0.0265 | mg/l | MS/MSD | 134%/136% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 24 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 24 | | 26-Aug-08 | M200.8 | Selenium | 0.0335 | mg/l | MB | 0.00011 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 24 | | 27-Jan-09 | E200.7 | Silica | 12.3 | mg/l | MS/MSD | 182%/188% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 24 | | 30-Dec-08 | M200.7 | Copper | 48.7 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 25 | | 4-Nov-08 | E340.2 | Fluoride | 1.2 | mg/l | MS | 68% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 25 | | 21-Oct-08 | M200.8 | Selenium | 0.0084 | mg/l | MB | 0.00047 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| TEST 25 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 25 | | 26-Aug-08 | M200.8 | Selenium | 0.0347 | mg/l | MB | 0.00011 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 25S | | 10-Feb-09 | E200.8 | Selenium | 0.0033 | mg/l | MS/MSD | 140%/135% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 25S | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 25S | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 25S | | 10-Feb-09 | E340.2 | Fluoride | 00.2 F | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 25S | | 30-Dec-08 | M200.7 | Copper | 3.29 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 25S | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 26 | | 3-Feb-09 | E200.7 | Molybdenum | 00.02 F | mg/l | MS/MSD | 122%/122% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 26 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 26 | | 12-Jan-10 | E200.7 | Copper | 30.5 | mg/l | MS/MSD | -400%/-455% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 26 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 26 | | 25-Nov-08 | M200.8 | Antimony | 00.0007 F | mg/l | CCV | 112% | V2 | High | Calibration verification recovery was above method acceptance limits. This target analyte was detected in the sample. The sample could not be reanalyzed due to insufficient sample. |
| TEST 26 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 26 | | 26-Aug-08 | M200.8 | Selenium | 0.0056 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 26 | | 30-Dec-08 | M200.7 | Copper | 0.44 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 26 | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 27 | | 10-Feb-09 | E200.7 | Aluminum | 4.58 | mg/l | MS/MSD | 82%/76% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 27 | | 10-Feb-09 | E200.7 | Copper | 2.78 | mg/l | MS/MSD | 45%/49% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 27 | | 10-Feb-09 | E200.7 | Iron | 14.3 | mg/l | MS/MSD | 22%/34% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 27 | | 10-Feb-09 | E200.7 | Nickel | 00.03 F | mg/l | MS/MSD | 122%/125% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 27 | | 10-Feb-09 | E200.7 | Silica | 5.2 | mg/l | MSD | 118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 27 | | 10-Feb-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 73%/71% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 27 | | 10-Feb-09 | E200.7 | Zinc | 7.59 | mg/l | MS/MSD | -28%/-30% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 27 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 27 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 27 | | 10-Feb-09 | E340.2 | Fluoride | 3.3 D2 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 27 | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 27 | | 25-Nov-08 | M200.8 | Selenium | 0.0103 | mg/l | CCB | 0.00035 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 27 | | 26-Aug-08 | E340.2 | Fluoride | 158 D1 | mg/l | MS | 77% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 27 | | 26-Aug-08 | M200.8 | Selenium | 0.0434 | mg/l | MB | 0.00011 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 27 | | 30-Dec-08 | M200.7 | Copper | 1.12 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 27 | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 28 | | 7-Apr-09 | E200.8 | Selenium | 0.0247 | mg/l | CCB | 0.004 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 28 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 28 | | 18-Nov-08 | E340.2 | Fluoride | 40.6 D2 | mg/l | MS | 71% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 28 | | 21-Oct-08 | M200.8 | Selenium | 0.0063 | mg/l | MB | 0.00047 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| TEST 28 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 28 | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 28 | | 25-Nov-08 | M200.8 | Selenium | 0.0146 | mg/l | CCB | 0.00035 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 28 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 28 | | 26-Aug-08 | M200.8 | Selenium | 0.0367 | mg/l | MB | 0.00011 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 28 | | 27-Jan-09 | E340.2 | Fluoride | 32.7 D1 | mg/l | MS | 88% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 28 | | 30-Dec-08 | M200.7 | Copper | 17.7 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 28 | | 30-Jun-09 | E200.8 | Selenium | 0.104 | mg/l | CCB | 0.0039 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 29 | | 7-Oct-08 | E340.2 | Fluoride | 12.4 D1 | mg/l | MS | 55% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 29 | | 7-Oct-08 | M200.8 | Lead | 0.045 | mg/l | MB | 0.00035 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 29 | | 9-Sep-08 | E340.2 | Fluoride | 6.1 | mg/l | MS | 68% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 29 | | 21-Oct-08 | M200.8 | Selenium | 0.0185 | mg/l | MB | 0.00047 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| TEST 29 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 29S | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 29S | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 29S | | 10-Feb-09 | E340.2 | Fluoride | <3 D2 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 29S | | 16-Dec-08 | M200.7 | Copper | 4.26 | mg/l | MS/MSD | -24%/-20% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 29S | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 29S | | 25-Nov-08 | M200.8 | Lead | 0.016 | mg/l | CCB | 0.00035 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 29S | | 30-Dec-08 | M200.7 | Copper | 4.59 | mg/l | CCB | 0.033 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 29S | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 30 | | 3-Feb-09 | E200.7 | Copper | 72.5 | mg/l | MS/MSD | -858%/-969% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 30 | | 3-Feb-09 | E200.7 | Silica | 7.2 | mg/l | MS/MSD | 121%/118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 30 | | 6-Jan-09 | E325.2 | Chloride (as Cl) | 1 F | mg/l | MS | 115% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 30 | | 6-Jan-09 | M200.7 | Copper | 75.3 | mg/l | MS/MSD | -1568%/-1460% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 30 | | 7-Apr-09 | E200.8 | Selenium | 0.0081 | mg/l | CCB | 0.004 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 30 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 131% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 30 | | 10-Feb-09 | M200.7 | Copper | 70.9 | mg/l | MS/MSD | -1062%/-1001% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 30 | | 10-Feb-09 | M200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 124%/127% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 30 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 30 | | 13-Jan-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 114% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 30 | | 13-Jan-09 | M200.7 | Copper | 70.2 | mg/l | MS/MSD | -764%/-866% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 30 | | 13-Jan-09 | M200.7 | Silica | 7 | mg/l | MS/MSD | 118%/118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 30 | | 13-Jan-09 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 81%/74% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 30 | | 20-Jan-09 | E200.7 | Copper | 71.7 | mg/l | MS/MSD | -718%/-873% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 30 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB/ MS/MSD | 124%/ 121%/119% | L1M1 | High | The associated blank spike recovery was above laboratory acceptance limits. MS recovery was high. The method control sample recovery was acceptable. |
| TEST 30 | | 20-Jan-09 | E200.7 | Silica | 7.8 | mg/l | MS/MSD | 117%/116.5% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 30 | | 23-Dec-08 | M200.7 | Aluminum | 2.92 | mg/l | MSD | 81% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 30 | | 23-Dec-08 | M200.7 | Copper | 74 | mg/l | MS/MSD | -693%/-902% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 30 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 30 | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 30 | | 25-Nov-08 | M200.8 | Lead | 0.159 | mg/l | CCB | 0.00035 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 30 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 30 | | 27-Jan-09 | E200.7 | Copper | 66.9 | mg/l | MS/MSD | -604%/-558% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 30 | | 27-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB/ MS/MSD | 117%/ 118%/119% | L1M1 | High | The associated blank spike recovery was above laboratory acceptance limits. MS recovery was high. The method control sample recovery was acceptable. MS run twice. |
| TEST 30 | | 27-Jan-09 | E200.7 | Silica | 9 | mg/l | MS/MSD | 118%/121% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 30 | | 27-Jan-09 | E200.8 | Lead | 0.169 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 30 | | 30-Dec-08 | E325.2 | Chloride (as Cl) | 1 F | mg/l | MS | 117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 30 | | 30-Dec-08 | M200.7 | Copper | 69.6 | mg/l | MS/MSD | -994%/-1017% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 30 | | 30-Jun-09 | E200.8 | Selenium | 0.0252 | mg/l | CCB | 0.0039 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 31 | | 4-Nov-08 | M200.7 | Iron | 8.88 | mg/l | MS/MSD | 35%/41% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 4-Nov-08 | M200.7 | Silica | 3.2 | mg/l | MS/MSD | 121%/123% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31 | | 4-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 70%/74% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31 | | 7-Oct-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 111% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31 | | 7-Oct-08 | M200.7 | Aluminum | 23.1 | mg/l | MS | 33% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 7-Oct-08 | M200.7 | Copper | 63 | mg/l | MS/MSD | -808%/-854% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 7-Oct-08 | M200.7 | Iron | 29.4 | mg/l | MS/MSD | -35%/-46% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 7-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 78%/80% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31 | | 7-Oct-08 | M200.7 | Zinc | 28.4 | mg/l | MS/MSD | -256%/-289% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 9-Sep-08 | M200.7 | Aluminum | 18.9 | mg/l | MS/MSD | -15%/4.9% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 9-Sep-08 | M200.7 | Copper | 8.44 | mg/l | MS/MSD | -49%/-35% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 9-Sep-08 | M200.7 | Iron | 45.3 | mg/l | MS/MSD | -288%/-277% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 9-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 43%/51% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31 | | 9-Sep-08 | M200.7 | Zinc | 7.53 | mg/l | MS/MSD | 9%/10% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 14-Oct-08 | M200.7 | Aluminum | 8.84 | mg/l | MS/MSD | 80%/51 | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 31 | | 14-Oct-08 | M200.7 | Copper | 15.2 | mg/l | MS/MSD | -42%/-113% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 14-Oct-08 | M200.7 | Iron | 22.5 | mg/l | MS/MSD | 7%/-44% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 14-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 55%/57% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31 | | 14-Oct-08 | M200.7 | Zinc | 8.94 | mg/l | MSD | -27% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 16-Sep-08 | M200.7 | Aluminum | 12.9 | mg/l | MS/MSD | 60%/52% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 16-Sep-08 | M200.7 | Copper | 12.3 | mg/l | MS/MSD | -17%/-39% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 16-Sep-08 | M200.7 | Iron | 16.5 | mg/l | MS/MSD | 6%/-5% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 16-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 77%/80% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31 | | 16-Sep-08 | M200.7 | Zinc | 6.44 | mg/l | MS/MSD | 21%/8% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 21-Oct-08 | M200.7 | Aluminum | 11 | mg/l | MS/MSD | 61%/58% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 21-Oct-08 | M200.7 | Iron | 26.1 | mg/l | MS/MSD | -8.5%/4.5% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 21-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MB | 54%/52% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31 | | 21-Oct-08 | M200.7 | Zinc | 12.1 | mg/l | MS/MSD | -35%/-14% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 21-Oct-08 | M200.8 | Selenium | 0.0242 | mg/l | MB | 0.00047 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 31 | | 23-Sep-08 | M200.7 | Aluminum | 16 | mg/l | MSD | 68% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 23-Sep-08 | M200.7 | Copper | 39.2 | mg/l | MS/MSD | -493%/-396% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 23-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 22%/16% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31 | | 23-Sep-08 | M200.7 | Zinc | 16.2 | mg/l | MS/MSD | -119%/-72% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 26-Aug-08 | M200.8 | Selenium | 0.0281 D1 | mg/l | LFB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 31 | | 28-Oct-08 | M200.7 | Aluminum | 11.9 | mg/l | MS/MSD | 77%/72% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 28-Oct-08 | M200.7 | Boron | <0.05 | mg/l | MS/MSD | 116%/116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31 | | 28-Oct-08 | M200.7 | Copper | 40.5 | mg/l | MS/MSD | -360%/-418% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 28-Oct-08 | M200.7 | Iron | 29.9 | mg/l | MS/MSD | 33%/-7.6% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 28-Oct-08 | M200.7 | Magnesium | 00.3 F | mg/l | MS/MSD | 119%/119% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31 | | 28-Oct-08 | M200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 116%/118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31 | | 28-Oct-08 | M200.7 | Potassium | 1.6 F | mg/l | MS/MSD | 124%/123% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31 | | 28-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 51%/45% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31 | | 28-Oct-08 | M200.7 | Sodium | <2 | mg/l | MS/MSD | 123%/122% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31 | | 28-Oct-08 | M200.7 | Vanadium | <0.03 | mg/l | MS/MSD | 119%/121% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31 | | 28-Oct-08 | M200.7 | Zinc | 15.3 | mg/l | MS/MSD | -19%/-51% | M3 | High | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 30-Sep-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31 | | 30-Sep-08 | M200.7 | Aluminum | 27.7 | mg/l | MS/MSD | -53%/-5.6% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 31 | | 30-Sep-08 | M200.7 | Copper | 47 | mg/l | MS/MSD | -683%/-553% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 30-Sep-08 | M200.7 | Iron | 31.9 | mg/l | MS/MSD | -135%/-99% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31 | | 30-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 84%/76% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31 | | 30-Sep-08 | M200.7 | Zinc | 27 | mg/l | MS/MSD | -436%/-338% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 2-Dec-08 | M200.7 | Copper | 8 | mg/l | MS/MSD | -11%/-39% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 2-Dec-08 | M200.7 | Iron | 10.4 | mg/l | MS/MSD | 66%/46% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 2-Dec-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 39%/48% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31S | | 2-Dec-08 | M200.7 | Zinc | 4.99 | mg/l | MS/MSD | 58%/44% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 9-Dec-08 | M200.7 | Copper | 5.28 | mg/l | MS/MSD | 47%/44% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 9-Dec-08 | M200.7 | Iron | 8.84 | mg/l | MS/MSD | 82%/76% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 9-Dec-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 73%/76% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31S | | 9-Dec-08 | M200.7 | Zinc | 3.66 | mg/l | MS/MSD | 75%/79% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 18-Nov-08 | M200.7 | Copper | 11.4 | mg/l | MS/MSD | -88%/30% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 31S | | 18-Nov-08 | M200.7 | Iron | 9.83 | mg/l | MS/MSD | 27%/50% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 18-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 67%/71% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31S | | 18-Nov-08 | M200.7 | Zinc | 6.17 | mg/l | MS/MSD | 13%/27% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 25-Nov-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 113% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 31S | | 25-Nov-08 | M200.7 | Copper | 6.81 | mg/l | MS/MSD | 38%/-19% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 25-Nov-08 | M200.7 | Iron | 7.37 | mg/l | MS/MSD | 61%/55% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 25-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 73%/70% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 31S | | 25-Nov-08 | M200.7 | Zinc | 3.82 | mg/l | MS/MSD | 55%/48% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 31S | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 32 | | 2-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 46%/39% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 32 | | 26-Aug-08 | M200.7 | Calcium | 361 | mg/l | MS/MSD | 39%/78% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 32 | | 26-Aug-08 | M200.7 | Magnesium | 376 | mg/l | MS | 61% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 32 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 32 | | 26-Aug-08 | M200.7 | Sodium | 214 | mg/l | MS | 82% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 32 | | 26-Aug-08 | M200.8 | Selenium | 0.225 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 32S | | 10-Feb-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 47%/54% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 32S | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 32S | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 32S | | 10-Feb-09 | E340.2 | Fluoride | <10 D3 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 32S | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 32S | | 23-Dec-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 32S | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 32S | | 25-Nov-08 | M200.8 | Selenium | 0.0074 | mg/l | CCB | 0.00035 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 33 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 33 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 33 | | 10-Feb-09 | E340.2 | Fluoride | 00.1 F | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 33 | | 18-Nov-08 | M200.8 | Selenium | 00.0002 F | mg/l | MSD | 132% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 33 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 33 | | 26-Aug-08 | E245.1 | Mercury | <0.001 | mg/l | MSD | 84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 33 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB/ MS/MSD | 116%/ 41%/48% | L1M2 | High | The associated blank spike was above laboratory acceptance limits. MS recovery was a low. The method control recovery was acceptable. |
| TEST 34 | | 5-May-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 55%/55% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 34 | | 10-Mar-09 | E200.7 | Zinc | <0.05 | mg/l | LFB | 124% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 34 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 34 | | 18-Nov-08 | E340.2 | Fluoride | 00.1 F | mg/l | ICV/MS | 105.4%/86% | V1M2 | HL | Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. MS recovery was low. The method control sample recovery was acceptable. |
| TEST 34 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 34 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 34 | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 122% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 34 | | 25-Nov-08 | M200.8 | Arsenic | <0.002 | mg/l | MS/MSD | 132%/132% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 34 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 35 | | 2-Jun-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 67%/70% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 35 | | 4-Nov-08 | M200.8 | Selenium | 0.003 | mg/l | MS/MSD | 152%/144% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 35 | | 7-Apr-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 74%/73% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 35 | | 10-Mar-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 53%/50% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 35 | | 10-Mar-09 | E200.7 | Zinc | <0.05 | mg/l | LFB/ MS/MS | 124%/ 118%/117% | L1M1 | High | The associated blank spike recovery was above laboratory acceptance limits. MS recovery was high. The method control sample recovery was acceptable. MS run twice. |
| TEST 35 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 35 | | 10-Mar-09 | E300 | Chloride (as Cl) | <3 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 35 | | 18-Nov-08 | E340.2 | Fluoride | 1.1 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 35 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 35 | | 25-Aug-09 | E200.7 | Silica | 4.9 | mg/l | MS/MSD | 130%/133% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |

| | | | |
|---|---|---|---|
| CCB | continuing calibration blank | MB | method blank |
| CCV | continuing calibration verification | MCL | maximum contaminant level. |
| FD | field duplicate | MI | matrix interference |
| HT | holding time | MS/MSD | matrix spike/matrix spike duplicate. |
| ICS | interference check sample | PRES | preservative |
| ICV | initial calibration verification | RPD | relative percent difference. |
| IS | internal standard | SC | Saturated Cell Test |
| LFB | laboratory fortified blank | SD | serial dilution |
| LR | laboratory replicate | | |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 35 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV/MS | 112%/116% | V1M1 | High | Calibration verification recovery was above method acceptance limits. This target analyte was not detected. MS/MSD recoveries were high. |
| TEST 35 | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 35 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 35 | | 26-Aug-08 | M200.8 | Selenium | 0.0173 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 35 | | 28-Jul-09 | E200.7 | Magnesium | 1.9 | mg/l | MS/MSD | 117.5%/117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 35 | | 28-Jul-09 | E200.7 | Silica | 3.6 | mg/l | MS/MSD | 119%/119% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 35 | | 28-Jul-09 | E200.7 | Silver | <0.03 | mg/l | MS | 84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 35 | | 28-Jul-09 | E200.7 | Vanadium | <0.03 | mg/l | MS/MSD | 119%/118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 35 | | 28-Jul-09 | E200.7 | Zinc | <0.05 | mg/l | MS/MSD | 121%/122% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 35 | | 30-Jun-09 | E200.7 | Silica | 3.7 | mg/l | MS/MSD | 126%/125% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 35 | | 30-Jun-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 75%/79% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 36 | | 7-Apr-09 | E200.7 | Molybdenum | 00.01 F | mg/l | MSD | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 36 | | 10-Mar-09 | E200.7 | Zinc | <0.05 | mg/l | LFB | 124% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 36 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 36 | | 18-Nov-08 | E340.2 | Fluoride | 2.6 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 36 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 36 | | 25-Aug-09 | E200.7 | Nickel | 0.02 F | mg/l | MS/MSD | 118%/116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 36 | | 25-Aug-09 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 77%/66% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 36 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 36 | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 36 | | 25-Nov-08 | M200.8 | Selenium | 0.0046 | mg/l | CCB | 0.00035 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 36 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 36 | | 26-Aug-08 | M200.8 | Selenium | 0.0756 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 36 | | 30-Jun-09 | E200.7 | Silver | 00.02 F | mg/l | MS/MSD | 47%/43% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 37 | | 2-Sep-08 | E325.2 | Chloride (as Cl) | 70 D1 | mg/l | MS | 67% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 37 | | 10-Mar-09 | E200.7 | Zinc | <0.05 | mg/l | LFB | 124% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 37 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 37 | | 16-Dec-08 | E340.2 | Fluoride | 0.6 | mg/l | MS | 80% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 37 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB | 124% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 37 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 37 | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 37 | | 26-Aug-08 | E340.2 | Fluoride | 00.2 F | mg/l | MS | 88% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 37 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 37 | | 26-Aug-08 | M200.8 | Selenium | 0.0072 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 38 | | 25-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 38 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 39 | | 9-Sep-08 | E340.2 | Fluoride | 1.1 | mg/l | MS | 89% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 39 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | LFB | 116% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 39 | | 26-Aug-08 | M200.8 | Selenium | 0.138 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 40 | | 25-Nov-08 | M200.8 | Selenium | 0.0011 | mg/l | MS/MSD | 138%/137% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 40 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 76%/79% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 40 | | 26-Aug-08 | M200.8 | Selenium | 0.101 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 41 | | 2-Dec-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 113% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 2-Dec-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 57%/59% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 2-Sep-08 | M200.8 | Selenium | 0.0985 | mg/l | MB | 0.00043 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 41 | | 4-Nov-08 | M200.7 | Manganese | <0.03 | mg/l | MSD | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 4-Nov-08 | M200.7 | Manganese | <0.03 | mg/l | MSD | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 4-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 61%/61% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 4-Nov-08 | M200.8 | Antimony | <0.002 | mg/l | IS | 126% | N1 | High | IS recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL. |
| TEST 41 | | 7-Oct-08 | E340.2 | Fluoride | 0.6 | mg/l | MS | 85% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 7-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 81%/76% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 9-Dec-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 114% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 9-Dec-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 83%/84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 9-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 78%/72% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 9-Sep-08 | M200.7 | Sodium | 274 | mg/l | MS/MSD | 80%/69% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 14-Oct-08 | M200.7 | Calcium | 22 | mg/l | MS | 119% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 14-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 69%/60% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 16-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 84%/85% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 18-Nov-08 | M200.7 | Silica | 7.4 | mg/l | MS/MSD | 123%/118.5% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 18-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 76%/75% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 21-Oct-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 21-Oct-08 | M200.7 | Manganese | <0.03 | mg/l | MS | 117% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 41 | | 21-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 77%/70% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 25-Nov-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 114% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 25-Nov-08 | M200.7 | Silica | 5.9 | mg/l | MS | 118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 25-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 46%/33% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 26-Aug-08 | M200.8 | Selenium | 0.119 | mg/l | MB | 0.00053 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 41 | | 28-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 70%/73% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 41 | | 30-Sep-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 41 | | 30-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 80%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 42 | | 26-Aug-08 | M200.7 | Sodium | 857 D1 | mg/l | MB/MS/MSD | 0.54 mg/k/78%/76% | B7M2 | Low | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. MS recovery was low. The method control sample recovery was acceptable. |
| TEST 43 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 43 | | 14-Oct-08 | E340.2 | Fluoride | 1.5 FD1 | mg/l | MS | 67% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 43 | | 18-Nov-08 | M200.8 | Selenium | 0.0039 | mg/l | MS/MSD | 136%/138% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 43 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 43 | | 25-Nov-08 | M200.7 | Copper | 26.2 | mg/l | CCB | 0.032 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 43 | | 30-Dec-08 | M200.7 | Sodium | <2 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 43 | | 30-Jun-09 | E200.8 | Selenium | 0.0038 | mg/l | CCB | 0.0039 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| TEST 44 | | 2-Sep-08 | M200.8 | Selenium | 0.0565 | mg/l | MB | 0.00043 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 44 | | 7-Apr-09 | E200.8 | Selenium | 0.0118 | mg/l | CCB | 0.00031 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 44 | | 7-Oct-08 | M200.8 | Cadmium | 0.0509 | mg/l | MB | 0.00039 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 44 | | 9-Dec-08 | M200.7 | Copper | 109 D1 | mg/l | MS/MSD | -732%/-634.5% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 44 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 44 | | 13-Jan-09 | M200.7 | Copper | 103 D1 | mg/l | CCB | 0.035 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 44 | | 18-Nov-08 | E340.2 | Fluoride | <10 D2 | mg/l | MS/ICV | 84%/105.4% | M2V1 | HL | MS recovery was low. The method control sample recovery was acceptable. Calibration verification recovery was above method acceptance limits. This target analyte was not detected in the sample. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 44 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 120%/118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 44 | | 23-Dec-08 | M200.7 | Copper | 118 D1 | mg/l | MS/MSD | 0%/0% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 44 | | 23-Dec-08 | M200.7 | Iron | 16.8 | mg/l | MS/MSD | 44%/58.5% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 44 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 44 | | 25-Nov-08 | M200.7 | Copper | 129 D1 | mg/l | CCB | 0.032 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 44 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 41%/48% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 44 | | 30-Dec-08 | M200.7 | Magnesium | <1 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 44 | | 30-Dec-08 | M200.7 | Sodium | <2 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 44 | | 30-Jun-09 | E200.8 | Selenium | 0.0123 | mg/l | CCB | 0.0039 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| TEST 45 | | 2-Sep-08 | M200.7 | Aluminum | 7.27 | mg/l | MS/MSD | 33%/25% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 45 | | 2-Sep-08 | M200.7 | Copper | 74.9 | mg/l | MS/MSD | -922%/-1039% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 45 | | 2-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 36%/43% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 45 | | 2-Sep-08 | M200.8 | Selenium | 0.0351 | mg/l | MB | 0.00043 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 45 | | 7-Oct-08 | M200.8 | Cadmium | 0.0214 | mg/l | MB | 0.00039 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 45 | | 10-Feb-09 | E200.8 | Selenium | 0.0118 | mg/l | MS | 132% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 45 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 45 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 45 | | 10-Feb-09 | E340.2 | Fluoride | <10 D2 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 45 | | 18-Nov-08 | E340.2 | Fluoride | <10 D2 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 45 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB | 117% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 45 | | 23-Dec-08 | M200.7 | Iron | 7.85 | mg/l | MS/MSD | 60%/26% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 45 | | 23-Dec-08 | M200.7 | Manganese | 00.011 F | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 45 | | 23-Dec-08 | M200.7 | Zinc | 0.14 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 45 | | 25-Nov-08 | M200.7 | Copper | 60.8 | mg/l | CCB | 0.032 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 45 | | 30-Dec-08 | M200.7 | Magnesium | <1 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 45 | | 30-Dec-08 | M200.7 | Sodium | <2 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 46 | | 2-Sep-08 | M200.8 | Selenium | 0.0143 | mg/l | MB | 0.00043 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 46 | | 3-Feb-09 | E200.7 | Copper | 11.5 | mg/l | MS/MSD | -73%/-41% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 46 | | 3-Feb-09 | E200.7 | Silica | 2 | mg/l | MS/MSD | 153%/156% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 4-Nov-08 | M200.8 | Selenium | 0.0053 | mg/l | MS/MSD | 152%/151% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 6-Jan-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 6-Jan-09 | M200.7 | Copper | 11.2 | mg/l | MS/MSD | -187%/-206% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 46 | | 6-Jan-09 | M200.7 | Silica | 1.7 F | mg/l | MS/MSD | 130%/132% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 7-Oct-08 | M200.8 | Cadmium | 0.0127 | mg/l | MB | 0.00039 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 46 | | 9-Dec-08 | E340.2 | Fluoride | <5 D1 | mg/l | MS | 89% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 46 | | 10-Feb-09 | E200.7 | Copper | 16.4 | mg/l | MS/MSD | -160%/-156% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 46 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 46 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 46 | | 10-Feb-09 | E340.2 | Fluoride | <5 D1 | mg/l | HT | DL/38 days | H3 | None | Analysis requested past holding time. |
| TEST 46 | | 13-Jan-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 13-Jan-09 | M200.7 | Copper | 9.81 | mg/l | MS/MSD | -9%/-30% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 46 | | 13-Jan-09 | M200.7 | Silica | 2 | mg/l | MS/MSD | 162%/165% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 13-Jan-09 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 74%/73% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 46 | | 16-Dec-08 | M200.7 | Copper | 17.3 | mg/l | MS/MSD | -435%/-428% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 46 | | 16-Dec-08 | M200.7 | Manganese | 00.005 F | mg/l | MS/MSD | 116.5%/1118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 16-Dec-08 | M200.7 | Silica | 2.4 | mg/l | MS/MSD | 117%/119.5% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 46 | | 18-Nov-08 | E340.2 | Fluoride | <5 D2 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 46 | | 20-Jan-09 | E200.7 | Copper | 8.97 | mg/l | MS/MSD | 57%/27% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 46 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB/ MS/MSD | 124%/ 118%120% | L1M1 | High | The associated blank spike recovery was above laboratory acceptance limits. MS recovery was high. The method control sample recovery was acceptable. |
| TEST 46 | | 20-Jan-09 | E200.7 | Silica | 1.9 F | mg/l | MS/MSD | 156%/156% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 21-Oct-08 | M200.8 | Selenium | 0.0065 | mg/l | MB | 0.00016 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 46 | | 25-Nov-08 | M200.7 | Copper | 17.8 | mg/l | CCB | 0.032 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 46 | | 27-Jan-09 | E200.7 | Copper | 10.6 | mg/l | MS/MSD | -12%/-68% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 46 | | 27-Jan-09 | E200.7 | Iron | 2.48 | mg/l | MSD | 80.50% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 46 | | 27-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 120%/118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 27-Jan-09 | E200.7 | Silica | 1.8 F | mg/l | MS/MSD | 162%/162% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Barium | <0.02 | mg/l | MSD | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Calcium | 00.7 F | mg/l | MS/MSD | 125%/127% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Cobalt | 00.02 F | mg/l | MS/MSD | 117%/121% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Copper | 14.2 | mg/l | MS/MSD | -216%/-155% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 46 | | 30-Dec-08 | M200.7 | Magnesium | <1 | mg/l | MS/MSD | 132.5%/136% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Manganese | <0.03 | mg/l | MS/MSD | 121%/124% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Molybdenum | <0.05 | mg/l | MS/MSD | 126%/131% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Nickel | <0.05 | mg/l | MS/MSD | 117%/121% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Potassium | <2 | mg/l | MS/MSD | 118%/121% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Silica | 2.5 | mg/l | MS/MSD | 124%/131% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 46 | | 30-Dec-08 | M200.7 | Sodium | <2 | mg/l | MS/MSD | 111%/128%/133% | V1M1 | High | Calibration verification recovery was above method acceptance limits. This target analyte was not detected. MS/MSD recoveries were high. |
| TEST 46 | | 30-Dec-08 | M200.7 | Zinc | 00.03 F | mg/l | MS/MSD | 121%/124% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 47 | | 2-Sep-08 | M200.8 | Selenium | 0.0047 | mg/l | MB | 0.00043 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |

| | | | |
|---|---|---|---|
| CCB | continuing calibration blank | MB | method blank |
| CCV | continuing calibration verification | MCL | maximum contaminant level. |
| FD | field duplicate | MI | matrix interference |
| HT | holding time | MS/MSD | matrix spike/matrix spike duplicate. |
| ICS | interference check sample | PRES | preservative |
| ICV | initial calibration verification | RPD | relative percent difference. |
| IS | internal standard | SC | Saturated Cell Test |
| LFB | laboratory fortified blank | SD | serial dilution |
| LR | laboratory replicate | | |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 47 | | 7-Oct-08 | M200.7 | Zinc | 335 D1 | mg/l | MS/MSD | -211%/-55% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 47 | | 7-Oct-08 | M200.8 | Cadmium | 0.0151 | mg/l | MB | 0.00039 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 47 | | 21-Oct-08 | M200.8 | Selenium | 0.0067 | mg/l | MB | 0.00016 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 47 | | 26-Aug-08 | M200.7 | Silver | <0.1 D1 | mg/l | CCV | 128% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 47S | | 10-Feb-09 | E200.7 | Zinc | 15.2 | mg/l | MS/MSD | -135%/-126% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 47S | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 47S | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 47S | | 10-Feb-09 | E340.2 | Fluoride | 2.5 FD1 | mg/l | HT | DL/38 days | H3 | None | Analysis requested past holding time. |
| TEST 47S | | 18-Nov-08 | E340.2 | Fluoride | 3.8 D2 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 47S | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB | 124% | L1 | High | The associated blank spike recovery was above laboratory acceptance limits. |
| TEST 47S | | 23-Dec-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 47S | | 23-Dec-08 | E340.2 | Fluoride | 1.4 FD1 | mg/l | MS | 84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 47S | | 23-Dec-08 | M200.7 | Copper | 11.6 | mg/l | MS/MSD | -183%/-133% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 47S | | 23-Dec-08 | M200.7 | Iron | 25.4 | mg/l | MS/MSD | -22%/52% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 47S | | 23-Dec-08 | M200.7 | Zinc | 15 | mg/l | MS/MSD | -138%/-51% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 47S | | 25-Nov-08 | M200.7 | Copper | 9.1 | mg/l | CCB | 0.032 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 47S | | 27-Jan-09 | E200.8 | Arsenic | <0.002 | mg/l | IS | 127% | N1 | High | IS recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL. |
| TEST 47S | | 30-Dec-08 | M200.7 | Magnesium | <1 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 47S | | 30-Dec-08 | M200.8 | Arsenic | <0.002 | mg/l | IS | 126% | N1 | High | IS recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL. |
| TEST 48 | | 2-Sep-08 | M200.8 | Selenium | 0.0066 | mg/l | MB | 0.00043 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 48 | | 7-Oct-08 | M200.8 | Cadmium | 0.0095 | mg/l | MB | 0.00039 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 48 | | 9-Sep-08 | M200.7 | Chromium, Total | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 48 | | 9-Sep-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 118% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 48 | | 26-Aug-08 | E340.2 | Fluoride | 75 D1 | mg/l | MS/MSD | 88% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 48S | | 11-Nov-08 | M200.8 | Arsenic | <0.002 | mg/l | IS | 132% | N1 | High | IS recovery exceeded the acceptance limits. Concentration of associated target analyte(s) in the sample is < MDL. |
| TEST 48S | | 18-Nov-08 | E340.2 | Fluoride | 2 FD2 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 48S | | 25-Nov-08 | M200.7 | Copper | 39.9 | mg/l | CCB | 0.032 mg/l/ -1104%/-1026% | B3M3 | None | Target analyte detected in calibration blank at or above the method reporting limit. The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 49 | | 2-Sep-08 | E340.2 | Fluoride | 26 D1 | mg/l | MS | 30% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 49 | | 7-Oct-08 | E340.2 | Fluoride | 39 D1 | mg/l | MS | 55% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 49 | | 7-Oct-08 | M200.8 | Cadmium | 0.0048 | mg/l | MB | 0.00039 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 49 | | 7-Oct-08 | M200.8 | Lead | 0.0391 | mg/l | MB | 0.003 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 49 | | 9-Sep-08 | M200.7 | Chromium, Total | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 49 | | 9-Sep-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 118% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 49 | | 21-Oct-08 | E340.2 | Fluoride | 9 D1 | mg/l | MS | 69% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 49S | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 49S | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 49S | | 10-Feb-09 | E340.2 | Fluoride | 2 FD2 | mg/l | HT | DL/38 days | H3 | None | Analysis requested past holding time. |
| TEST 49S | | 18-Nov-08 | E340.2 | Fluoride | 2 FD2 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 49S | | 25-Nov-08 | M200.7 | Copper | 15.9 | mg/l | CCB | 0.032 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 49S | | 27-Jan-09 | E200.8 | Lead | 0.0056 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 49S | | 30-Dec-08 | M200.7 | Magnesium | <1 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 49S | | 30-Dec-08 | M200.7 | Sodium | <2 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 50 | | 2-Sep-08 | M200.8 | Selenium | 0.111 | mg/l | MB | 0.00043 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 50 | | 4-Nov-08 | E340.2 | Fluoride | 47 D1 | mg/l | MS | 79.50% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 50 | | 7-Oct-08 | M200.8 | Cadmium | 0.0322 | mg/l | MB | 0.00039 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 50 | | 9-Sep-08 | M200.7 | Chromium, Total | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 50 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 50 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 50 | | 10-Feb-09 | E340.2 | Fluoride | 29 D1 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 50 | | 13-Jan-09 | M200.7 | Copper | 211 D1 | mg/l | CCB | 0.031 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 50 | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB/CCV | 124%/123% | L1V1 | High | The associated blank spike recovery was above laboratory acceptance limits. Calibration verification recovery was above limits. This target analyte was not detected in the sample. |
| TEST 50 | | 21-Oct-08 | M200.8 | Selenium | 0.0723 | mg/l | MB | 0.00016 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 50 | | 23-Sep-08 | M200.8 | Selenium | 0.132 D2 | mg/l | MB | 0.00032 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 50 | | 25-Nov-08 | M200.7 | Copper | 213 D1 | mg/l | CCB | 0.032 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 50 | | 25-Nov-08 | M200.8 | Selenium | 0.0764 D1 | mg/l | CCB | 0.0051 mg/l | B3 | None | Target analyte detected in calibration blank at or above the method reporting limit. |
| TEST 50 | | 26-Aug-08 | M200.7 | Aluminum | 101 | mg/l | MS/MSD | -270%/-279% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 50 | | 26-Aug-08 | M200.7 | Calcium | 410 | mg/l | MS/MSD | 64%/66% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 50 | | 26-Aug-08 | M200.7 | Copper | 2.16 | mg/l | MS/MSD | 63%/59% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 50 | | 26-Aug-08 | M200.7 | Iron | 92.6 | mg/l | MS/MSD | -233%/-207% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 50 | | 26-Aug-08 | M200.7 | Manganese | 25.4 | mg/l | MS/MSD | -79.5%/-84% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 50 | | 26-Aug-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 72%/73% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 50 | | 26-Aug-08 | M200.7 | Zinc | 7.21 | mg/l | MS/MSD | 38%/45% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 51 | | 2-Dec-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 113% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 2-Dec-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 54%/52% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 51 | | 2-Sep-08 | M200.8 | Selenium | 0.0341 | mg/l | MB | 0.00043 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 51 | | 4-Nov-08 | M200.7 | Calcium | 191 | mg/l | MSD | 81.50% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 7-Oct-08 | E325.2 | Chloride (as Cl) | 1 F | mg/l | MS | 112% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 7-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 75%/76% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 9-Dec-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 83%/84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 9-Sep-08 | M200.7 | Chromium, Total | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 51 | | 9-Sep-08 | M200.7 | Iron | <0.05 | mg/l | CCV | 116% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 51 | | 9-Sep-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 118% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 51 | | 9-Sep-08 | M200.7 | Silica | 4.3 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 9-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 70%/79% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 51 | | 11-Nov-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 124% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 11-Nov-08 | M200.7 | Manganese | 0.148 | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 11-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MSD | 82% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 14-Oct-08 | E325.2 | Chloride (as Cl) | <5 | mg/l | MS | 113% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 14-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 50%/51% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 16-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 75%/74% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 18-Nov-08 | E340.2 | Fluoride | 1.1 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 51 | | 18-Nov-08 | M200.7 | Silica | 3.7 | mg/l | MS/MSD | 127%/129% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 18-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 74%/74% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 21-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 63%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 21-Oct-08 | M200.8 | Selenium | 0.0065 | mg/l | MB | 0.00016 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 51 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 51 | | 25-Nov-08 | M200.7 | Aluminum | 00.06 F | mg/l | MS | 84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 25-Nov-08 | M200.7 | Copper | <0.05 | mg/l | MS/MSD | -1106%/-1118% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 51 | | 25-Nov-08 | M200.7 | Manganese | 0.227 | mg/l | MS | 115.50% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 25-Nov-08 | M200.7 | Silica | 3.8 | mg/l | MSD | 117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 25-Nov-08 | M200.7 | Silica | 3.8 | mg/l | MS | 117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 25-Nov-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD<br>MS/MSD | 37%/35%<br>50%/49% | M2 | Low | MS recovery was low. The method control sample recovery was acceptable. (Run twice.) |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 51 | | 28-Oct-08 | M200.7 | Calcium | 200 | mg/l | MSD<br>MSD | 71% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 28-Oct-08 | M200.7 | Potassium | 7.3 | mg/l | MSD | 118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 28-Oct-08 | M200.7 | Silica | 4 | mg/l | MSD | 118% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST 51 | | 28-Oct-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 75%/77% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 51 | | 30-Dec-08 | M200.7 | Sodium | <2 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 51 | | 30-Jun-09 | E200.8 | Selenium | 0.0029 | mg/l | CCB | 0.0039 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| TEST 51 | | 30-Sep-08 | M200.7 | Silver | <0.03 | mg/l | MS/MSD | 73%/75% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 52 | | 2-Sep-08 | M200.8 | Selenium | 0.0229 | mg/l | MB | 0.00043 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 52 | | 9-Sep-08 | M200.7 | Chromium, Total | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 52 | | 9-Sep-08 | M200.7 | Iron | <0.05 | mg/l | CCV | 116% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 52 | | 9-Sep-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 118% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 52S | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 52S | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 52S | | 10-Feb-09 | E340.2 | Fluoride | 00.3 F | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 52S | | 18-Nov-08 | E340.2 | Fluoride | 0.8 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 52S | | 20-Jan-09 | E200.7 | Molybdenum | <0.05 | mg/l | LFB/CCV | 124%/123% | L1V1 | High | The associated blank spike recovery was above laboratory acceptance limits. Calibration verification recovery was above limits. This target analyte was not detected in the sample. |
| TEST 52S | | 30-Dec-08 | M200.7 | Molybdenum | <0.05 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 52S | | 30-Dec-08 | M200.7 | Silica | <2 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 53 | | 7-Oct-08 | M200.8 | Cadmium | 0.0048 | mg/l | MB | 0.00039 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 53 | | 9-Sep-08 | M200.7 | Chromium, Total | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 53 | | 9-Sep-08 | M200.7 | Iron | <0.05 | mg/l | CCV | 116% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 53 | | 10-Feb-09 | E245.1 | Mercury | <0.001 | mg/l | HT | 37 days | H3 | None | Analysis requested past holding time. |
| TEST 53 | | 10-Feb-09 | E325.2 | Chloride (as Cl) | <5 | mg/l | HT | 36 days | H3 | None | Analysis requested past holding time. |
| TEST 53 | | 10-Feb-09 | E340.2 | Fluoride | <5 D2 | mg/l | HT | 38 days | H3 | None | Analysis requested past holding time. |
| TEST 53 | | 18-Nov-08 | E340.2 | Fluoride | 6 D2 | mg/l | ICV | 105.40% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 53 | | 25-Nov-08 | E340.2 | Fluoride | 4.7 | mg/l | MS | 57% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST 53 | | 27-Jan-09 | E200.8 | Lead | 0.0191 | mg/l | MB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 53 | | 30-Dec-08 | M200.7 | Magnesium | <1 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 53 | | 30-Dec-08 | M200.7 | Molybdenum | <0.05 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST 53 | | 30-Dec-08 | M200.7 | Sodium | <2 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 54 | | 7-Apr-09 | E200.8 | Selenium | 0.0039 | mg/l | CCB | 0.00031 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 54 | | 9-Sep-08 | M200.7 | Chromium, Total | <0.05 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 54 | | 9-Sep-08 | M200.7 | Iron | <0.05 | mg/l | CCV | 116% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 54 | | 9-Sep-08 | M200.7 | Magnesium | 33.3 | mg/l | CCV | 118% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 54 | | 9-Sep-08 | M200.7 | Nickel | <0.05 | mg/l | CCV | 118% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 54 | | 10-Mar-09 | E200.8 | Antimony | <0.002 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 54 | | 21-Oct-08 | M200.8 | Selenium | 0.0073 | mg/l | MB | 0.00016 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST 54 | | 23-Sep-08 | M200.8 | Lead | <0.0005 | mg/l | MB | 0.00032 mg/l | B4 | None | Target analyte detected in blank at or above method acceptance criteria. |
| TEST 54 | | 25-Aug-09 | E200.7 | Sodium | <2 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 54 | | 30-Dec-08 | M200.7 | Calcium | 469 | mg/l | MS | 78% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST 54 | | 30-Dec-08 | M200.7 | Molybdenum | <0.05 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST 54 | | 30-Jun-09 | E200.8 | Selenium | 0.008 | mg/l | CCB | 0.0039 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| TEST SC2 | | 8-Mar-10 | E200.7 | Calcium | 560 | mg/l | MS/MSD | 74%/72% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC2 | | 8-Mar-10 | E200.7 | Silica | 20.1 | mg/l | MS/MSD | 249%/253% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC2 | | 8-Mar-10 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 68%/69% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC2 | | 8-Mar-10 | E245.1 | Mercury | <0.001 | mg/l | MSD | 81% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC2 | | 10-May-10 | E200.7 | Calcium | 419 | mg/l | MS/MSD | 70%/62% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC2 | | 10-May-10 | E200.7 | Potassium | 5.9 | mg/l | MS/MSD | 117%/117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC2 | | 10-May-10 | E200.7 | Silica | 8 | mg/l | MS/MSD | 137%/138% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC2 | | 10-May-10 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 82%/77% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC2 | | 10-May-10 | E300 | Chloride (as Cl) | <30 | mg/l | MS | 81% | D1M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC2 | | 15-Mar-10 | E200.7 | Calcium | 592 | mg/l | MS/MSD | 10.9%/-4.7% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC2 | | 15-Mar-10 | E200.7 | Nickel | <0.05 | mg/l | MS | 82% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC2 | | 15-Mar-10 | E200.7 | Silica | 14.2 | mg/l | MS/MSD | 116%/119% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST SC2 | | 15-Mar-10 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 80%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC2 | | 15-Mar-10 | E200.7 | Sodium | 1.6 F | mg/l | MSD | 122% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC2 | | 24-May-10 | E200.7 | Calcium | 430 | mg/l | MS/MSD | 66%/84% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC2 | | 24-May-10 | E200.7 | Silica | 7.3 | mg/l | MS/MSD | 124%/127% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC2 | | 24-May-10 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 77%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC11 | | 8-Mar-10 | E300 | Fluoride | <10 | mg/l | LFB | 111% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC11 | | 15-Mar-10 | E200.7 | Aluminum | 73.1 | mg/l | CCB | 0.143 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST SC11 | | 24-May-10 | E300 | Chloride (as Cl) | <30 | mg/l | MS | 86% | D1M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC11 | | 24-May-10 | E300 | Fluoride | <5 | mg/l | MS | 85% | D1M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC12 | | 15-Mar-10 | E200.7 | Copper | 387 | mg/l | MS/MSD | 0.775231054 | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC12 | | 15-Mar-10 | E200.7 | Nickel | 0.02 F | mg/l | MS | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC12 | | 24-May-10 | E200.8 | Arsenic | <0.002 | mg/l | MSD | 143% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC12 | | 24-May-10 | E200.8 | Cadmium | <0.0005 | mg/l | MS/MSD | 132%/147% | M3 | High | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC12 | | 24-May-10 | E200.8 | Lead | 0.0008 | mg/l | MSD | 140% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC12 | | 24-May-10 | E200.8 | Thallium | <0.0005 | mg/l | MSD | 139% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC12 | | 24-May-10 | E200.8 | Uranium | <0.0005 | mg/l | MSD | 146% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC14 | | 15-Mar-10 | E200.7 | Aluminum | 36.7 | mg/l | CCB | 0.143 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST SC21 | | 8-Mar-10 | E200.8 | Selenium | 1.92 | mg/l | CCB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST SC21 | | 15-Mar-10 | E200.7 | Aluminum | 20.7 | mg/l | CCB | 0.143 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST SC28 | | 15-Mar-10 | E200.7 | Aluminum | 26.5 | mg/l | CCB | 0.143 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST SC38 | | 8-Mar-10 | E200.8 | Selenium | <0.005 | mg/l | CCB | 0.00036 mg/l | B1 | None | Target analyte detected in method blank at or above the method reporting limit. |
| TEST SC38 | | 15-Mar-10 | E200.7 | Cobalt | <0.05 | mg/l | CCV | 119% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC38 | | 15-Mar-10 | E200.7 | Molybdenum | <0.05 | mg/l | CCV | 117% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC39 | | 15-Mar-10 | E200.7 | Cobalt | <0.05 | mg/l | CCV | 119% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX M
# DATA VERIFICATION RESULTS

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST SC44 | | 15-Mar-10 | E200.7 | Molybdenum | <0.05 | mg/l | CCV | 117% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC44 | | 24-May-10 | E200.8 | Arsenic | <0.002 | mg/l | MS | 136% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC44 | | 24-May-10 | E200.8 | Selenium | 0.0049 | mg/l | MS | 130.50% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC44 | | 24-May-10 | E200.8 | Thallium | <0.0005 | mg/l | MS | 131% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC49 | | 8-Mar-10 | E200.7 | Magnesium | <50 | mg/l | CCV | 112% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC49 | | 8-Mar-10 | E200.8 | Antimony | <0.02 | mg/l | MS | 132% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC49 | | 8-Mar-10 | E200.8 | Selenium | 0.134 | mg/l | CCB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST SC49 | | 8-Mar-10 | E200.8 | Uranium | 0.122 | mg/l | MS/MSD | 146%/146% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC49 | | 10-May-10 | E200.7 | Iron | 18.5 | mg/l | MS/MSD | -53%/-39% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC49 | | 10-May-10 | E200.7 | Potassium | 0.3 F | mg/l | MSD | 116% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC49 | | 10-May-10 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 80%/78% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC49 | | 10-May-10 | E200.7 | Zinc | <0.05 | mg/l | MS | 128% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC49 | | 10-May-10 | E300 | Chloride (as Cl) | <30 | mg/l | MS | 86% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC49 | | 15-Mar-10 | E200.7 | Boron | <0.5 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC49 | | 15-Mar-10 | E200.7 | Sodium | <20 | mg/l | CCV | 111% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC49 | | 15-Mar-10 | E200.7 | Vanadium | <0.3 | mg/l | CCV/MSD | 116%/117% | V1M1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. Matrix spike recovery was high. The method control sample recovery was acceptable. |
| TEST SC49 | | 24-May-10 | E200.7 | Iron | 14.1 | mg/l | MS/MSD | 6%/26% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC49 | | 24-May-10 | E200.7 | Silver | <0.03 | mg/l | MS/MSD | 69%/69% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC50 | | 8-Mar-10 | E200.7 | Copper | 670 | mg/l | MS/MSD | -1780%/-1960% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC50 | | 8-Mar-10 | E200.8 | Arsenic | 0.0126 | mg/l | MS/MSD | 195%/198% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC50 | | 8-Mar-10 | E200.8 | Selenium | 0.185 | mg/l | CCB | 0.00036 mg/l | B7 | None | Target analyte detected in method blank at or above method reporting limit. Concentration found in the sample was 10 times above the concentration found in the method blank. |
| TEST SC50 | | 8-Mar-10 | E245.1 | Mercury | <0.001 | mg/l | MS | 84% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC50 | | 8-Mar-10 | E300 | Fluoride | 190 | mg/l | MS | 70% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC50 | | 15-Mar-10 | E200.7 | Boron | <0.05 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

**APPENDIX M**
**DATA VERIFICATION RESULTS**

| Field Identification | | Sample Date | Analysis | Analyte | Sample Result | Sample Units | QC Type | QC Result | Qualifier | Bias | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| TEST SC50 | | 15-Mar-10 | E200.7 | Copper | 78.6 | mg/l | MS/MSD | -1595%/-1596% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC50 | | 15-Mar-10 | E200.7 | Iron | 18.3 | mg/l | MS/MSD | -94%/-91% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC50 | | 15-Mar-10 | E200.7 | Manganese | 1.61 | mg/l | MS/MSD | -66%/-65% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC50 | | 15-Mar-10 | E200.7 | Molybdenum | <0.05 | mg/l | CCV/MSD | 117%/118% | V1M1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. Matrix spike recovery was high. The method control sample recovery was acceptable. |
| TEST SC50 | | 15-Mar-10 | E200.7 | Zinc | 1.43 | mg/l | MI | NA | N1 | Low | Concentration estimated. Analytical result was less than the negative MDL due to matrix interferences. |
| TEST SC50 | | 15-Mar-10 | E300 | Chloride (as Cl) | <30 | mg/l | MS/MSD | 73%/69% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC50 | | 24-May-10 | E300 | Chloride (as Cl) | <30 | mg/l | MS | 88.50% | D1M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC50 | | 24-May-10 | E300 | Fluoride | 10 | mg/l | MS | 80% | D1M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC52 | | 8-Mar-10 | E200.8 | Selenium | 0.0638 | mg/l | MS/MSD | 234%/234% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC52 | | 15-Mar-10 | E200.7 | Boron | <0.05 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC52 | | 15-Mar-10 | E200.7 | Molybdenum | <0.05 | mg/l | CCV | 117% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC52 | | 15-Mar-10 | E200.7 | Silica | 8.9 | mg/l | MS/MSD | 142.5%/130% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC52 | | 15-Mar-10 | E200.7 | Vanadium | <0.03 | mg/l | CCV | 116% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC54 | | 8-Mar-10 | E200.7 | Boron | <0.05 | mg/l | MS/MSD | 116%/117% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC54 | | 8-Mar-10 | E200.7 | Copper | 13.7 | mg/l | MS/MSD | -51%/-23% | M3 | Low | The accuracy of the spike recovery value is reduced since the analyte concentration in the sample is disproportionate to spike level. The method control sample recovery was acceptable. |
| TEST SC54 | | 8-Mar-10 | E200.7 | Magnesium | 49.8 | mg/l | MS | 79% | M2 | Low | Matrix spike recovery was low. The method control sample recovery was acceptable. |
| TEST SC54 | | 15-Mar-10 | E200.7 | Boron | <0.05 | mg/l | CCV | 113% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC54 | | 15-Mar-10 | E200.7 | Molybdenum | <0.05 | mg/l | CCV | 117% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC54 | | 15-Mar-10 | E200.7 | Vanadium | <0.03 | mg/l | CCV | 116% | V1 | High | Calibration verificiation recovery above method acceptance limits. Analyte not detected. |
| TEST SC54 | | 15-Mar-10 | E200.8 | Arsenic | 0.0006 F | mg/l | MS/MSD | 142%/142% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |
| TEST SC54 | | 15-Mar-10 | E200.8 | Selenium | 0.0104 | mg/l | MS/MSD | 147%/147% | M1 | High | Matrix spike recovery was high. The method control sample recovery was acceptable |

| | |
|---|---|
| mg/l | milligrams per liter. |
| pci/g | picocuries per gram. |
| D1 | Sample required dilution due to matrix. |
| D2 | Sample required dilution due to high concentration of target analyte. |
| D3 | Sample dilution required due to insufficient sample. |
| D4 | Minimum reporting level adjusted to reflect sample amount received and analyzed. |
| F | Analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit, but greater than the method detection limit. |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| FD | field duplicate |
| HT | holding time |
| ICS | interference check sample |
| ICV | initial calibration verification |
| IS | internal standard |
| LFB | laboratory fortified blank |
| LR | laboratory replicate |
| MB | method blank |
| MCL | maximum contaminant level. |
| MI | matrix interference |
| MS/MSD | matrix spike/matrix spike duplicate. |
| PRES | preservative |
| RPD | relative percent difference. |
| SC | Saturated Cell Test |
| SD | serial dilution |

# APPENDIX H

Geochemical Characterizations
of Resolution Tailings

DUKE HYDRO|CHEM

REPORT

# GEOCHEMICAL CHARACTERIZATION OF RESOLUTION TAILINGS

## RESOLUTION COPPER MINING, PINAL COUNTY, ARIZONA

AUGUST 19, 2014

DUKE
HYDRO|CHEM

# REPORT

# GEOCHEMICAL CHARACTERIZATION OF RESOLUTION TAILINGS

**PREPARED FOR:**

RESOLUTION COPPER MINING LLC
SUPERIOR, ARIZONA, USA

**PREPARED BY:**

DUKE HYDROCHEM LLC
TUCSON, ARIZONA, USA

19 AUGUST, 2014

**TECHNICAL REVIEW NOTICE**

Technical review of this document was provided by Mr. Mark Logsdon of Geochimica, Inc., Aptos, California at the request of Resolution Copper Mining LLC and Duke HydroChem LLC.

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# Appendices

**Appendix A:** Summary of metallurgical testing methods
**Appendix B:** Kennecott Utah Copper acid-base accounting procedure
**Appendix C**: Resolution Copper Mining acid-base accounting data for scavenger tailings

# List of Acronyms and Abbreviations

| | |
|---|---|
| ABA | acid-base accounting |
| ADEQ | Arizona Department of Environmental Quality |
| AGP | acid generating potential |
| ANP | acid neutralizing potential |
| APP | aquifer protection permit |
| ARD | acid-rock drainage |
| BLM | Bureau of Land Management |
| EPA | Environmental Protection Agency |
| HCT | humidity cell test |
| ICP-MS | inductively coupled plasma – mass spectrometry |
| ICP-OES | inductively coupled plasma – optical emissions spectrometry |
| MC | material composite |
| NAG | net acid generation |
| NNP | net neutralization potential |
| NPAG | not potentially acid generating |
| NPR | neutralization potential ratio |
| PAG | potentially acid generating |
| QEMSCAN | quantitative evaluation of minerals by scanning electron microscopy |
| RCM | Resolution Copper Mining, LLC |
| SFE | shake flask extraction |
| SPLP | synthetic precipitation leaching procedure |
| TDS | total dissolved solids |
| TSF | tailings storage facility |
| XRD | x-ray diffraction |

# 1.0 Executive Summary

Background

1. Geochemical characterization of Resolution tailings began in 2002. Since then, a series of studies utilizing both static and kinetic (Tier 1 and 2) tests has been conducted culminating in three multi-year kinetic studies at both laboratory and field-cell scales.
2. These studies have been conducted to support development of Resolution's Mine Plan of Operations and subsequent NEPA assessment as well as the Project's application for an Aquifer Protection Permit from the Arizona Department of Environmental Quality.
3. Resolution's current tailings management strategy calls for separation of tailings into two mineralogically and geochemically discrete streams known as "cleaner" and "scavenger" tailings (terminology that comes from the metallurgical ore processing).
4. Cleaner tailings contain the majority of the pyrite and residual metals; this tailings stream is anticipated to account for approximately 15 percent of the total tailings volume.
5. Scavenger tailings contain very low concentrations of sulfide due to segregation of the majority of the pyrite to the cleaner tailings; this tailings stream is anticipated to account for approximately 85 percent of the total tailings volume.
6. Other tailings products considered during process development and optimization, including whole tailings and cycloned scavenger tailings, have also been subjected to geochemical testing and the results are provided in this report; however, these products are not included in the current tailings management plan.
7. It should be noted that the results of geochemical testing included in this report simply pertain to the likely geochemical reactivity of the tailings materials should they be exposed to oxidizing conditions. These tests do not predict the composition of discharge from the tailings storage facility (TSF) or the quality of groundwater adjacent to the impoundment.
8. Analytical data generated from geochemical testing of tailings will be used, along with metallurgical, engineering and operating information, in solute/water balance and fate-and-transport modeling that is planned pending completion of the hydrogeologic characterization of the proposed site of the TSF. The goal of the solute/water-balance and fate-and-transport modeling will be to provide a quantitative assessment of the potential chemical composition of discharge from the TSF as well as the groundwater quality adjacent to the proposed TSF during mining operations and post-closure.

Cleaner Tailings

9. The majority of the non-economic sulfides (largely pyrite) and residual metals that cannot be recovered economically from the gangue are segregated and concentrated into the cleaner tailings during metallurgical processing.
10. Geochemical characterization studies consistently demonstrate that cleaner tailings are potentially acid generating, meaning that, if allowed to weather in an oxidizing environment, they may be expected to generate acidic conditions and produce drainage with elevated metals and sulfate.
11. The acid generating potential of the cleaner tailings has long been recognized by the Resolution Project, and the current tailings management strategy includes emplacement and storage of cleaner tailings under saturated conditions; cleaner tailings will be encapsulated by scavenger tailings and, ultimately, covered with an engineered cover to prevent exposure to oxidizing conditions.

Scavenger Tailings

12. Scavenger tailings contain very little pyrite due to the segregation of pyrite to the cleaner tailings.
13. RCM's metallurgical program has demonstrated that production of scavenger tailings with very low sulfide sulfur content is an achievable goal.
14. Geochemical characterization indicates that scavenger tailings with very low sulfide sulfur contents are unlikely to leach metals or sulfate at concentrations of environmental concern.
15. Continued geochemical characterization of scavenger tailings is ongoing.

# 2.0 Introduction

Resolution Copper Mining LLC (RCM) is proposing to develop an underground copper mine using the Panel Cave mining method approximately two miles east of the town of Superior in the Pioneer Mining District, Pinal County, Arizona. It is anticipated that this project would generate approximately 1.5 billion tons (1.4 billion tonnes) of tailings material over a projected mine life of 40 years. RCM has conducted a series of characterization studies beginning in 2002 in order to determine the geochemical properties of the tailings and assess the potential for them to generate acidic drainage and leach metals or sulfate if allowed to weather under oxidizing conditions. This work has been conducted to support development of RCM's Mine Plan of Operations and subsequent NEPA assessment as well as the Project's application for an Aquifer Protection Permit (APP) from the Arizona Department of Environmental Quality (ADEQ).

The purpose of the current report is to summarize the testing methods and principal results of each phase of the geochemical characterization program, compile the geochemical data and reports generated by each study into a single library of resources, and provide an evaluation of the potential geochemical reactivity of the tailings materials based on the work completed to date. This data compilation and evaluation informs RCM's geochemical goals for the tailings materials that will be produced. Data regarding the potential geochemical behavior of the tailings under oxidizing conditions will be used to develop solute/water-balance models and fate-and-transport models. The goal of these modeling efforts will be to determine the likely quality of groundwater adjacent to the proposed tailings impoundment over the life of the facility. In order to estimate groundwater quality it is necessary to integrate the estimated geochemical composition of leachate from the tailings with operational details regarding the design, construction, and closure of the tailings storage facility (TSF) as well as the hydrologic, geologic, and geochemical characteristics of the surrounding environment. Fate-and-transport modeling will commence once hydrogeologic characterization is completed at the proposed TSF site.

The ultimate goal of the geochemical testing of tailings presented in this report is to understand the potential geochemical reactivity of the tailings should they be allowed to weather under oxidizing conditions. It is important to note that these tests do not, and are not intended to, predict the quality of groundwater or surface water in the environment. Geochemical testing allows identification of those materials that are likely to generate acidic conditions in an oxidizing environment and those that are likely to remain circumneutral. In addition, analysis of leachates generated from both static and kinetic testing provides information regarding constituents that might potentially be released under acidic conditions. For the purposes of this report, constituents are identified as having the potential to be released under acidic conditions if they are elevated with respect to metals concentrations in natural waters in non-

mineralized systems as presented by Hem (1985). This assessment is qualitative and intended only to provide an initial indication of elements that may require further attention as fate-and-transport models are developed and as Resolution further refines its engineering plans for tailings management during operations and final closure.

Although testing has occurred over more than a decade, each of the geochemical characterization studies conducted on tailings has several elements in common. First, samples of ore material were selected based on study objectives and the mine plan. Then tailings were generated according to the metallurgical goals of the project, and geochemical testing was conducted using either static or kinetic testing protocols or both. Initial testing consisted of smaller samples with shorter test times; then, as understanding of the geochemical characteristics was developed, longer, more complex studies were conducted using larger samples. Operational details of each of the geochemical characterization studies are summarized in **Table 1**.

A brief description of the analytical methods used in each of the characterization studies is presented in **Section 3**.

**Section 4** provides a discussion of each study including:

- Objectives of the study
- Sample selection and tailings generation
- Summary of the geochemical testing and characterization
- Principal test results

A summary of the principal findings of the geochemical characterization program and considerations regarding the geochemical reactivity of the tailings materials are presented in **Section 5.0**.

| Ore Sample Description | Tailings Generated By: | Testing By: | Test Type | Samples Tested | Report Reference |
|---|---|---|---|---|---|
| **INITIAL CHARACTERIZATION** | | | | | |
| One master composite from RES-002C-2, RES-003-1, RES-003A-1 | Dawson[1] | Dawson | Static | 1 Scavenger Tailings<br>1 Cleaner Tailings<br>1 Desulfidized Scavenger | Dawson (2002) |
| **ACID BASE ACCOUNTING ANALYSIS OF SCAVENGER TAILINGS** | | | | | |
| Approximately 240 scavenger tailings samples | Dawson | Dawson | Static | Scavenger tailings | Data provided in Appendix A |
| **BOREHOLE RES-007** | | | | | |
| One overall master composite from RES-007/7A and RES-007C | | KCB[2] | Static | 1 Scavenger Tailings<br>2 Cleaner Tailings<br>1 Scavenger Supernatant<br>1 Cleaner Supernatant | KCB (2007) |
| | | SVL[3] | Static | 1 Scavenger Tailings<br>1 Cleaner Tailings<br>1 Scavenger Supernatant<br>1 Cleaner Supernatant | Golder[4] (2007) |
| | | CEMI[5] | Kinetic | 3 Scavenger Tailings (thickened, paste, filtered)<br>3 Cleaner Tailings (thickened, paste, filtered) | Golder (2008)<br>Golder (2009) |

**Table 1:** Summary of geochemical characterization studies (2002 – 2014)

[1] Dawson Metallurgical Laboratories (now FLSmidth Dawson Metallurgical Laboratories), Salt Lake City, Utah, USA

[2] Klohn Crippen Berger Ltd., Vancouver, British Columbia, Canada

[3] SVL Analytical Inc., Kellogg, Idaho, USA

[4] Golder Associates Inc., Redmond, Washington, USA

[5] Canadian Environmental & Metallurgical Inc., Burnaby, British Columbia, Canada

| Ore Sample Description | Tailings Generated By: | Testing By: | Test Type | Samples Tested | Report Reference |
|---|---|---|---|---|---|
| **BLENDED ORE COMPOSITES** | | | | | |
| Three blended composites representing a range of ore sulfide concentrations; samples from many boreholes | Dawson | ACZ[6] | Static | 3 Scavenger Tailings<br>3 Cleaner Tailings<br>3 Whole Tailings<br>3 Feedstock<br>3 Concentrate | MWH (2014) |
| | | Chemac[7]/ACZ | Kinetic | 3 Scavenger Tailings<br>3 Cleaner Tailings<br>3 Whole Tailings | MWH (2014) |
| **PILOT PLANT** | | | | | |
| Approximately 3 tonnes of RCM ore | SGS[8] | SGS | Static and Kinetic | 1 Scavenger Tailings<br>1 Cleaner Tailings<br>1 Whole Tailings<br>1 Cyclone Underflow - Untreated<br>1 Cyclone Underflow - Desulfidized | SGS (2014) |
| **BARREL TESTING** | | | | | |
| Pilot plant tailings samples | SGS | Golder/Geochimica[9] | Kinetic | 3 Scavenger Tailings<br>3 Cleaner Tailings (2 paste, 1 filter cake)<br>1 Whole Tailings<br>2 Cyclone Underflow – Untreated<br>2 Cyclone Underflow – Desulfidized | Golder (2013) |

**Table 1 (continued):** Summary of geochemical characterization studies (2002 – 2014)

[6] ACZ Laboratories Inc., Steamboat Springs, Colorado, USA

[7] Chemac Environmental Services; Centennial CO

[8] SGS Canada Inc., Lakefield, Ontario, Canada

[9] Geochimica Inc., Aptos, California, USA

# 3.0 Background

This section provides a brief overview of:

- the processes by which tailings samples have been generated for geochemical characterization
- the geochemical methods that have been used to characterize the acid generating and metal leaching potential of each of the tailings products
- industry guidelines used in interpreting the results of geochemical tests

## 3.1 Metallurgical Testing (Tailings Production)

The ore to be mined at the Resolution Copper Project is a copper-molybdenum ore and it is expected to yield economic quantities of both elements. Thus, the principal goal of the metallurgical development carried out by RCM has been to optimize recovery of both copper and molybdenum. However, another important focus has been on separating the non-economic product of the ore processing (tailings) into two mineralogically and geochemically discrete tailings streams known as "cleaner" tailings and "scavenger" tailings ("scavenger" tailings are also referred to as "rougher" or "rougher/scavenger" tailings in some Project documents). The primary goal of this separation is to concentrate the remaining non-economic (or gangue) sulfide minerals (primarily pyrite) and residual metals that have not already been removed into the copper and/or molybdenum concentrate products into the cleaner tailings and thus to generate a scavenger tailings stream that is not acid generating.

To follow best practice acid prevention and management techniques, RCM's goal has been to reduce the sulfide sulfur content of the scavenger tailings. Sulfide sulfur contents of the scavenger tailings have varied over the last decade as flotation strategy has been refined to meet both metallurgical and environmental goals. Early in the project many of the tests that generated scavenger tailings were focused on optimizing copper and molybdenum yields, and some of these tests generated scavenger tailings with highly variable sulfide sulfur contents (sulfide sulfur contents from all tests ranged from less than 0.1 weight percent sulfide sulfur to 1 weight percent with an average sulfide sulfur content of 0.18 weight percent). However, RCM's metallurgical program has demonstrated that, when the test goal is specifically to reduce sulfide sulfur in the scavenger tailings, total sulfide sulfur contents toward the low end of the observed range can be achieved through optimization of engineering and quality assurance.. Although the low sulfide content of the scavenger tailings means that the cleaner tailings contain more sulfide and therefore have greater potential to generate acid, the cleaner tailings account for a small part of the total volume of tailings (anticipated to be approximately 15 percent) and can be more easily managed and segregated within the tailings storage facility (TSF) to prevent exposure to oxidizing conditions.

Tailings have been generated from metallurgical test work at the laboratory and pilot plant scale to represent the type of ore processing and tailings generation methodology to be used by RCM. For a brief explanation of laboratory and pilot plant metallurgical testing methods see **Appendix A**.

## 3.2 Geochemical Characterization of Tailings

Because multiple studies have been conducted over the last decade nomenclature varies between the reports that have been generated. In order to compare results across studies the authors of the current report use a standardized set of terms and units associated with geochemical testing and interpretation of test results. These terms are commonly used in the literature; however, the reader will find variations used in Project documents and in supporting reports and memoranda.

- Terms describing test types and material classifications are defined in subsections of **Section 3.2** below and acronyms are listed in the front matter of this report. Results and discussion from supporting documents that are presented in this report have been standardized to this terminology.
- The current report provides results of tests that yield the potential for a material to generate acid in units of tons of equivalent calcium carbonate ($CaCO_3$) per kiloton of rock (T $CaCO_3$/kT rock). Several other units are widely used in the literature including both grams of $CaCO_3$ per kilogram of rock (g $CaCO_3$/kg rock) and kilograms of $CaCO_3$ per metric ton (tonne) of rock (kg $CaCO_3$/T of rock); these alternative units are all in parts-per-thousand, and so convey the same proportional meanings.

Geochemical characterization of tailings materials has been carried out in accordance with industry best-practice guidelines including guidance from ADEQ regarding selection of best available demonstrated control technology (BADCT) for a tailings storage facility (TSF). The ADEQ divides characterization procedures into Tier 1 (static) and Tier 2 (kinetic) categories (ADEQ, 2004). Tests from both of these categories have been undertaken as part of RCM's geochemical characterization program and a brief description of each is provided below.

### 3.2.1 Tier 1 (Static) Testing

Tier 1, or static, geochemical testing is composed of a set of analyses that, taken together, describe the potential for a material to generate acidic conditions and/or leach metals or other constituents of concern when weathered under oxidizing conditions. These scoping tests do not provide information regarding whether such acidic conditions would actually occur, nor do they provide information regarding the potential timing of the onset of such conditions. The humidity cell tests (kinetic tests) described in **Section 3.22** are used to investigate leachate composition and the timeframe within which geochemical changes occur. This section provides

a brief description of each of the Tier 1 tests conducted as part of the RCM baseline tailings characterization.

### *3.2.1.1 Acid-Base Accounting*

Acid-base accounting (ABA) is used as an initial screening tool to evaluate the potential of a material to generate acidic conditions due to weathering in an oxidizing environment. ABA analyses measure the relative amounts of potentially acid generating minerals and potentially acid neutralizing minerals in a given sample. Results are expressed in this report using the terms listed below. It should be noted that many variations on this nomenclature are used in the literature, and in other Project documents, but all terms are generally intended to express the potential of a material to produce or neutralize acidity under oxidizing conditions and, as such, are largely equivalent.

- Paste pH which indicates the present drainage pH of the sample and may be used to identify samples that have undergone some degree of oxidation between being generated and tested.
- Acid generating potential (AGP) which is calculated from the sulfide sulfur content of the sample. The acid generating potential (AGP) of materials determined using ABA methods is a conservative measure in that the calculations assume that all sulfide sulfur is present as pyrite and that all the pyrite is available for oxidation (see **Section 3.2.1.6** for a brief discussion of the relationship between pyrite and sulfide sulfur content). Thus the AGP value generated by ABA calculations is a maximum value that does not account for the presence of sulfides that produce less acidity than pyrite during oxidation, or those sulfide grains that are not accessible due to encapsulation by silicates or other less reactive minerals.
- Acid neutralizing potential (ANP) which is a measure of the amount of acid that a given material is capable of neutralizing. There are two forms of ANP which are calculated from the amount and type of potentially neutralizing minerals in a sample. The carbonate ANP is based on the amount of carbonate minerals (particularly calcite) within the sample which is calculated from the measured total inorganic carbon. In contrast, bulk ANP (often called Sobek NP, after the lead author of the original EPA study (Sobek et al., 1978)) is measured using a titration test that determines the amount of strong acid the rock can neutralize. This ANP test does not distinguish neutralization provided by silicate minerals from that released from carbonates.
- Net neutralization potential (NNP) is calculated as the difference between ANP and AGP (NNP = ANP – AGP).
- AGP, ANP, and NNP are all expressed in units of tons of equivalent calcium carbonate ($CaCO_3$) per kiloton of rock (T $CaCO_3$/kT rock).
- Neutralization potential ratio (NPR) is the ratio ANP to AGP (NPR = ANP/AGP) and is unitless.

Theoretically, materials with an NNP of less than 0.0 T $CaCO_3$/kT rock and an NPR of less than 1 are classified as potentially acid generating (PAG), whereas materials with an NNP of greater than 0.0 T $CaCO_3$/kT rock and an NPR of greater than 1 are not potentially acid generating (NPAG). It should be noted that, in classifying the NNP of RCM scavenger tailings, it is necessary to calculate the difference between two very small values that are close to the analytical limit of detection. The AGP of the scavenger tailings is small due to very low sulfide sulfur contents, and the ANP is often small due to the low carbonate content of the Resolution tailings. In order to avoid potential error and ambiguity associated with NNP calculated from small AGP and ANP values, greater weight is given to NPR values in this report.

NPR values recommended in the literature as indicating a safe margin of error range from 1 to 3; however, recent industry guidance states that an NPR value of 2 or greater, "generally signifies that there is a high probability that the material will remain circum-neutral in pH" (AMIRA, 2002). The AMIRA (2002) guidance is used throughout this report to classify tailings as potentially acid generating (PAG; NPR < 1) or not potentially acid generating (NPAG; NPR > 2) based on ABA data. Samples with NPR values between 1 and 2 are technically NPAG but do not meet the AMIRA (2002) recommended margin of safety. Note that the nomenclature used in the AMIRA (2002) guidance is slightly different than that used in the current report; the ratio between ANP and AGP referred to as NPR in this report is equivalent to the term referred to in the AMIRA guidance as the ratio between acid neutralizing capacity (ANC) and maximum potential acidity (MPA) or the ANC/MPA ratio.

An additional consequence of the low acid-generating and acid-neutralizing capacities of the scavenger tailings is that material heterogeneity, the ability of a given sample to represent that heterogeneity, and analytical uncertainty all impact the values to a greater degree than when large quantities of acid-generating or acid-neutralizing materials are present and the NPR is clearly dominated by one or the other. Although comparisons to industry guidelines are provided in this report, it should be noted that ABA results must be interpreted within the larger context of mineralogy and the results of kinetic testing in order to form an accurate understanding of the potential reactivity of these materials under oxidizing conditions.

#### *3.2.1.2 Net Acid Generation Testing*

Net acid generation (NAG) testing is used to assess whether a sample is capable of neutralizing the acid produced by the complete oxidation of all sulfide minerals present in the sample. The oxidation is achieved using hydrogen peroxide ($H_2O_2$), a much stronger oxidizer than is oxygen in air. NAG testing may also provide an estimate of the leachate chemistry should complete oxidation of sulfide minerals occur. After complete oxidation of the sulfide minerals within the sample, the NAG solution is analyzed for pH and a full suite of chemical parameters; however, it

should be understood that the observed concentrations are specific to the test protocol, including use of $H_2O_2$ and a high solution: solid leaching ratio.

NAG results are interpreted as follows (MEND, 2009; Stewart et al., 2006):

- Final pH > 4.5: not potentially acid generating (NPAG)
- Final pH < 4.5: Potentially acid generating (PAG)

The NAG tests are most useful when evaluated in conjunction with the standard ABA methodologies, as independent methods of assessing acid generation potential at the screening level.

#### *3.2.1.3 Synthetic Precipitation Leaching Procedure*

The synthetic precipitation leaching procedure (SPLP) is used to determine what chemical constituents are likely to initially leach from a geologic material during natural weathering (e.g., exposure to precipitation or surface water runoff). The initial leach solution is distilled water that has been slightly acidified to match precipitation chemistry (pH 4.2) according to guidance in U.S. EPA Method 1312. The water: rock ratio used ranged from 20:1 (Golder, 2007) to 3:1 (MWH, 2014). The leach solution and geologic material are allowed to remain in contact for 24 hours and the resulting leachate is analyzed for common ions, metals, metalloids, and water quality parameters. SPLP results need to be considered in terms of the history of the sample under leach (i.e., whether it is fresh rock or an aged, weathered sample that has already been exposed to oxidation) and the water: rock ratio of the test in light of site-specific hydrology (i.e., the 20:1 or 3:1 water: rock ratio used in the SPLP in comparison to a water: rock ratio of approximately 1:6 for a saturated sample of porous-medium, alumino-silicate rock at 30 percent porosity). If the final SPLP pH is above the initial leachate pH of 4.2 then the solid released alkalinity during leaching and is therefore not considered to be acid generating. Conversely, if the final pH is below the initial leachate pH there was addition of mineral acidity during leaching and the sample is classified as acid generating.

#### *3.2.1.4 Shake Flask Extraction*

Shake flask extraction (SFE) is also used to evaluate the potential mobility of chemical constituents from the tailings. This is a more aggressive leaching procedure in which distilled water and the rock sample are added together at a 3:1 water: rock ratio and rotated end over end for 24 hours. The leachate is analyzed for common ions, metals, metalloids, and water quality parameters.

### *3.2.1.5 Whole Rock Chemical Analysis*

Whole rock chemical analyses were conducted using two techniques: 1) strong acid digestion followed by analysis by inductively coupled plasma- mass spectrometry (ICP-MS) for a full suite of major ions and metals; and, 2) a lithium borate fusion followed by x-ray fluorescence (XRF) spectroscopy for major and minor oxide determinations. Whole rock chemistry data are compared with crustal element abundances to identify constituents present at elevated concentrations in a given sample. This analysis does not provide information regarding the leachability or mobility of any chemical component but does allow identification of potential constituents of concern for further investigation. This study uses crustal abundances from Price (1997); where Price (1997) does not provide data, values from Mason and Moore (1982) were used.

### *3.2.1.6 Mineralogical Analyses*

Mineralogical analyses conducted as part of the geochemical characterization of tailings include:

- X-ray diffraction (XRD) with semi-quantitative analysis to identify the relative abundance of mineral phases present in a sample. XRD does not detect amorphous or non-crystalline compounds. Detection limits are generally on the order of about 1 weight percent.
- Quantitative Evaluation of Minerals by Scanning Electron Microscope (QEMSCAN) also provides data on bulk mineralogy and relative abundance with lower detection limits than XRD.

Mineralogical analyses often report pyrite which is a mineral containing both iron and sulfur. The ideal composition of pyrite (i.e., pyrite where all the iron is in the Fe(II) oxidation state and where no other trace metals are substituted for iron in the mineral lattice) is represented by the chemical formula $FeS_2$. According to the stoichiometry of the pyrite molecule, sulfur accounts for approximately 53 percent of the mass of ideal pyrite. Therefore, if pyrite is the only sulfide mineral present, a sample containing 10 weight percent pyrite would be expected to have a sulfide sulfur content on the order of 5.3 weight percent. This is important because sulfide sulfur is a principal component in determination of the acid generating potential of a given material, and, in Resolution ore, the primary source of sulfide sulfur is pyrite. Any large discrepancy between sulfide calculated from pyrite content and sulfide sulfur content measured as part of ABA analyses, likely indicates either the presence of additional, non-pyrite, sulfide minerals or analytical error in either the mineralogical analysis or the sulfide sulfur determination.

### *3.2.1.7 Particle Size Distribution*

The particle (or grain) sizes of the solid tailings materials were determined using sieve and hydrometer methods (KCB, 2011; SGS, 2014). A principal result of these analyses is the 80$^{th}$ percentile of the particle size distribution ($P_{80}$) which is the particle size below which 80 percent of all particles lie. Understanding the distribution of grain sizes in a sample, and how the grain sizes correlate with mineralogy, provides valuable insight into the relative reactivity of a material. In general, materials that contain reactive minerals (e.g., sulfides or carbonates) in the smaller size fractions will weather more quickly than materials that contain reactive minerals in the larger size fractions. Particle size distribution (PSD) is commonly used to scale experimental results up or down between materials used in the laboratory and those expected to be encountered under operational conditions. However, for the testing summarized in this report, the test tailings are understood to be equivalent in PSD to the anticipated operational tailings, and little or no scaling of results should be required.

### *3.2.1.8 Chemical Analysis of Tailings Decant Waters*

During mining operations the chemistry of discharge from the TSF will be dominated by the chemistry of pore-water released from the tailings due to compaction and drain-down. Decant waters from tailings (i.e., the water removed from tailings samples after the solids were allowed to settle) have been analyzed in order to determine the likely chemical composition of pore-waters in the tailings at the time of deposition in the tailings storage facility. Samples were analyzed for water quality parameters, common ions, and trace metals and metalloids.

## 3.2.2 Tier 2 (Kinetic) Testing

Tier 2, or kinetic, tests provide information on the rates at which weathering and leaching reactions occur in a sample. In this study the kinetic method used was humidity cell testing (HCT). A brief description of the HCT method is provided below.

### *3.2.2.1 Humidity Cell Testing*

Humidity cell tests (HCTs) were conducted to determine: 1) the rate at which acid generation and neutralization reactions occur when a sample is exposed to water and air; 2) the chemical composition of, and mass loading to, the leachate; 3) changes in the solid phase geochemistry such as the depletion of acid generating or neutralizing minerals; and, 4) in the case of samples that do generate acidic conditions, the lag time to onset of acid generation. In addition, HCTs are used to determine the likelihood that a rock type with uncertain ABA characteristics will produce acidic leachates.

HCT methods vary slightly between different studies but all are implementations of the American Society of Testing and Materials (ASTM) D5744-96 procedure (ASTM, 1996). In general, the tailings material is placed in a cylindrical column, saturated with deionized water and allowed to drain. Then dry air is circulated through the sample for several days followed by several more days of humid air. At the end of the cycle (usually one week) deionized water is added to the samples at a fixed mass: mass ratio, allowed to sit for one hour, and then drained. The leachate is then preserved and analyzed for water quality parameters and common and trace chemical constituents. The results are assessed in order to identify changes in pH, acidity, alkalinity, sulfate, and metals with time. Analytical data generated from HCTs will be used to develop solute/water-balance models and fate-and-transport models in order to refine Project understanding of the potential composition of discharge from the TSF during and after mining operations.

# 4.0 Summaries of Geochemical Characterization Studies

This section presents summaries of the principal tailings geochemistry studies that have been conducted by RCM and their consultants since 2002. Each subsection provides information regarding the objective of the study, the materials that were characterized, the test methods implemented, and principal results and observations. A listing of the geochemical characterization studies and the principal reference for each is provided in **Table 1**.

## 4.1 Initial Geochemical Characterization of Tailings

In 2002, flotation test work was completed on a master composite sample (MC-1) composed of equal amounts (50 kg each) of ore from exploration boreholes RES-002C-2, RES-003-1, and RES-003A-1. This work was conducted by Dawson Metallurgical Laboratories, Inc. of Salt Lake City, Utah. Details are provided in Dawson (2002).

### 4.1.1 Objectives

The primary objective of this initial study was to determine whether Resolution ore could be processed using conventional flotation techniques and yield acceptable copper and molybdenum concentrates. In addition, one flotation test was conducted to evaluate procedures for removing pyrite from the tailings. As part of the ore characterization, acid-base accounting (ABA) was conducted on scavenger and cleaner tailings to determine potential to generate acidic conditions and leach metals.

### 4.1.2 Sample Selection and Preparation

A composite sample (sample identifier: MC-1) was produced by combining 50 kg of ore from each of three Resolution diamond drill holes, RES-002C-2, RES-003-1, and RES-003A-1. ABA testing was conducted on tailings from two laboratory-scale tests.

### 4.1.3 Acid-Base Accounting

Based on results of ABA testing (NPR for both samples of 0.02) the two cleaner tailings samples are classified as PAG. In contrast, ABA results for both scavenger tailings samples showed NPR values of 3.4 and 1.6, respectively. Based on these results, the scavenger tailings are classified as NPAG although one of them does not meet the margin of safety recommended in AMIRA (2002).

## 4.2 Acid-base Accounting for Scavenger Tailings

Scavenger tailings have been generated from individual and master composite ore samples representing some 7,000 meters of core from 19 boreholes completed within the Resolution ore body. Scavenger tailings were generated from individual composite samples using laboratory-scale rougher/scavenger flotation tests. Acid-base accounting was conducted using the Kennecott Utah Copper (KUC) ABA test procedure provided in **Appendix B**. Test results are provided in **Appendix C**.

As discussed in the **Section 3.1** above, this historical compilation of ABA data includes samples with a wide range in sulfide sulfur contents generated by metallurgical tests designed to optimize copper and molybdenum yields and refine flotation procedures. Sulfide sulfur content of scavenger tailings from all tests ranges from less than 0.1 weight percent sulfide sulfur to 1 weight percent with an average sulfide sulfur content of 0.18 weight percent. However, more recent metallurgical tests have yielded scavenger tailings with lower sulfide sulfur contents generally on the order of 0.1 percent sulfide sulfur or less (see blended ore composites and pilot plant samples discussed in **Sections 4.4 and 4.5**, respectively). Comparison of calculated NPR values to the AMIRA (2002) guidelines indicates that 56 percent of the scavenger tailings containing 0.1 percent sulfide sulfur or less are classified as NPAG, 28 percent are classified as PAG, and 15 percent have NPR values that lie between 1 and 2 and are therefore technically NPAG but fall outside of the recommended safety margin.

## 4.3 Geochemical Characterization of Tailings from Borehole RES-007

Two geochemical characterization efforts were conducted in 2007 using tailings generated from ore samples from boreholes RES-007/7A and RES-007C. Summaries of each of these studies are provided below. Further details regarding test methodology and results are available in KCB (2007) and Golder (2007, 2008, and 2009).

### 4.3.1 Objectives

The objectives of the geochemical characterization studies using tailings generated from borehole RES-007 included:

- refine Project understanding of the potential for the principal tailings streams (cleaner and scavenger) to generate acidic conditions and leach metals
- define potential constituents of concern through whole rock analysis of tailings
- assess geochemical composition of tailings decant water

### 4.3.2 Static Geochemical Testing of Tailings from Borehole RES-007

Klohn Crippen Berger (KCB) performed static geochemical testing on tailings samples provided by Dawson Metallurgical Laboratories (Dawson) in 2007. Tailings were generated from batch testing (12 tests) of an overall master composite sample that was generated by combining the remaining material from the seven master composite samples (MC-1 – MC-7) collected from RES-007/007A and RES-007C. Three tailings samples were provided to KCB including:

1. CL-1: Cleaner tailings from batch test numbers 3 through 12
2. CL-2: Cleaner tailings from batch test numbers 1 and 2
3. SC-1: Scavenger tailings from batch test numbers 3 through 12

Samples CL-1 and SC-1 were delivered to KCB as slurries and, as such, were assumed to have been saturated and therefore not oxidized in the time between tailings production and static geochemical testing. Sample CL-2 was filtered, oven dried, and stored for approximately 12 months prior to testing which may have resulted in some degree of oxidation and depletion of neutralizing potential in this sample.

Static geochemical testing performed by KCB on the three tailings samples included:

- Acid base accounting (ABA)
- Mineralogical analysis using x-ray diffraction (XRD) with Rietveld refinement
- Whole rock analysis by acid digestion followed by elemental analysis using inductively coupled plasma-optical emission spectrometry (ICP-OES) and inductively coupled plasma-mass spectrometry (ICP-MS)
- Low-level mercury analysis of the acid-digested sample with cold vapor atomic absorption (CVAA)
- Shake flask extraction (SFE)

In addition, water decanted from the SC-1 and CL-1 tailings slurries after settling were analyzed for general parameters, anions, total and dissolved metals, and low-level mercury. Results of analyses are available in KCB (2007); principal findings are summarized below.

### *4.3.2.1 Acid-Base Accounting*

Acid-base accounting results are summarized in **Table 2** below (adapted from Table 2.5 in KCB (2007)).

| **ANALYSES** | **SAMPLE** | | |
|---|---|---|---|
| | **CL-1** | **CL-2** | **SC-1** |
| Paste pH | 5.7 | 3.8 | 7.5 |
| Total Sulfur (weight percent) | 38 | 39 | 0.53 |
| Sulfate Sulfur (weight percent) | 0.15 | 0.29 | 0.24 |
| Sulfide Sulfur (weight percent) | 38 | 38 | 0.29 |
| AGP (T $CaCO_3$/kT) | 1,192 | 1,200 | 9.1 |
| Total Inorganic Carbon (weight percent) | 0.02 | <0.010 | 0.02 |
| Bulk ANP (T $CaCO_3$/kT) | 1.9 | 0 | 5.5 |
| Carbonate ANP (T $CaCO_3$/kT) | 1.7 | NA | 1.7 |
| Bulk NPR | 0.0016 | NA | 0.61 |
| Carbonate NPR | 0.0014 | NA | 0.18 |
| Bulk NNP (T $CaCO_3$/kT) | -1,190 | -1,200 | -3.6 |
| Carbonate NNP (T $CaCO_3$/kT) | -1,190 | NA | -7.4 |

**Table 2:** KCB ABA results for RES-007 cleaner and scavenger tailings samples
Adapted from Table 2-5 in KCB (2007)
NA: indicates an analysis or calculation was not conducted
< indicates constituent below method detection limit

Principal findings/conclusions of the ABA analyses conducted by KCB (2007) are summarized below.

Cleaner Tailings (samples CL-1 and CL-2)

- High sulfide sulfur content in both cleaner tailings samples (CL-1 and CL-2) is consistent with the pyrite content measured by XRD (**Section 4.3.2.2**).
- NPR calculations classify the cleaner tailings as PAG. The low paste pH values for CL-2 indicate that there was some incipient oxidation of the sample during drying and storage prior to ABA testing.

Scavenger Tailings (sample SC-1)

- The scavenger tailings sample (SC-1) had a low sulfide sulfur content consistent with the lack of detectable pyrite measured by XRD (**Section 4.3.2.2**). It should be noted that, at 0.29 weight percent, the sulfide sulfur content of this sample was above the typical average sulfide sulfur content generated from other studies.
- Based on bulk and carbonate NPR values of 0.61 and 0.18, respectively, the scavenger tailings samples are classified as PAG.

### *4.3.2.2 Mineralogy of Tailings Solids*

Mineralogical analysis of the tailings samples using XRD with Rietveld refinement yielded the following principal findings (see Table 2.3 in KCB (2007) for XRD results):

- High pyrite abundances were observed in both cleaner tailings samples; 71 and 75 weight percent for samples CL-1 and CL-2, respectively. Pyrite was not detected in the scavenger tailings sample (detection limit is 0.5 weight percent).
- Very low calcite abundances were observed in all three tailings samples (0.8, 0.5, and <0.5 weight percent for CL-1, CL-2, and SC-1 respectively).
- Minor gypsum was present (1.2, 1.4, and 0.5 weight percent for CL-1, CL-2, and SC-1 respectively).
- Principal silicate minerals include: quartz, muscovite, biotite, potassium feldspar, and kaolinite. These minerals are all characteristic of porphyry copper deposits. These minerals are present in lower abundance in the cleaner tailings samples (CL-1 and CL-2) and in higher abundance in the scavenger tailings sample (SC-1).

### *4.3.2.3 Acid Digest and Elemental Analysis*

Samples were subjected to acid digestion followed by elemental analysis using inductively coupled plasma-optical emission spectrometry (ICP-OES) and inductively coupled plasma-mass spectrometry (ICP-MS). Elemental abundances in the samples were compared to whole crustal abundance as specified by Price (1997). Elements identified as being present at concentrations greater than five times crustal abundance include:

- In cleaner tailings (CL-1 and CL-2): arsenic, bismuth, cobalt, copper, iron, molybdenum, mercury, silver, and sulfur
- In scavenger tailings (SC-1): bismuth, copper, molybdenum, mercury, silver, and sulfur

### *4.3.2.4 Tailings Leachate Extraction and Supernatant Water Quality*

Leachates yielded by SFE of the samples CL-1 and SC-1 were circumneutral (pH 7.3 and 7.5, respectively). However, leachate from sample CL-2 was acidic (pH 4.5) consistent with the low paste pH value for this sample. This is likely due to oxidation of the sample during sample drying and storage. Concentrations of metals and metalloids in circumneutral pH SFE leachate from the unoxidized cleaner tailings (CL-1) and the scavenger tailings (SC-1) were substantially lower than in the oxidized CL-2 sample.

Supernatants decanted from both the scavenger (SC-1) and cleaner (CL-1) tailings were circumneutral; supernatant from cleaner tailings sample CL-2 was not available for analysis as

this sample had been dried prior to storage. Concentrations of metals and metalloids were generally low in both supernatant samples.

### 4.3.3 Static and Kinetic Testing of Tailings from Borehole RES-007

Golder (2007) summarizes results of static geochemical testing of cleaner and scavenger tailings, and decant waters from those tailings. Samples were provided to Golder by Dawson Metallurgical Laboratories (Dawson). These samples were similar to samples CL-1 and SC-1, and their decant waters, described in KCB (2007) and **Section 4.32** above.

Golder conducted some of the same analyses carried out by KCB including:

- Acid base accounting (ABA)
- Mineralogical analysis by XRD
- Whole rock analysis of tailing solids by x-ray fluorescence (XRF)
- Short-term leach testing (using the Synthetic Precipitation Leaching Procedure (SPLP) rather than shake flask extraction (SFE) used by KCB)
- Chemical analysis of decant water

In addition Golder conducted the following analyses that were not conducted by KCB:

- Net acid generation (NAG) testing
- Comprehensive analysis of NAG leachates

Following is a summary of the principal results from Golder (2007) and, where appropriate, comparison of results with those of KCB (2007).

#### *4.3.3.1 Acid Base Accounting and Net Acid Generation Testing*

ABA and NAG results are summarized in **Table 3** below (adapted from Table 3 in Golder (2007)). Principal findings/conclusions of the ABA and NAG analyses conducted by Golder (2007) are summarized below:

<u>Cleaner Tailings</u>

- Total sulfur content is 36 weight percent; the bulk of the sulfur present in the cleaner tailings sample is sulfide sulfur (31 weight percent)
- Neutralizing potential is low (consistent with low calcite content)
- NPR is less than 0.01
- NAG test results indicate a low NAG pH of 2.2
- Based on ABA and NAG testing results the cleaner tailings are classified as PAG

Scavenger Tailings

- Total sulfur content is 0.4 weight percent and sulfide sulfur is 0.08 weight percent; the bulk of the sulfur present in the scavenger tailings sample is sulfate sulfur
- Neutralizing potential is low (consistent with low calcite content)
- NPR is 1.8
- NAG test results indicate a NAG pH of 4.51
- Based on ABA and NAG results the potential for the scavenger tailings to generate acidic conditions is uncertain as both the NPR and the NAG pH values fall very close to recommended thresholds (AMIRA, 2002; MEND, 2009). However, it should be noted that subsequent kinetic testing confirmed the scavenger tailings as NPAG (**Section 4.3.3.7**).

| **ANALYSES** | **TAILINGS SAMPLE** | |
|---|---|---|
| **Acid-Base Accounting (ABA)** | | |
| | **Cleaner** | **Scavenger** |
| Paste pH (standard units (s.u.)) | 7.25 | 7.52 |
| Total Sulfur (weight percent) | 36.1 | 0.38 |
| Sulfate Sulfur (weight percent) | 5.30 | 0.26 |
| Sulfide Sulfur (weight percent) | 30.7 | 0.08 |
| Residual Sulfur (weight percent) | 0.08 | 0.04 |
| AGP (T $CaCO_3$/kT) | 960 | 2.5 |
| ANP (T $CaCO_3$/kT) | 2.2 | 4.4 |
| NNP (T $CaCO_3$/kT) | -958 | 1.9 |
| NPR | <0.01 | 1.8 |
| **Net Acid Generation (NAG)** | | |
| NAG pH after reaction (s.u.) | 2.20 | 4.51 |
| NAG to pH 4.5 kg $H_2SO_4$/ton | 49.8 | - |
| NAG to pH 7.0 kg $H_2SO_4$/ton | 60.6 | 2.35 |

**Table 3:** Golder ABA results for RES-007 cleaner and scavenger tailings samples
Adapted from Table 3 in Golder (2007)

### *4.3.3.2 Net Acid Generation Testing Leachate Analysis*

NAG leachate from the cleaner tailings was acidic with a pH of 2.20. Sulfate concentration in the leachate from the cleaner tailings was substantially elevated as a result of sulfide oxidation (1,570 mg/L). Concentrations of aluminum, chromium, copper, fluoride, iron, and selenium were elevated with respect to values observed in natural waters in non-mineralized systems (Hem, 1985).

NAG leachate from the scavenger tailings had a pH of 4.76 (close to the predicted NAG pH of 4.51). Sulfate concentration was low (95.1 mg/L). Aluminum and copper concentrations were

slightly elevated compared with concentrations in natural waters in non-mineralized systems (Hem, 1985) but substantially lower than concentrations observed in the cleaner tailings leachate.

#### *4.3.3.3 Mineralogy of Tailings Solids*

Mineralogical analysis of the tailings samples using XRD with Rietveld refinement yielded the following principal findings (see Table 2 in Golder (2007) for XRD results):

- Pyrite was observed in the cleaner tailings samples at a concentration of 47 weight percent. This value is substantially lower than the pyrite content of approximately 70 to 75 weight percent reported in cleaner tailings samples by KCB (2007).
- Pyrite was not detected in the scavenger tailings sample (detection limit is approximately 1 weight percent).
- Calcite was not identified in either the cleaner or the scavenger tailings samples.
- Sulfate minerals were not identified in the cleaner or scavenger tailings samples.
- Silicate minerals including quartz, mica, kaolinite, and feldspar are the dominant mineral phases in the scavenger tailings sample.

Results of XRD analysis of the cleaner and scavenger tailings solids are largely in agreement between Golder and KCB analyses. Both analyses indicate that silicate minerals make up the majority of the scavenger tailings, and that they contain little pyrite or calcite (pyrite and calcite are below the detection limit in both KCB and Golder analyses). Mineralogy of the cleaner tailings solids is dominated by pyrite with the remainder made up of silicate minerals. Little or no gypsum or carbonate was identified in the cleaner tailings samples (1 to 1.5 wt. % in KCB analysis and not detected in the Golder analysis).

#### *4.3.3.4 Whole Rock Analysis*

- Elemental abundances in solid material from both the cleaner and scavenger tailings were compared with crustal abundance values given in Smith and Huyck (1999) by Golder and to values from Price (1997) for the current report; results of the two analyses are consistent.
- Elements identified as being present in both the cleaner and the scavenger tailings at concentrations greater than five times crustal abundance include: sulfur, copper, molybdenum, lead, tin, thorium, uranium and tungsten. Additional elements with elevated concentrations identified only in the cleaner tailings include: iron, arsenic, and cobalt.
- In general, concentrations of metals and metalloids are substantially higher in the cleaner tailings than the scavenger tailings.

- There is reasonable agreement between KCB and Golder regarding those elements present in the solid tailings material at concentrations greater than five times crustal abundance. However, Golder's analysis generally yielded higher trace metal concentrations than did KCB's analysis due to the difference in analytical procedures used. The aqua regia digest conducted by KCB results in a partial digestion of the sample whereas XRF provides analysis of the total material. This resulted in Golder identifying lead, thorium, uranium and tungsten concentrations as being greater than five times crustal abundance whereas KCB did not.
- Other inconsistencies between Golder and KCB results arise from differences in the analytical suite: KCB did not analyze for tin, and Golder did not analyze for silver, bismuth, or mercury.

#### *4.3.3.5 Synthetic Precipitation Leach Procedure*

Leachates yielded by SPLP were circumneutral for both the cleaner and the scavenger tailings samples (i.e., pH was increased to above the initial leachate pH of 4.2) which indicates that alkalinity was released during leaching. Concentrations of metals, metalloids, and sulfate were low in leachates from both the cleaner and the scavenger tailings.

#### *4.3.3.6 Supernatant Water Quality*

Supernatants decanted from the cleaner and scavenger tailings slurries were circumneutral. Concentrations of metals and metalloids were low; however, sulfate in both samples was elevated with respect to supernatant water quality observed in pilot plant tailings (**Section 4.5.9**).

#### *4.3.3.7 Kinetic Testing*

Humidity cell tests (HCTs) were conducted on cleaner and scavenger tailings by Golder. Results are published in Golder (2008; 2009).

The goals of the kinetic testing program included:

- Investigate potential changes in leachate composition associated with long-term weathering of cleaner and scavenger tailings
- Investigate the acid generation potential of the scavenger tailings which was classified as uncertain based on ABA and NAG testing conducted by Golder in 2007 (See **Section 4.3.3.1** above for ABA and NAG results)
- Evaluate sulfide reactivity as a function of tailings moisture content

Humidity cell tests were conducted on three samples each of the cleaner and scavenger tailings materials previously subjected to static geochemical testing. The six HCT samples were:

- HC 1-C: cleaner tailings (thickened, non-segregating, approximately 71 percent solids)
- HC 2-C: cleaner tailings (filter cake, approximately 83.5 percent solids)
- HC 3-C: cleaner tailings (paste, 10-inch slump, approximately 77.5 percent solids)
- HC 1-S: scavenger tailings (thickened, non-segregating, approximately 70 percent solids)
- HC 2-S: scavenger tailings (filter cake, approximately 83 percent solids)
- HC 3-S: scavenger tailings (paste, 10-inch slump, approximately 75 percent solids

Humidity cell testing was conducted in accordance with ASTM method D5744-6. For the first round of testing, HCTs were run for 20 weeks. After 20 weeks, testing of the cleaner tailings samples (samples HC 1-C through HC 3-C) was concluded. However, the scavenger tailings HCTs (samples HC 1-S through HC 3-S) were continued for an additional 23 weeks due to indeterminate results observed at the end of the initial 20-week test period. Leachates were collected weekly and analyzed for diagnostic geochemical parameters including pH, conductivity, redox (Eh), alkalinity, acidity, and major ions. In addition, samples were collected every four weeks and analyzed for a suite of trace metals and metalloids.

See Golder (2008, 2009) for analytical data and time-series plots of HCT leachate chemistry. Principal observations from HCT testing are summarized below.

<u>Cleaner Tailings</u>

- All three cleaner tailings samples turned acidic very rapidly with the driest material being the most reactive. Within the first five weeks the pH decreased to between 2.5 and 3.0 for all samples.
- Sulfate concentrations rose rapidly after five weeks of testing. Between weeks 5 and 15 concentrations ranged from approximately 2,100 to 3,800 mg/L. After about 15 weeks concentrations appeared to be decreasing slightly although they were still quite variable, ranging between approximately 1,000 and 3,000 mg/L.
- Alkalinity was not detected in any cleaner tailings sample after week 4.
- Due to acidic conditions metal leaching was substantially enhanced in the cleaner tailings samples compared with the scavenger tailings samples.
- After initial spikes between approximately weeks 0 and 10 for some parameters (due to initial flushing) most concentration trends were stable or decreasing over time.
- Samples with higher solids contents generally gave rise to higher initial concentrations of metals; however, over time, leachate concentrations were relatively independent of solids content.
- Concentrations of beryllium, and chromium were elevated compared with concentrations in natural waters in non-mineralized systems (Hem, 1985).

- Reaction rates are proportional to solids content. That is, the tailings with lower water content/higher solids content (e.g., paste tailings) exhibited faster reaction rates than those tailings that contained more water (e.g., thickened tailings).
- Lag times to acid generation are inversely proportional to solids content. That is, those tailings samples that contained less water (and more solids) had shorter lag times to onset of acidic conditions.
- HCT testing confirms static testing results; cleaner tailings are potentially acid generating with little or no lag time to acid generation.

Scavenger Tailings

- Scavenger tailings samples remained neutral over the testing period of 43 weeks with pH ranging between 6.5 and 7.7 which is substantially higher than the NAG pH of 4.51 yielded by initial static testing of the scavenger tailings (**Section 4.3.3.1**). A very slight downward trend in pH with time was observed.
- Alkalinity decreased from between 40 and 50 mg/L as $CaCO_3$ to approximately 5 mg/L as $CaCO_3$ over the 43-week test period.
- Sulfate concentrations decreased consistently throughout the test period from approximately 1,000 - 1,500 mg/L to below 15 mg/L.
- Dissolved metals concentrations were low in the scavenger HCT leachates.
- All metals except for barium and zinc displayed a steady or decreasing trend; barium and zinc each showed a minor but consistent increase in concentration over the testing period.
- Depletion calculations show that AGP was being depleted slightly more quickly than ANP which indicates that the scavenger tailings would not be acid generating in the long term.
- Comparison of the results of depletion calculations and post-HCT ABA analyses indicates that the sulfate reporting to the HCT leachates originates from the dissolution of sulfates in the scavenger tailings samples and not from oxidation of sulfides.
- There did not appear to be a systematic correlation between leachate chemistry and solids content of the samples.
- In summary, kinetic testing indicated that the scavenger tailings samples were non-acid generating and their metal leachability was low.

## 4.4 Geochemical Characterization of Blended Ore Composite Tailings

Geochemical characterization of tailings generated from three blended ore composite samples was conducted in the period April, 2010 through February, 2014. A summary of test results and principal conclusions is provided below. See MWH (2014) for detailed descriptions of environmental testing methodology and results.

### 4.4.1 Objectives

The principal objective of the blended ore composite study was to refine Project understanding of the potential geochemical behavior of whole, cleaner and scavenger tailings as a function of the pyrite content of the feedstock used to generate the tailings products through bench-scale metallurgical testing.

### 4.4.2 Sample Preparation/Selection

Three blended ore composites (MC1, MC2, and MC3) were generated by RCM in order to provide samples of ore with a range of pyrite contents. Each composite consisted of at least 75 kg of ¼-core material selected from between five and eight boreholes. Each composite was crushed, homogenized, and subjected to locked cycle flotation testing by Dawson Metallurgical Laboratories in Salt Lake City, Utah. This work was conducted during April 2010. The pyrite contents of the three ore composite samples were 19 percent, 7 percent, and 6 percent for MC1, MC2, and MC3, respectively.

MWH conducted static testing on samples generated from the three blended ore composite samples including flotation feedstock, concentrate, whole tailings, cleaner tailings, and scavenger tailings. In addition, supernatants decanted from both cleaner and scavenger tailings were analyzed. Kinetic testing was conducted on samples of each of the three tailings streams (whole, cleaner, and scavenger).

### 4.4.3 Acid Base Accounting and Net Acid Generation Testing

MWH conducted ABA and NAG testing on feedstock and tailings (cleaner, scavenger, and whole) for each composite sample. Results are provided in **Table 4** (adapted from Table 3.1 in MWH 2014). Principal findings/conclusions of the ABA analyses are summarized below:

#### *4.4.3.1 Cleaner and Whole Tailings*

- Cleaner tailings samples contained between approximately 30 and 40 weight percent sulfide sulfur.
- Cleaner tailings from all three composites were classified as PAG based on NPR and NAG pH.
- Analysis of NAG leachates indicates that, were the cleaner tailings to become oxidized, they may potentially release: arsenic, beryllium, cadmium, chromium, fluorine, lead, nickel, selenium, sulfate, and thallium.

- Whole tailings from the composites MC1, MC2, and MC3 were classified as PAG based on NPR and NAG pH.

| Composite | Sample Type | Total Sulfur | Sulfate Sulfur | Sulfide Sulfur | Total Sulfur Minus Sulfate | Residual Sulfur | Bulk ANP | AGP | NNP | NPR | NAG pH |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | (Weight Percent) | | | | | ($T\ CaCO_3/kT$) | | | (ratio) | (s.u.) |
| MC1 | Feedstock | 11.3 | 0.12 | 10.2 | 11.2 | 1.01 | <1 | 350 | -349 | <0.01 | 2.9 |
| | Whole Tailings | 4.7 | <0.01 | 4.79 | 4.7 | 0.13 | <1 | 147 | -146 | <0.01 | 2.3 |
| | Whole Tailings (Duplicate) | 10.6 | 1.96 | 8.39 | 8.65 | 0.26 | <1 | 270 | -269 | <0.01 | 2.2 |
| | Cleaner Tailings | 42.4 | 1.72 | 39.2 | 40.7 | 1.45 | <1 | 1272 | -1271 | <0.01 | 2.2 |
| | Cleaner Tailings (Duplicate) | 42.2 | 2.16 | 38.7 | 40 | 1.34 | <1 | 1250 | -1249 | <0.01 | 2.1 |
| | Scavenger Tailings | 0.17 | 0.07 F | 0.06 F | 0.1 | 0.04 F | 2 F | 3 | -1 | 0.6 | 3.7 |
| | Scavenger Tailings (Duplicate) | 0.15 | 0.06 F | 0.05 F | 0.09 F | 0.04 F | <1 | 3 | -2 | 0.36 | 3.9 |
| MC2 | Feedstock | 5.17 | 0.23 | 4.17 | 4.94 | 0.77 | 12 | 154 | -142 | 0.08 | 2.9 |
| | Whole Tailings | 2.97 | 0.1 | 2.77 | 2.87 | 0.1 | 20 | 90 | -70 | 0.2 | 2.4 |
| | Cleaner Tailings | 32 | 1.58 | 29.5 | 30.5 | 0.97 | 10 | 953 | -943 | 0.01 | 2.2 |
| | Scavenger Tailings | 0.46 | 0.38 | 0.03 F | 0.08 F | 0.05 F | 22 | 3 | 20 | 8.8 | 9.6 |
| MC3 | Feedstock | 5.52 | 1.21 | 3.33 | 4.31 | 0.98 | 61 | 135 | -74 | 0.5 | 3.2 |
| | Whole Tailings | 2.7 | 0.64 | 2.06 | 2.06 | <0.1 | 58 | 64 | -6 | 0.9 | 2.7 |
| | Cleaner Tailings | 31.9 | 1.82 | 29.2 | 30.1 | 0.82 | 41 | 941 | -900 | 0.04 | 2.3 |
| | Scavenger Tailings | 0.95 | 0.87 | 0.08 F | 0.08 F | <0.1 | 61 | 3 | 59 | 24.4 | 10.4 |

**Table 4:** ABA and NAG results for blended ore composite feedstock and tailings
Adapted from Table 3.1 in MWH (2014)

F: flag indicates the analyte was positively identified but the reported concentration is estimated; reported concentration is less than the reporting limit but greater than the method detection limit.
<: indicates analyte reported at the method detection limit shown.

#### *4.4.3.2 Scavenger Tailings*

- Scavenger tailings from all three composites contained less than 0.1 weight percent sulfide sulfur.
- Scavenger tailings from MC1 were classified as PAG based on NPR and NAG pH and scavenger tailings from MC2 and MC3 were classified as NPAG based on NPR and NAG pH.
- Concentrations of trace elements and sulfate in the NAG leachate from all three scavenger tailings samples were generally lower than concentrations observed in NAG leachate from the cleaner tailings.

### 4.4.4 Mineralogy

Mineralogical analysis was conducted using QEMSCAN. Principal findings are summarized below:

#### *4.4.4.1 Cleaner Tailings*

- Cleaner tailings samples contained between 61 and 78 weight percent pyrite.
- Calcite/dolomite was observed at 0.12 weight percent or less in the cleaner tailings.
- Minor sulfates/phosphates were reported at approximately 0.1 to 0.3 weight percent.
- Silicates including: quartz, orthoclase, muscovite/illite, amphiboles/chlorite and undifferentiated aluminosilicates dominated the non-pyrite fraction of the cleaner tailings.

#### *4.4.4.2 Scavenger Tailings*

- Scavenger tailings contained less than 0.1 weight percent pyrite (0.08, 0.02, and 0.05 weight percent in the MC1, MC2, and MC3 scavenger tailings, respectively).
- Calcite/dolomite was observed in very small amounts in the MC1 scavenger tailings (0.01 weight percent) and somewhat larger amounts in the MC2 and MC3 scavenger tailings (0.31 and 0.71 weight percent, respectively).
- Minor sulfates/phosphates were reported at approximately 0.2 to 0.8 weight percent.
- Silicates including: quartz, orthoclase, muscovite/illite, amphiboles/chlorite and undifferentiated aluminosilicates dominated the mineralogy of the scavenger tailings.

### 4.4.5 Acid Digest and Elemental Analysis

MWH conducted elemental analysis on whole, scavenger, and cleaner tailings generated from all three composite samples. Samples were digested using a strong acid digestion (perchloric, nitric, hydrofluoric, and hydrochloric acids) and the solution was analyzed using inductively coupled plasma-mass spectrometry (ICP-MS). Elemental compositions were compared with crustal abundances provided in Price (1997). Principal findings are presented below:

- The following elements were elevated to levels more than five times crustal abundance in one or more tailings samples: antimony, arsenic, bismuth, cadmium, copper, lead, molybdenum, rhenium, selenium, silver, tellurium, tin, and tungsten.
- In general, metal and metalloid concentrations are higher in the cleaner tailings than in the scavenger and whole tailings.

### 4.4.6 Particle Size Distribution

Particle size distribution in the blended ore composite tailings was determined using sieving and hydrometry (KCB, 2011). Principal observations are provided below:

- $P_{80}$ of the scavenger tailings ranged between 160 and 180 microns (um) and the percent clay-sized particles (less than 2 um) ranged from 8 to 12 percent.
- $P_{80}$ of the cleaner tailings ranged between 40 and 41 um and percent of clay-sized particles (less than 2 um) ranged from 12 to 20 percent.
- KCB (2011) notes that not all clay-sized particles are active clays and may be fine rock flour.

### 4.4.7 Synthetic Precipitation Leach Procedure

Synthetic precipitation leach procedure (SPLP) testing was conducted on whole, cleaner, and scavenger tailings samples generated from each of the three composite samples. Principal findings include:

- pH in SPLP leachates from cleaner tailings was variable: pH 4.1 for MC1, 5.5 for MC2, and 6.6 for MC3; pH values above the initial leachate pH of 4.2 indicate that alkalinity was released from the sample during leaching.
- Analysis of SPLP leachates indicates that, were the cleaner tailings to become oxidized, they may potentially release: beryllium, cadmium, fluorine, nickel, sulfate, and thallium.
- SPLP leachates from scavenger tailings samples were circumneutral with pH values of 7.6 to 8; pH values above the initial leachate pH of 4.2 indicate that alkalinity was released from the sample during leaching.
- Trace elements concentrations in SPLP leachate from the scavenger tailings were low compared to concentrations observed in leachates from the cleaner tailings.

- Sulfate concentrations in the scavenger tailings leachates were 94 mg/L, 1,120 mg/L, and 1,330 mg/L for MC1, MC2, and MC3 samples, respectively.

### 4.4.8 Process Water Chemical Analysis

Solution chemistry was analyzed for supernatants decanted from cleaner and scavenger tailings generated from all three composite samples. Results include:

- All supernatants had circumneutral or alkaline pH values.
- The neutral to alkaline pH constrains trace element concentrations in supernatants decanted from both the scavenger and the cleaner tailings.
- Sulfate was somewhat elevated with respect to sulfate concentrations observed in supernatants from pilot plant tailings (**Section 4.5.9**) except in supernatant from the MC3 cleaner tailings sample.

### 4.4.9 Humidity Cell Testing

Humidity cell testing (HCT) was conducted on nine samples: scavenger, cleaner, and whole tailings generated from each of the three master composite samples. MWH (2014) provides details regarding the test methodology and results. The majority of the HCTs were run for 156 weeks, although two samples, scavenger tailings from MC1 and whole tailings from MC3 were run through week 181 as the results were still somewhat equivocal at the end of 156 weeks. It should be noted that, due to changes in laboratory temperature during the humidity cell testing, concentrations of many leachate analytes show a marked seasonal fluctuation. From studies in the open literature, it is known that rates of sulfide oxidation and the acid-base reactions of mineral acids with titratable base cations in alumino-silicate rocks are proportional to temperature. A 10 degree centigrade (°C) change in temperature corresponds to close to a factor of two change in reaction rate (Lasaga, 1998; Ahonen and Tuovinen, 1990). It is likely that the range of experimental temperatures is consistent with the range of temperatures that would be experienced by at least shallow tailings managed at the surface in Pinal County. Consequently, it is considered that there are no adverse impacts to the information in the kinetic test work from the laboratory range of temperatures.

#### *4.4.9.1 Cleaner Tailings*

<u>pH</u>

- pH of cleaner tailings leachates from all three composite samples decreased to below pH 3 within the first 20 weeks of testing and remained strongly acidic for the remainder of the testing period. Observed behavior was consistent with ABA/NAG results that indicated that the cleaner tailings samples were PAG.

Acidity

- Cleaner tailings samples generated relatively consistent levels of acidity over the period of testing; concentrations were on the order of several hundred to 1,000 mg/L as $CaCO_3$.

Alkalinity

- Alkalinity in cleaner tailings leachates was below the detection limit consistent with acidity levels generated throughout the testing period.

Sulfate Concentration

- Cleaner tailings generated elevated sulfate concentrations that ranged between approximately 195 and 2,230 mg/L, excluding the initial flush which produced maximum sulfate concentrations on the order of 5,000 mg/L.

Sulfur Consumption

- Approximately 10 percent of the total sulfur present in the cleaner tailings samples was consumed over the testing period.

Metals

- Assessment of cadmium, cobalt, nickel, and zinc concentrations in the cleaner tailings leachates yields the following observations:
    - Zinc and cadmium exhibited initially higher rates of release than cobalt and nickel.
    - Cobalt and nickel concentrations are more consistent and it is likely that they are present within the pyrite (substituting for iron in the mineral lattice).
- Copper concentrations in the cleaner tailings leachates generally started high (on the order of 1,000 mg/L in MC1, 750 mg/L in MC2 and 100 mg/L in MC3) and decreased throughout the testing period to end at roughly 1 mg/L.
- Concentrations of iron in the cleaner tailings range from approximately 100 to 700 mg/L associated with strongly acidic conditions and the ample supply of iron in the tailings.
- In addition, analysis of HCT leachates indicates that, were the cleaner tailings to become oxidized, they may potentially release: arsenic, beryllium, cadmium, chromium, fluorine, nickel, selenium, and thallium.

### *4.4.9.2 Scavenger Tailings*

pH

- pH of the MC1 scavenger tailings leachate varied between pH 6 and 7 over the first 10 weeks of testing then settled into a slowly decreasing trend that dropped below pH 4 by week 170. By the end of the testing period, pH in the MC1 leachate was approximately

3.7 standard units (s.u.). Observed behavior was consistent with ABA/NAG results that indicated that the MC1 scavenger tailings were weakly PAG.

- pH of the MC2 and MC3 scavenger tailings leachates remained circumneutral at a pH of approximately 7.5 over the testing period of 156 weeks with a slight drift toward pH 7.0. Observed behavior was consistent with ABA/NAG results that indicated that the MC2 and MC3 scavenger tailings were NPAG.

Acidity

- Acidity of the MC1 scavenger tailings leachate was at or below the detection limit of 5 mg/L as $CaCO_3$ for the first year of testing but subsequently exhibited a rising trend, peaking at approximately 36 mg/L $CaCO_3$ in week 156. Following this peak, acidity decreased for the remainder of the testing period and was approximately 11 mg/L as $CaCO_3$ in week 181. Note that, although the pH fell to below 4, the titratable acidity of the solutions is very low due to the low sulfide sulfur content of the scavenger tailings.
- Acidity in the MC2 and MC3 scavenger tailings leachates remained below the detection limit of 5 mg/L as $CaCO_3$ for the period of the testing (156 weeks).

Alkalinity

- Scavenger tailings from composite MC1 generated low levels of alkalinity (approximately 5 to 10 mg/L as $CaCO_3$) until week 4 after which alkalinity was below the detection limit for the remainder of the testing period.
- Scavenger tailings from composites MC2 and MC3 generated alkalinity on the order of 10 to 60 mg/L as $CaCO_3$ for the entire testing period. Excess alkalinity from materials such as these scavenger tailings samples would be available to neutralize the low acidities associated with materials like MC-1.

Sulfate

- Scavenger tailings from MC1 exhibited a fairly rapid rinse-out of soluble sulfate in the first 12 weeks of testing after which sulfate concentrations were largely below the detection limit (10 mg/L) until the onset of acidic conditions. Starting in week 98 the MC1 scavenger tailings generated increasing sulfate concentrations that peaked in week 152 at 46 mg/L. After the peak, sulfate concentrations decreased until they were once again below the detection limit by the end of the testing period. Thus, the test data show that there is a limited reservoir of mobile sulfate present even in samples like MC1.
- Soluble sulfate took longer to rinse out of the MC2 and MC3 scavenger tailings. The initial rinse-out took roughly 45 weeks for MC2 and nearly two years for MC3. Maximum sulfate concentrations were on the order of 1,000 mg/L during the initial rinse-out.

Sulfur Consumption

- Approximately 56 percent of the total sulfur present in the MC1 scavenger tailings sample was consumed over the testing period.
- Between approximately 90 and 100 percent of the total sulfur present in the MC2 and MC3 scavenger tailings samples was consumed over the testing period.

Depletion of acid generating and neutralizing potentials

- Calculated depletion rates for MC1 indicate that approximately 90 percent of ANP was depleted by the time the pH approached 3.7.
- Calculated depletion rates of AGP and ANP show that, for MC2 and MC3 scavenger tailings, AGP would be consumed before the ANP which indicates that these materials will not generate acidic conditions. This finding is consistent with ABA results that characterized these samples as NPAG.

Metals

- Concentrations of cadmium, cobalt, nickel, and zinc in the scavenger tailings leachates were generally at or below the detection limit.
- Assessment of copper concentrations in the scavenger tailings leachates yields the following observations:
    - Copper concentration in the MC1 scavenger tailings leachate increased from approximately 0.01 mg/L to approximately 1 mg/L in in the first year of the test. In the second year, copper concentrations were relatively stable at approximately 1 to 2 mg/L. Starting around week 120 copper concentrations began to rise and peaked at about 10 mg/L around week 150 after which they declined throughout the remainder of the test to finish at approximately 2 mg/L. This peak in copper concentrations occurred at the same time as peaks in acidity and sulfate concentration associated with generation of weakly acidic conditions.
    - Concentrations of copper in the circumneutral MC2 and MC3 leachates were below the detection limit for the period of the test.
- Assessment of iron concentrations in the scavenger tailings leachates yields the following observations:
    - In the MC1 leachate iron concentration was at or below the detection limit until week 157 when it started to rise and ended at 0.12 mg/L at week 181. This rise in iron concentration was coincident with the pH of the leachate dropping below pH 4.
    - Iron concentrations in the circumneutral MC2 and MC3 scavenger tailings leachates were at or below the detection limit of 0.05 mg/L for the period of the test.
- In general, concentrations of metals in leachates from scavenger tailings were substantially lower than those observed in leachates from cleaner tailings.

### *4.4.9.3 Whole Tailings*

pH

- pH of the MC1 whole tailings dropped rapidly to below pH 3. Observed behavior was consistent with ABA/NAG results that indicated that the MC1 whole tailings samples were PAG.
- pH of the MC2 whole tailings also eventually dropped to below pH 3 but with a lag of approximately 89 weeks prior to which the leachate pH was circumneutral. Observed behavior was consistent with ABA/NAG results that indicated that the MC2 whole tailings samples were PAG.
- pH of the MC3 whole tailings remained circumneutral for the entire, extended testing period of 181 weeks. Observed behavior was not consistent with ABA/NAG results that indicated that the MC3 whole tailings samples were PAG.

Acidity

- Whole tailings from composite MC1 generated relatively consistent levels of acidity over the period of testing; leachate concentrations were on the order of approximately 200 to 600 mg/L as $CaCO_3$.
- Acidity in leachate from MC2 whole tailings was below the detection limit of 5 mg/L as $CaCO_3$ until week 93. Acidity then increased rapidly to 140 mg/L as $CaCO_3$ in week 102 after which it settled into a generally rising trend and ended at approximately 300 mg/L as $CaCO_3$ by the end of the testing period.
- Acidity in the MC3 whole tailings leachates remained below the detection limit of 5 mg/L as $CaCO_3$ for the entire 181 weeks of testing.

Alkalinity

- Alkalinity in MC1 whole tailings leachates was below the detection limit, consistent with the fact that the tailings generated acidity throughout the testing period.
- Whole tailings from composite MC2 generated alkalinity on the order of 5 to 20 mg/L as $CaCO_3$ until week 92 after which the sample generated acidity as discussed above.
- Whole tailings from composite MC3 generated alkalinity throughout the testing period at levels between approximately 10 and 40 mg/L as $CaCO_3$.

Sulfate

- Whole tailings from MC1 generated sulfate concentrations generally within the range 200 to 600 mg/l with the exception of maximum concentrations observed during initial rinse-out on the order of 2,500 mg/L.
- Soluble sulfate rinsed out of the MC2 whole tailings over the first year of testing with maximum sulfate concentrations of approximately 1,500 mg/L. Between weeks 60 and 90 there was a period of low sulfate generation with concentrations between approximately 10 and 20 mg/L. Then, with the onset of acidic conditions at roughly

week 90 sulfate concentrations started to trend upwards reaching maximum concentrations on the order of 400 mg/L by the end of the testing period.
- Soluble sulfate flushed out of the MC3 whole tailings sample over a period of approximately 80 weeks and ranged between 15 and 100 mg/L for the remainder of the testing period.

Sulfur Consumption

- Approximately 30 to 40 percent of the total sulfur present in the whole tailings samples was consumed over the testing period.

Depletion of acid generating and neutralizing potentials

- Depletion calculations show that 100 percent of ANP was consumed in the MC2 whole tailings at approximately week 125.
- Tier I analyses characterized the MC3 whole tailings as PAG; however, this sample did not produce acidic leachate within the testing period. Depletion calculations suggest that this sample would likely begin to generate acidic conditions between years 6.5 and 10 which correlate with depletion of 85 to 100 percent of the neutralizing potential.

Selected Metals

- Assessment of cadmium, cobalt, nickel, and zinc concentrations in the whole tailings leachates yields the following observations:
    - Concentrations of cadmium, cobalt, nickel, and zinc are correlated with the acid generating behavior of the sample.
    - Trends of metals concentrations in the MC1 whole tailings are similar to those observed in the cleaner tailings (see **Section 4.4.9.1**).
    - Trace metal concentrations were below the detection limit in the MC2 whole tailings leachate until the onset of acidic conditions. As was observed in the cleaner tailings leachates, there was an initial spike in the concentrations of cadmium and zinc once the pH decreased followed by a decreasing trend whereas concentrations of cobalt and nickel were more sustained.
    - Trace metals concentrations were generally at or below the detection limit in the MC3 whole tailings leachate which is consistent with the circumneutral pH conditions.
- Assessment of copper concentrations in the whole tailings leachates yields the following observations:
    - Copper concentrations in the MC1 whole tailings leachates were initially elevated with maximum concentration on the order of 800 mg/L; concentrations were somewhat variable but generally decreasing throughout the remainder of the testing period with final concentrations at or below 1 mg/L. This copper leaching behavior is similar to that observed in the cleaner tailings (**Section 4.4.9.1**).

- Copper concentration in the MC2 whole tailings leachate was initially very low until week 97, when, coincident with the onset of acidic conditions, copper concentrations increased rapidly to peak at approximately 30 mg/L in weeks 105 to 109. After the peak, concentrations decreased throughout the remainder of the testing period to a final concentration of approximately 1 mg/L.
- Copper concentrations in the circumneutral MC3 whole tailings leachate were at or below the detection limit throughout the testing period.

- Assessment of iron concentrations in the whole tailings leachates yields the following observations:
  - Concentrations of iron in the acidic MC1 whole tailings leachate ranged between 1 and approximately 200 mg/L.
  - Concentrations of iron in the MC2 whole tailings leachate were low until approximately week 110 when they started to increase reaching approximately 60 mg/L by the end of the test. This increase was coincident with leachate pH approaching pH 4 which is similar to behavior observed in the MC1 scavenger tailings (**Section 4.4.9.2**).
  - Concentrations of iron in the circumneutral MC3 whole tailings leachate were largely at or below the detection limit of 0.05 mg/L.
- All metal behaviors are associated with the effects of pH on metal solubility.

## 4.5 Geochemical Characterization of Pilot Plant Tailings

Geochemical characterization of tailings generated from pilot plant metallurgical testing was conducted in the period March 2009 through April, 2013. A summary of test results and principal conclusions is provided below. See SGS (2014) for detailed descriptions of testing methodology and results.

### 4.5.1 Objectives

The objective of geochemical testing conducted on pilot plant tailings was to investigate the potential for the tailings to generate acidic conditions and leach metals when exposed to an oxidizing environment. The larger feedstock mass used in this study compared with batch and locked cycle testing allowed RCM to assess potential impacts of scale on metallurgical behavior; specifically, from an environmental perspective, the effect of scale of process on the ability to generate scavenger tailings with low sulfide sulfur content.

Pilot plant materials that were subjected to geochemical characterization included untreated and desulfidized cyclone sands. At the time that the pilot plant and the associated geochemical testing program were designed, cyclone sands were under consideration as part of the engineering of the tailings storage facility. Although RCM's tailings management strategy does

not currently include the use of cyclone sands, the results of the geochemical testing of these materials do provide useful insight into the potential geochemical behavior of low-sulfide materials generated from the scavenger tailings stream.

### 4.5.2 Sample Preparation/Selection

The pilot plant flotation work was conducted in March 2009 using approximately 3 tonnes of ore. Samples subjected to environmental testing at SGS Minerals Services (Lakefield, Ontario, Canada) included:

- Scavenger tailings
- Cleaner tailings
- Whole tailings (a weighted combination of scavenger and cleaner tailings)
- Untreated cyclone underflow generated from scavenger tailings
- Desulfidized cyclone underflow also generated from scavenger tailings and then subjected to further flotation to remove sulfides

SGS Minerals Services (SGS) conducted both static and kinetic testing of the tailings products listed above. Testing included:

- Acid base accounting (ABA) and net acid generation (NAG) testing
- Semi-quantitative x-ray diffraction (XRD)
- Whole rock analysis using x-ray fluorescence (XRF)
- Strong acid digest followed by elemental analysis using inductively coupled plasma-optical emission spectrometry (ICP-OES) or inductively coupled plasma-mass spectrometry (ICP-MS)
- Particle size distribution
- Shake flask extraction (SFE)
- Decant solution analysis
- Humidity cell testing (HCT)

A summary of test results and principal conclusions is provided below. See SGS (2014) for detailed descriptions of testing methodology and results.

### 4.5.3 Acid Base Accounting and Net Acid Generation Testing

ABA and NAG results are summarized in **Table 5** below (adapted from Tables 9 and 10 in SGS (2014)).

| Parameter | Unit | Scavenger Tailings | Cleaner Tailings | Whole Tailings | Cyclone U/F-Untreated | Cyclone U/F-Desulfidized |
|---|---|---|---|---|---|---|
| **Modified Acid Base Accounting** | | | | | | |
| Paste pH | standard units | 8.51 | 6.96 | 7.48 | 8.15 | 8.39 |
| Total Sulfur | weight percent | 0.091 | 19.4 | 4.25 | 0.220 | 0.046 |
| Sulfate Sulfur | weight percent | 0.04 | 2.80 | 0.24 | 0.01 | < 0.01 |
| Sulfide Sulfur | weight percent | 0.06 | 16.6 | 4.02 | 0.21 | 0.05 |
| AGP | T $CaCO_3$/kT | 1.73 | 518 | 125 | 6.55 | 1.43 |
| Total Inorganic Carbon | weight percent | 0.026 | 0.089 | 0.035 | 0.012 | 0.020 |
| Bulk ANP[1] | T $CaCO_3$/kT | 5.0 | 7.2 | 4.8 | 4.0 | 3.8 |
| Carbonate ANP[2] | T $CaCO_3$/kT | 0.53 | 0.85 | 0.45 | 0.42 | 0.37 |
| Bulk NPR | ratio | 2.89 | 0.01 | 0.04 | 0.61 | 2.66 |
| Carbonate NPR | ratio | 0.31 | 0.002 | 0.004 | 0.06 | 0.26 |
| Bulk NNP | T $CaCO_3$/kT | 3.27 | -511.04 | -120.69 | -2.55 | 2.37 |
| Carbonate NNP | T $CaCO_3$/kT | -1.20 | -517 | -125 | -6.14 | -1.06 |
| Classification | based on ABA ANP[1] | uncertain | PAG | PAG | PAG | uncertain |
| Classification | based on $CO_3$ ANP[2] | PAG | PAG | PAG | PAG | PAG |
| **Net Acid Generation Analysis** | | | | | | |
| Final pH | standard units | 6.38 | 2.17 | 2.31 | 4.72 | 6.45 |
| NAG@pH4.5 | kg $H_2SO_4$/T | 0 | 51 | 36 | 0 | 0 |
| NAG@pH7.0 | kg $H_2SO_4$/T | 0.6 | 114 | 55 | 2.3 | 0.7 |

**Table 5:** ABA and NAG testing results for pilot plant samples.
Adapted from Tables 9 and 10 in SGS (2014)
[1]measured in ABA test
[2]theoretical, based on carbonate content alone

Principal findings/conclusions of the ABA and NAG analyses reported in SGS (2014) are summarized below.

#### *4.5.3.1 Cleaner and Whole Tailings*

- The bulk of the sulfur present in the cleaner and whole tailings samples consisted of sulfide sulfur (16.6 weight percent and 4.02 weight percent, respectively).
- Neutralizing potential was low for both samples (consistent with low calcite content).
- Bulk NPR was 0.01 and 0.04 for the cleaner and whole tailings, respectively.
- NAG test results indicate NAG pH values of 2.17 and 2.31 for cleaner and whole tailings, respectively.
- Titration of the NAG test solutions to pH 4.5 confirms the acid generating potential of these samples.
- Titration of the NAG test solution to pH 7.0 indicates the presence of metal ions (e.g., copper, manganese, and zinc) that consume alkalinity over the pH range 4.5 to 7.0.
- Cleaner and whole tailings are classified as PAG based on both ABA and NAG testing results.

#### *4.5.3.2 Scavenger Tailings*

- The scavenger tailings sample contained 0.06 weight percent sulfide sulfur.
- Neutralizing potential was low and the carbonate content measurement indicated that approximately 90 percent of the neutralizing potential was due not to carbonate but to less reactive silicate sources.
- Bulk NPR was 2.89 and carbonate NPR was 0.31 for scavenger tailings.
- NAG pH was 6.38 for the scavenger tailings which indicates that there is no net acidity generated after aggressive oxidation of the samples.
- Titration of the NAG test solutions to pH 7.0 indicated that minor residual acidity (likely due to the presence of acidic metal ions) was present in the scavenger tailings sample.
- The scavenger tailings sample is classified as NPAG based on bulk NPR and NAG pH values.

#### *4.5.3.3 Untreated Cyclone Underflow*

- The untreated cyclone sample contained 0.21 percent sulfide sulfur (higher than scavenger tailings due to density concentration of the pyrite fraction in the cyclone underflow stream).
- Neutralizing potential was low.
- Bulk NPR was 0.61 and carbonate NPR was 0.06 for the untreated cyclone underflow.

- NAG pH was 4.72 for the untreated cyclone underflow sample which indicated that there was no net acidity generated after aggressive oxidation of the sample.
- Titration of the NAG test solution to pH 7.0 indicates that a minor quantity of residual acidity was present in the untreated cyclone sample.
- The untreated cyclone underflow sample is classified as PAG based on bulk NPR and NPAG based on NAG pH.

#### *4.5.3.4 Desulfidized Cyclone Underflow*

- Sulfide sulfur was 0.05 percent in the desulfidized cyclone sample.
- Neutralizing potential was low.
- Bulk NPR was 2.66 and carbonate NPR was 0.26 for the desulfidized cyclone underflow.
- NAG pH was 6.45 for the desulfidized cyclone sample which indicated that there was no net acidity generated after aggressive oxidation of the sample.
- Titration of the NAG test solutions to pH 7.0 indicated that a minor quantity of residual acidity was present in the desulfidized cyclone sample.
- The desulfidized cyclone underflow sample is classified as NPAG based on NPR and NAG pH values. NAG test results are consistent with the understanding that the samples cannot generate significant acidity because the potential source, sulfide oxidation, is limited by very low concentrations of sulfide in this material.

### 4.5.4 Mineralogy

Semi-quantitative x-ray diffraction (XRD) was conducted on four of the five tailings samples (desulfidized cyclone underflow was not analyzed). Principal findings of the XRD analyses are summarized below:

- All the samples were predominantly composed of silicates including quartz, muscovite, kaolinite, orthoclase, and ilmenite.
- The cleaner tailings contained abundant pyrite (nominally estimated at 34 weight percent) ; the scavenger tailings and untreated cyclone underflow contained small amounts of pyrite (estimated at 0.6 and 0.4 weight percent pyrite, respectively, with a detection limit of 0.5 to 2 percent which is strongly dependent on crystallinity); and the whole tailings contained a nominal 8.5 weight percent pyrite.
- It should be noted that the sulfide-sulfur value from ABA testing of scavenger tailings of 0.06 weight percent (**Section 4.5.3**) is calculated from the quantitative Leco-furnace pyrolysis method. This indicates that the semi-quantitative XRD estimate is too high.
- Minor calcite (1.9 weight percent) was observed in the cleaner tailings sample but no calcite was observed by XRD in the scavenger, whole, or cyclone tailings samples.
- No sulfate minerals were reported for any of the tailings samples.

### 4.5.5 Whole Rock Analysis

Whole rock analysis was conducted using x-ray fluorescence (XRF) on four of the five tailings samples (desulfidized cyclone underflow was not analyzed).

- Data confirm results of the XRD analysis in that the principal component of all the samples is silicate ($SiO_2$).
- Cleaner and whole tailings contain elevated concentrations of iron (23 and 6 percent $Fe_2O_3$, respectively) consistent with the presence of pyrite in the XRD analyses
- Scavenger and cyclone tailings report substantially less iron (approximately 1 percent $Fe_2O_3$) consistent with low reported pyrite contents.

### 4.5.6 Acid Digest and Elemental Analysis

Elemental analysis was conducted on four of the five tailings samples (desulfidized cyclone underflow was not analyzed). Samples were digested using a mixture of nitric, hydrofluoric, perchloric, and hydrochloric acids and elemental analysis was conducted using inductively coupled plasma-optical emission spectrometry (ICP-OES) or inductively coupled plasma-mass spectrometry (ICP-MS). Principal findings are summarized below:

- Results of elemental analysis were consistent with the results of whole rock and XRD analyses.
- The cleaner and whole tailings reported elevated iron content (16 and 4 weight percent, respectively) compared with scavenger tailings and cyclone tailings which reported less than 1 weight percent iron.
- Cleaner and whole tailings showed generally higher concentrations of arsenic, boron, bismuth, cobalt, copper, selenium, and silver than did the scavenger and cyclone tailings.

Elemental analyses were not compared to crustal abundances in SGS (2014). However, for consistency with assessments presented elsewhere in this report elemental abundances were compared with those provided in Price (1997). Where Price (1997) does not provide a value (for boron, lithium, selenium, silicon, tin, and yttrium) values from Mason and Moore (1982) were used. The following elements were identified as being present at concentrations greater than five times crustal abundance:

- In scavenger tailings: bismuth, copper, molybdenum, lead, selenium, tin, and tungsten
- In cleaner tailings: arsenic, boron, bismuth, copper, molybdenum, lead, selenium, silver, tin, tungsten
- In whole tailings: bismuth, copper, molybdenum, lead, selenium, silver, tin, and tungsten
- In untreated cyclone underflow: bismuth, copper, molybdenum, lead, selenium, tin, and tungsten

### 4.5.7 Particle Size Distribution

Particle size distribution in the pilot plant tailings samples was determined using sieving and hydrometry (SGS, 2014). Principal observations are provided below:

- Scavenger and whole tailings had similar fine-particle-size distribution with approximately 56 percent passing the 200-mesh sieve (i.e., particles with diameter less than 75 um). The majority of the fines were silt-size particles with only 7 percent of each sample falling into the clay-sized fraction.
- Cleaner tailings were finer-grained than the scavenger and whole tailings with 97 percent passing the 200-mesh sieve. Approximately 12 percent of the fines were in the clay-sized fraction.

### 4.5.8 Shake Flask Extraction

Shake flask extraction (SFE) was conducted to evaluate potential mobility of contaminants from the tailings solids. SFE was conducted on four of the five tailings samples (desulfidized cyclone underflow was not analyzed). Deionized water was added to the tailings solids at a 3:1 liquid to solid ratio; samples were rotated for 24 hours and then filtered. Leachate was subjected to chemical analyses including: water quality parameters, common ions, and trace metals and metalloids. Principal findings are summarized below:

- Leachate pH values were circumneutral for all four samples.
- Concentrations of metals and metalloids were low in leachates from both the cleaner and the scavenger tailings with the exception of manganese which was somewhat elevated in the cleaner tailings leachate (compared with concentrations in natural waters in non-mineralized systems (Hem, 1985)).
- Sulfate concentrations were substantially lower in leachates from scavenger tailings and untreated cyclone underflow compared with sulfate concentrations observed in leachates from cleaner and whole tailings (72 and 25 mg/L, respectively compared with 1,800 and 470 mg/L, respectively).

### 4.5.9 Decant Solution Analysis

Tailings solutions were settled and decanted and elemental analysis using ICP-OES/MS was conducted on the supernatants from all five tailings samples. Principal results are summarized below:

- All five tailings supernatants were slightly alkaline with pH values of approximately 8 s.u.
- In general, concentrations of all analytes were relatively low; however:

- Solutions from the cleaner and whole tailings contained detectable concentrations of thiosalts (43 and 27 mg/L, respectively). These components are likely an artifact of the metallurgical testing procedure at low temperature in Ontario. Under the warmer conditions that would be typical of Arizona, it is considered unlikely that thiosalts would be generated. In addition, Resolution can refine the flow sheet to minimize risk and increase quality-assurance controls to ensure that thiosalts do not develop.
- Total and dissolved mercury concentrations in the scavenger tailings solution were elevated compared with the other tailings samples (0.0045 mg/L total and 0.0007 mg/L dissolved compared with below the detection limit of 0.0001 mg/L for all other solutions).

### 4.5.10 Humidity Cell Testing

Humidity cell tests (HCTs) were conducted on cleaner tailings, whole tailings, untreated cyclone underflow and desulfidized cyclone underflow samples. The HCTs were conducted following the standard ASTM D5744-96 (2001) method. Leachate from the HCTs were measured weekly for general parameters (pH, acidity, alkalinity, conductivity, and sulfate concentration). Trace element analyses were conducted on the leachates weekly for the first five weeks and then every five weeks thereafter. HCTs were conducted for 100 weeks for the cleaner and whole tailings, 202 weeks for the untreated cyclone sample, and 172 weeks for the desulfidized cyclone sample.

Further information regarding test design and implementation along with detailed results is provided in SGS (2014). Principal results/conclusions are summarized below:

#### *4.5.10.1 Cleaner Tailings*

Cleaner tailings were subjected to humidity cell testing for 100 weeks. Principal results include:

pH

- At the beginning of the test pH was 7.05; pH decreased to below 4 in approximately 24 weeks; in the final 20 weeks of the test pH stabilized at approximately 3 s.u.

Acidity

- Acidity was detectable in leachates throughout the test; levels increased from below the analytical detection limit to approximately 160 mg/L as $CaCO_3$ over the first 40 weeks and then generally stabilized between approximately 120 and 150 mg/L as $CaCO_3$.

Alkalinity

- Alkalinity concentrations decreased to below the analytical detection limit (<2 mg/L $CaCO_3$) by week 6.

Sulfate

- Sulfate concentrations increased until week 40 at which time they generally stabilized at concentrations between approximately 200 and 230 mg/L.

Depletion of acid neutralizing potential

- Calculation of cumulative ANP depletion indicates that total ANP was exhausted after approximately 44 weeks.

Metals

- Concentrations of the following metals in HCT leachates from cleaner tailings were consistent with declining pH: aluminum, chromium, copper, iron, manganese, and nickel.

### *4.5.10.2 Whole Tailings*

Whole tailings were subjected to humidity cell testing for 100 weeks. Principal results include:

pH

- At the beginning of the test pH was 7.3; by week 8 pH had decreased to below 6; pH stabilized at approximately 3.4 in the final 20 weeks of the test.

Acidity

- Acidity was detectable in leachates throughout the test; levels increased from below the analytical detection limit to approximately 80 mg/L as $CaCO_3$ over the first 40 weeks and then generally stabilized between approximately 50 and 60 mg/L as $CaCO_3$ in the final 20 weeks of the test.

Alkalinity

- Alkalinity concentrations decreased to below the analytical detection limit (<2 mg/L $CaCO_3$) by week 8.

Sulfate

- Sulfate concentrations decreased over the first 14 weeks of the test and stabilized at concentrations between approximately 60 and 100 mg/L for the remainder of the test.

Depletion of acid neutralizing potential

- Calculation of cumulative NP depletion indicates that total NP was exhausted after approximately 51 weeks.

Metals

- Concentrations of the following metals in HCT leachates from whole tailings were consistent with declining pH: aluminum, copper, iron, and manganese.

### *4.5.10.3 Untreated Cyclone Underflow*

The untreated cyclone underflow sample was subjected to humidity cell testing for 202 weeks. Principal results include:

pH

- At the start of the test pH was 7.15; by approximately week 40 pH decreased to below 6; pH stabilized at approximately 5.7 between weeks 40 and 150 then became somewhat more variable in the final 50 weeks of the test ranging between approximately 5.3 and 6.1 s.u.

Acidity

- Acidity levels were very low in this test; acidity was below the detection limit of 2 mg/L as $CaCO_3$ in the beginning of the test and increased slightly as the test progressed ranging between <2 and 8 mg/L.

Alkalinity

- Alkalinity concentrations decreased to below the analytical detection limit (<2 mg/L as $CaCO_3$) by week 22.

Sulfate

- Sulfate concentrations decreased over the first 25 weeks of the test and then stabilized at concentrations between approximately 10 and 20 mg/L for the remainder of the test.
- Low sulfate concentrations are consistent with the very low pyrite content of the cyclone underflow tailings.

Depletion of acid neutralizing potential

- Calculation of cumulative carbonate ANP depletion indicates that the fast-acting carbonate ANP was exhausted after approximately week 80.

- By the end of the test 22.3 percent of the total ANP was depleted; however, only 13.6 percent of the sulfide was depleted which indicates that the ANP is likely to be exhausted before the sulfide leading to increasingly acidic conditions with time. The significance of this result must be judged in terms of the very low total pyrite available as a source term.

Metals

- Concentrations of metals in HCT leachates from the untreated cyclone underflow materials were very low compared with concentrations observed in leachates from the cleaner and whole tailings. This observation is consistent with maintenance of circumneutral conditions in these leachates.

### *4.5.10.4 Desulfidized Cyclone Underflow*

The desulfidized cyclone underflow sample was subjected to humidity cell testing for 172 weeks. Principal results include:

pH

- At the beginning of the test pH was 7.41; by about week 70 pH had stabilized at approximately 6; in weeks 121 through 172 values consistently reported slightly below pH 6 s.u.

Acidity

- Acidity levels were very low in this test; at the beginning of the test acidity levels were below the detection limit of 2 mg/L as $CaCO_3$; they then increased slightly as the test progressed, ranging between <2 and 6 mg/L as $CaCO_3$.

Alkalinity

- Alkalinity concentrations decreased to below the analytical detection limit (<2 mg/L $CaCO_3$) by week 40.

Sulfate

- An initial flush yielded sulfate concentrations of approximately 10 to 20 mg/L in the first two weeks of testing,
- Sulfate concentrations stabilized below 2 mg/L after week 12.
- Low sulfate concentrations are consistent with the very low pyrite content of the desulfidized cyclone underflow tailings.

Depletion of neutralizing potential

- Cumulative depletion of carbonate ANP, total ANP, and sulfide were 59.4 percent, 5.8 percent, and 14.1 percent, respectively. These results indicate that the AGP (i.e., sulfide) would likely be depleted before the bulk ANP and therefore the desulfidized cyclone sands would not generate acidic conditions with time.

Metals

- Concentrations of metals in HCT leachates from the desulfidized cyclone underflow materials were very low compared with concentrations observed in leachates from the cleaner and whole tailings. This observation is consistent with maintenance of circumneutral conditions in these leachates.

### 4.5.11 Analysis of Post-HCT Residues

Samples of HCT residue from the cleaner and whole tailings, and the untreated and desulfidized cyclone samples were subjected to shake flask extraction (SFE), acid base accounting (ABA), and net acid generation (NAG) testing: Principal results are summarized below.

#### *4.5.11.1 Shake Flask Extraction*

- SFE leachates from cleaner and whole tailings samples were acidic with measured pH values of 3.46 and 3.47, respectively.
- Concentrations of the following constituents in SFE leachates from cleaner tailings were consistent with acidic pH of the leachate: chromium, copper, iron, manganese, nickel, and sulfate.
- Concentrations of the following constituents in SFE leachates from whole tailings were consistent with acidic pH of the leachate: copper, iron, and manganese.
- SFE leachates from the untreated and desulfidized cyclone samples were circumneutral with pH values of 6.54 and 6.78, respectively.
- Concentrations of metals in SFE leachates from the untreated and desulfidized cyclone samples were low.
- In general, the cleaner and whole tailings leachates reported much higher concentrations of acidity, sulfate, and most metals and metalloids than the untreated and desulfidized cyclone samples.

#### *4.5.11.2 Acid Base Accounting*

- Little sulfide depletion occurred over the test period in any of the test cells.
- There was substantial depletion of both total and carbonate NP in the whole and cleaner tailings samples.
- Both carbonate and total NP were somewhat depleted in the untreated and desulfidized cyclone samples.

#### *4.5.11.3 Net Acid Generation Testing*

- NAG testing confirmed the continued acid generation potential of the cleaner and whole tailings samples; NAG pH values were 1.91 and 2.25, respectively.
- Residual acidity values were higher in the cleaner and whole tailings residue samples than in the pre-test samples.
- The untreated cyclone sample reported a final pH of 4.11, minor residual acidity at pH 4.5 and increased residual acidity at pH 7.0 compared to pre-HCT NAG testing.
- The desulfidized cyclone sample reported a final NAG pH of 5.34 which indicates that no net acidity was generated after aggressive oxidation of the sample.
- Titration of the desulfidized cyclone sample to pH 7.0 showed an increase in the residual acidity from the pre-HCT value of 0.7 kg $H_2SO_4$/t to a post-HCT value of 4.9 kg $H_2SO_4$/t. This remains a low value for acidity.

## 4.6 Field cell (Barrel) Testing of Pilot Plant Tailings

The pilot plant tailings subjected to static and kinetic testing described in **Section 4.5** were used in larger-scale field cell tests in which 55-gallon barrels of each of the tailings types were exposed to ambient or accelerated weathering. Barrel testing was conducted for approximately 3.5 years, from May 2009 through January 2013. A summary of test results and principal conclusions is provided below. See Golder (2013) for detailed descriptions of testing methodology and results.

### 4.6.1 Objectives

Objectives of the barrel testing of pilot plant tailings included:

- Assess the impact of sample size on geochemical behavior of tailings in order to investigate up-scaling of environmental test results

- Investigate weathering behavior of tailings under ambient conditions more representative of the anticipated emplacement environment than those simulated by humidity cell tests
- Identify secondary minerals that control drainage chemistry through geochemical modeling of leachate chemistry

### 4.6.2 Barrel Test Methodology

Eleven barrels were prepared using cleaner, scavenger, and whole tailings and untreated and desulfidized cyclone sands. Two different moisture contents (paste and filter cake) were tested for the cleaner tailings. Each barrel contained on the order of 70 to 100 kg of tailings material with the exception of the non-irrigated scavenger tailings (barrel 6) that contained roughly 160 kg of tailings.

One barrel of each tailings type (except the whole tailings) was irrigated once a month with 10 gallons of water distributed over the surface of the barrel with a watering can. The remainder of the barrels received water only from ambient precipitation. Leachates from the barrels were collected continuously via gravity drainage into bottles and sampled monthly. Only the irrigated barrels yielded monthly leachate samples; ambient barrels produced leachate periodically associated with rainfall events. Leachates were analyzed for field parameters (pH, electrical conductivity, and temperature), common ions, and trace metals. A summary of the materials in each barrel and which barrels were irrigated is provided in the table below.

| Barrel No. | Tailing Type | Irrigated |
|---|---|---|
| 1 | Cleaner (paste) | no |
| 2 | Cleaner (paste) | yes |
| 3 | Cleaner (filter cake) | no |
| 4 | Scavenger | no |
| 5 | Scavenger | yes |
| 6 | Scavenger | no |
| 7 | Whole | no |
| 8 | Cyclone | no |
| 9 | Cyclone | yes |
| 10 | Desulfidized cyclone | no |
| 11 | Desulfidized cyclone | yes |

### 4.6.3 Chemical Analysis of Barrel Leachates

A summary of principal observations from the chemical analysis of barrel leachates is provided in this section. Details are available in Golder (2013).

#### *4.6.3.1 Cleaner Tailings*

- Leachates from non-irrigated, paste cleaner tailings (barrel 1) were acidic throughout the test period (pH range 2.1 to 4.5 for 8 samples). Acidity ranged between 2,390 and 55,000 mg/L as $CaCO_3$. Alkalinity was below the detection limit.
- Leachates from irrigated, paste cleaner tailings (barrel 2) were variable throughout the test period with acidic conditions dominating but occasional increases to circumneutral pH values associated with colder ambient temperatures (pH range 1.6 to 7.4 for 45 samples). Acidity ranged from below the detection limit to 49,000 mg/L as $CaCO_3$. Alkalinity was only occasionally detectable with maximum concentrations on the order of 100 to 200 mg/L as $CaCO_3$.
- Leachates from non-irrigated, filter-cake cleaner tailings (barrel 3) were acidic throughout the test period (pH range 1.9 to 3.3 for 6 samples); acidity ranged between 6,380 and 53,000 mg/L as $CaCO_3$. Alkalinity was below the detection limit.
- Sulfate concentrations were elevated in all cleaner tailings barrels, consistent with acidic conditions. Maximum sulfate concentrations were on the order of 50,000 mg/L.
- Concentrations of the following constituents in barrel leachates from cleaner tailings were consistent with declining pH: aluminum, arsenic, beryllium, cadmium, chromium, cobalt, copper, fluoride, iron, manganese, nickel, selenium, silver, uranium, vanadium, and zinc.
- There was no substantial difference in the observed geochemical behavior of paste compared with filter cake tailings.

#### *4.6.3.2 Scavenger Tailings*

- Barrel 4 (ambient) yielded one sample and barrel 6 (ambient) yielded two samples all with circumneutral pH.
- Leachates from irrigated scavenger tailings (barrel 5) remained circumneutral for the testing period with the exception of three samples that dropped to between pH 5 and 6. Acidity was mostly below the detection limit with occasional detections at 10 mg/L as $CaCO_3$. Alkalinity was detectable in barrel 5 leachate throughout the testing period with a maximum concentration of 270 mg/L as $CaCO_3$.
- For the first two years of the testing period sulfate concentrations in leachate from irrigated scavenger tailings (barrel 5) were approximately 250 mg/L. Starting in the

beginning of the third year sulfate concentrations increased and varied between approximately 250 mg/L and 930 mg/L.

- Depletion calculations (Golder, 2013) show that the small amounts of sulfide present in the irrigated scavenger tailings sample would be exhausted prior to the complete depletion of the alkalinity. This result confirms that the scavenger tailings in barrel 5 were non-acid generating.
- Concentrations of metals were generally low in leachates from the irrigated scavenger tailings consistent with maintenance of circumneutral conditions.

#### *4.6.3.3 Whole Tailings*

- Non-irrigated whole tailings (barrel 7) generated eight samples over the testing period each with pH less than 3. Acidity ranged between 680 and 17,600 mg/L as $CaCO_3$. Alkalinity was generally below the detection limit.
- Sulfate concentrations were elevated in the barrel 7 leachate consistent with acidic conditions. Maximum sulfate concentration was 17,000 mg/L.
- Concentrations of the following constituents in HCT leachates from whole tailings were consistent with declining pH: aluminum, arsenic, beryllium, cadmium, chromium, copper, fluoride, iron, manganese, and nickel.

#### *4.6.3.4 Untreated Cyclone Underflow*

- Barrel 8 (ambient) yielded one sample with a pH of 6.63.
- Leachate from irrigated, untreated cyclone sands (barrel 9) remained circumneutral for the testing period with the exception of three samples that dropped to between pH 5 and 6. Acidity was mostly below the detection limit with some detections at 10 mg/L as $CaCO_3$. Alkalinity concentrations were relatively stable in the range approximately 100 to 230 mg/L as $CaCO_3$.
- Depletion calculations (Golder, 2013) indicate that, in barrel 9, alkalinity would be depleted prior to the complete depletion of sulfide which suggests a long-term acid generation potential for untreated cyclone sands.
- Sulfate concentrations were elevated in leachate from barrel 9 with a maximum concentration of 1,560 mg/L; however, concentrations decreased through the testing period and were relatively stable at approximately 300 to 600 mg/L for the last two years of the testing period.
- Concentrations of metals and metalloids were generally low in leachates from the untreated cyclone sands consistent with maintenance of circumneutral conditions.

#### *4.6.3.5 Desulfidized Cyclone Underflow*

- Barrel 10 (ambient) yielded one sample with a pH of 7.92.
- Leachate from irrigated, desulfidized cyclone sands (barrel 11) remained circumneutral for the testing period. Acidity was below the detection limit and alkalinity concentrations were relatively stable in the range approximately 100 to 235 mg/L as $CaCO_3$.
- Depletion calculations (Golder, 2013) indicate that in barrel 11, sulfide would be depleted before the depletion of alkalinity. This result confirms that the desulfidized cyclone sands in barrel 11 were non-acid generating.
- Maximum sulfate concentrations in the first 18 months of the test were on the order of 1,200 mg/L. In the final two years of the testing period sulfate concentrations ranged between approximately 400 and 700 mg/L.
- Concentrations of metals and metalloids were generally low in leachates from the desulfidized cyclone sands consistent with maintenance of circumneutral conditions.

### 4.6.4 Geochemical Modeling of Barrel Leachates

Golder (2013) provides the results of geochemical modeling that was conducted to evaluate the likely geochemical controls on the composition of tailings leachates. Principal observations/conclusions include:

- Due to the low pH generated by the cleaner tailings leachate, the number of mineral phases modeled to be potentially supersaturated is limited. Various sulfate minerals (gypsum, barite, jarosite) may control dissolved sulfate, barium and/or iron concentrations.
- For the scavenger tailings leachate, dissolved barium, iron and copper concentrations may be controlled by precipitation of barite, ferrihydrite, and malachite, respectively. To a lesser extent, formation of manganese-bearing minerals is modeled to be feasible as well. Fluorite may govern dissolved fluoride concentrations, while calcite may control dissolved calcium and act as a pH buffer.

# 5.0 Discussion

Resolution's current tailings management strategy calls for separation of tailings into two mineralogically and geochemically discrete streams known as "cleaner" and "scavenger" tailings (terminology that comes from the metallurgical ore processing). Cleaner tailings contain the majority of the pyrite and show elevated sulfide and residual metals contents; this tailings stream is anticipated to account for approximately 15 percent of the total tailings volume. Scavenger tailings contain very low concentrations of sulfide due to segregation of the majority of the pyrite to the cleaner tailings; this tailings stream is anticipated to account for approximately 85 percent of the total tailings volume.

This section provides a discussion of the findings of the RCM tailings geochemical characterization studies summarized in **Section 4.0**. The major geochemical features of tailings behavior are consistent across the different sets of testing, which allows some strong inferences to be drawn about the geochemical behavior of tailings depending on how RCM might process and manage the tailings streams. RCM's current tailings management strategy calls for separation of cleaner and scavenger tailings and this section focuses on the geochemical behavior of these two tailings materials.

## 5.1 Mineralogy of Tailings

Mineralogy of the tailings materials has been determined by each of the major studies outlined in this report using either semi-quantitative x-ray diffraction (XRD) or Quantitative Evaluation of Minerals with Scanning Electron Microscopy (QEMSCAN). The results of the mineralogical analyses are consistent between studies and the principal components of the cleaner and scavenger tailings are summarized below.

### 5.1.1 Cleaner Tailings

The majority of the pyrite in ore samples subjected to metallurgical testing was successfully segregated into the cleaner tailings stream. This resulted in cleaner tailings samples that contained between 34 and 75 weight percent pyrite. Minor calcite on the order of approximately 1 weight percent or less was identified in some cleaner tailings samples but not in others. Sulfate minerals were either present in trace amounts or were not detected. The remainder of the cleaner tailings consists primarily of silicate minerals including: quartz, orthoclase, kaolinite, muscovite/illite, and amphibole/chlorite.

### 5.1.2 Scavenger Tailings

Mineralogy of the scavenger tailings is dominated by silicate minerals including: quartz, orthoclase, kaolinite, muscovite/illite, and amphibole/chlorite. Scavenger tailings contain very little pyrite as the majority of the pyrite is segregated into the cleaner tailings stream. Pyrite in the RES-007 studies was below the XRD detection limit (i.e. less than 1 weight percent) and in the blended ore composite study was below 0.1 weight percent. Calcite is similarly very low—below the detection limit in the majority of samples and present in only trace amounts in others. Sulfate minerals were either present in trace amounts or were not detected. Calcite and sulfate are naturally low in the ore.

## 5.2 Geochemical Reactivity of Tailings

The principal goal of the RCM tailings geochemical characterization program has been to determine the potential for cleaner and scavenger tailings streams to generate acidic conditions and leach sulfate or metals when exposed to an oxidizing environment, in order to define the management strategy for those tailings. Several multi-year testing campaigns have been conducted since 2002. The following section summarizes findings regarding the potential geochemical reactivity of cleaner and scavenger tailings, the two processing alternatives that are part of current mine planning, based on the results of the work presented in **Section 4.0** above.

It is important to note that the tests summarized in this report do not predict the composition of discharge from the TSF or the quality of groundwater adjacent to the impoundment. Geochemical testing is conducted to determine the potential geochemical reactivity of the tailings should they be exposed to oxidizing conditions and to help guide future engineering plans for management and closure of tailings. Solute/water-balance and fate-and-transport modeling will be conducted in order to provide a quantitative assessment of the potential chemical composition of discharge from the TSF as well as groundwater quality adjacent to the proposed TSF during mining operations and post-closure.

### 5.2.1 Cleaner Tailings

The expected geochemical behavior of the cleaner tailings has been clearly defined by the RCM geochemical characterization program. Because of the very high pyrite concentration and low neutralizing potential, the cleaner tailings are classified as potentially acid generating. If these materials were allowed to weather in an oxidizing environment, they would be expected to generate acidic conditions and leach elevated concentrations of fluoride, sulfate and metals. The results of both static and kinetic testing at a variety of scales indicate that drainage from

cleaner tailings would likely have pH less than 4. Analysis of leachates from both humidity cell and barrel tests show that, were the cleaner tailings allowed to oxidize, they could potentially release the following constituents: aluminum, arsenic, beryllium, cadmium, chromium, cobalt, copper, fluoride, iron, manganese, nickel, selenium, sulfate, uranium, vanadium, and zinc. Other metals also may be present in some zones of tailings based on variability of ore chemistry. The potential for cleaner tailings to generate acidic drainage with elevated concentrations of metals and sulfate has long been recognized by the Project. The current tailings management strategy includes emplacement and storage of cleaner tailings under saturated conditions; cleaner tailings will be encapsulated by scavenger tailings and, ultimately, covered with an engineered cover to prevent exposure to oxidizing conditions.

### 5.2.2 Scavenger tailings

RCM's metallurgical program has demonstrated that production of scavenger tailings with very low sulfide sulfur content is an achievable goal through optimization of the metallurgical processes and careful quality assurance. Long-term kinetic testing at both humidity-cell and field-cell scales (testing on the order of 1 kg and 100 kg of tailings, respectively) has shown that RCM's low-sulfide scavenger tailings are unlikely to leach metals or sulfate at concentrations of environmental concern. In those cases where the neutralizing potential is very low, there is the potential for mildly acidic leachates to be generated. However, kinetic testing shows that when low pH conditions are generated the release of acidity, sulfate, and metals is limited by the very low sulfide content of the scavenger tailings. Characterization efforts to refine Project understanding of the potential geochemical reactivity of scavenger tailings are ongoing.

## 5.3 Scaling of Metallurgical and Geochemical Test Results

Metallurgical testing has been conducted at both laboratory and pilot plant scales. These tests demonstrate that scavenger tailings with very low sulfide sulfur contents can be generated at both scales. This indicates that generation of a low-sulfide scavenger tailings stream should be feasible at operational scales.

The potential effects of scale have also been investigated during geochemical characterization of tailings by conducting kinetic testing at the humidity cell scale, which used roughly 1 kg of tailings material, and at the field cell (barrel) scale which used on the order of 100 kg of tailings per test. The geochemical behavior of the tailings materials was consistent between the smaller and larger tests which provides a degree of confidence in the applicability of the results to operational scales.

## 5.4 Impact of Moisture Content on Tailings Reactivity

Two studies have used kinetic testing to investigate the potential impact of tailings moisture content on the geochemical reactivity of the tailings. The first of these, summarized in **Section 4.3.3.7**, conducted humidity cell testing using tailings with three different moisture contents: thickened (approximately 70 percent solids), paste (approximately 75 to 77 percent solids), and filter cake (approximately 83 percent solids). Results show that cleaner tailings samples with higher solids contents generally gave rise to higher initial concentrations of metals; although in later times leachate concentrations were relatively independent of solids content. In addition, reaction rates were faster, and lag times to acid generation were shorter, for cleaner tailings samples with higher solids content. In contrast, there was little correlation between leachate chemistry and solids content in the scavenger tailings samples.

The second study to evaluate the impact of moisture content of tailings reactivity was the field cell (barrel) testing of pilot plant tailings summarized in **Section 4.6**. Two barrels contained cleaner tailings with different moisture contents: paste and filter cake tailings. Both barrels were weathered under ambient conditions (i.e., were not irrigated) so they only produced eight leachate samples from the paste tailings and six leachate samples from the filter cake tailings. Based on these few leachate samples, the geochemical behavior of the two cleaner tailings appears to have been similar; no observable variations in leachate chemistry could be attributed to the difference in the initial tailings moisture content.

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# Appendix A:
# Metallurgical Testing Methods (Tailings Production)

# Appendix A: Metallurgical Testing Methods (Tailings Production)

**Appendix A** provides a brief description of the types of metallurgical testing conducted by RCM. These metallurgical tests generate tailings samples which are subjected to static and kinetic testing to determine their potential geochemical reactivity when exposed to air and water. Metallurgical testing has been conducted at both laboratory and pilot plant scales as described below.

## A.1 Batch Flotation Testing

Batch flotation testing is laboratory-scale testing that is conducted in two stages. The first stage (rougher/scavenger stage) separates the copper and molybdenum-bearing minerals and the sulfide gangue minerals from the non-sulfide gangue. The non-sulfide gangue is discarded (scavenger tailings) and the concentrate is moved on to the next stage—cleaner flotation. In the cleaner flotation stage the concentrate is further refined and the sulfide-rich gangue (containing most of the pyrite and residual non-economic metals) is disposed of as cleaner tailings.

## A.2 Locked Cycle Testing

A locked cycle test is composed of a series of batch flotation tests in which copper and molybdenum minerals are progressively removed. Each stage of the test results in a concentrate that is enriched in the ore minerals of interest and tailings that are depleted in economic minerals. The locked cycle testing conducted on Resolution ore has varied from study to study in terms of the reagents used, number of stages, number of cycles, and other operational details. However, the principal stages and products of a standard locked cycle test include:

1. *The rougher/scavenger stage* which produces scavenger tailings (also called rougher or rougher/scavenger tailings though we use the term scavenger tailings in this report) and a rougher/scavenger concentrate.
2. *The No. 1 cleaner stage* in which the rougher/scavenger concentrate is subjected to the No. 1 cleaner and No. 1 cleaner scavenger processing. The No. 1 cleaner stage produces a concentrate that moves on to the second cleaner stage. The No. 1 cleaner scavenger stage produces the No. 1 cleaner scavenger tailings and the No. 1 cleaner scavenger concentrate. In each cycle of the test (generally seven cycles) No. 1 cleaner/scavenger tailings are discarded and the No. 1 cleaner scavenger concentrate is circulated back through the first cleaner stage for further processing.
3. *The No. 2 cleaner stage* in which the concentrate from the No. 1 cleaner stage moves on to the second cleaner stage (No. 2 cleaner) which produces the No. 2 concentrate

and No. 2 cleaner tailings that circulate back to the No. 1 cleaner stage for each of the test cycles.

4. *The No. 3 cleaner stage* in which the concentrate from the No. 2 cleaner stage moves on to the third cleaner stage which produces the final product (No. 3 concentrate) and No. 3 cleaner tailings that circulate back to the No. 2 cleaner stage for each of the test cycles.

There are sometimes more stages in a locked cycle test; however, all locked cycle tests produce only two waste streams, the scavenger and No. 1 cleaner tailings. Cleaner tailings after the first stage (i.e., No. 2 cleaner, No. 3 cleaner etc.) are recycled within the test and do not enter the waste stream. Tailings samples used in RCM's tailings characterization program were a composite of material from the final three cycles of testing (cycles 5, 6, and 7).

## A.3 Pilot Plant

Pilot plant metallurgical testing was conducted by SGS Minerals (Lakefield, Ontario, Canada) in March 2009. Pilot plant design was developed based on the results of earlier laboratory-scale metallurgical testing and consisted of a grinding circuit followed by rougher flotation, regrinding, and three stages of cleaner flotation. Approximately 3 tonnes of ore were processed through the pilot plant and both cleaner and scavenger tailings streams were produced. The majority of the pyrite was sequestered in the cleaner tailings which had an average sulfide sulfur content of 21.2 weight percent. Scavenger tailings were produced with a combined average sulfide sulfur content of 0.066 weight percent.

# Appendix B:

# Kennecott Utah Copper Acid-base Accounting Procedure

# STANDARD OPERATING PROCEDURE #1

## The Complete Modified Sobek Acid Base Accounting

Groundwater Discharge Permit No. UGW350011

Appendix A

Revision 6 - June 2000

Prepared by: Kennecott Utah Copper

## I. TITLE

THE COMPLETE MODIFIED SOBEK - ACID BASE ACCOUNTING

## II. SUMMARY

The purpose of this procedure is to measure the acid generating and neutralization potential of waste rock and tailings. This procedure is based on an original procedure developed by A. A. Sobek and others (1978 - EPA Method 600/2-78-054). Several modifications were made to this original method as recommended by Lawrence and others (1989) and White and Others (1996). Other minor modifications were also made to facilitate equipment present at the Kennecott Laboratory.

The acid generating potential results from the presence of metallic sulfide minerals. The sulfides contained in these minerals may be converted to sulfuric acid by oxidation of the sulfur. If sufficient neutralizing capacity is not present, the material may become acidic. This method measures the total concentration of sulfur, differentiates the forms of sulfur present, and measures the neutralization potential. The total sulfur present is determined analytically using a LECO Furnace. The forms of sulfur present are determined by leaching the samples with water, hydrochloric acid, and nitric acid and then analyzing the leached samples for sulfur using the LECO Furnace.

This method is based on the assumption that the forms of sulfur present in the sample can be differentiated as follows:

- Gypsum and some other sulfate minerals, are soluble in a hot water leach.
- Most sulfate minerals and other non-acid producing forms of sulfur are removed by a HCl leach.
- Sulfate, non-acid producing forms, and sulfide forms of sulfur, such as pyrite are removed during the $HNO_3$ acid leach.
- Forms of sulfur remaining after the $HNO_3$ leach (residual sulfur) will be primarily non-acid forming organic sulfur compounds.

Then, by subtraction, the various forms of sulfur can be evaluated. The portion of the sample comprised of iron-bearing sulfitic forms of sulfur (predominantly pyrite, chalcopyrite and bornite at Bingham Canyon) is of primary interest since it is this form that produces acid. The concentration of acid-forming sulfide sulfur in the sample is determined by subtracting the HCl extractable forms of sulfur from the concentration of total sulfur present in the sample. The hot water leach is optional since sulfate forms are extracted by both the hot

water and HCl leach. The HNO3 leach is also optional because the tailings and waste rock do not contain significant quantities of organic sulfur. It should be noted that the exclusion of the HNO3 leaching results will conservatively tend to overestimate the sulfide sulfur in the sample.

The Neutralization Potential (NP) is measured by over-acidifying the sample and then measuring the excess acid and determining the amount of acid consumed by the sample. The net neutralizing capacity of the sample is reported as the Acid Base Account (ABA) of the sample, which is the difference between the NP and the Acid Potential (AP) as determined from the concentration of pyritic sulfur. Total sulfur and the forms of sulfur are reported as percent sulfur, while the NP, AP and the ABA are reported as tons $CaCO_3$/1000 tons.

## III. PROCEDURES

Each sample for ABA analysis will follow all of the following procedures.

### A. Sample Preparation

1. Apparatus:

   a) Drying Oven

   b) Mesh screen

   (1) All samples will be oven dried at 80°C[1] and homogenized by the laboratory prior to the start of any analytical procedures. All ABA analyses will be run on a portion of sample ground to less than or equal to 200 mesh. Approximately 5 grams of material will be required.

### B. Total Sulfur

1. Reagents and Apparatus:

   a) Leco Sulfur Analyzer

[1] Recommended in ASTM D 5744 9.4

b) Balance with 0.0001g readability

c) Leco Crucible

2. Procedure

a) Weigh suitable sample aliquot of (0.1-1.0g) into a Leco crucible.

b) Analyze the sample on the Leco CNS2000 Analyzer following the manufacturer's specifications.

3. Reporting:

a) The result from this procedure is the Percent **Total Sulfur.**

C. **H20 Extractable Sulfur ( If requested)**

1. Reagents and Apparatus:

a) Filter rack and glass Funnels.

b) S&S 589 white ribbon filter paper or equivalent.

c) ASTM Type II Reagent water.

d) ml beaker to boil water.

e) Microwave to boil the container of water.

f) Balance with 0.001g readability.

2. Procedure:

a) Weigh a 1-2g sample.

b) Fold white ribbon filter paper and place inside the glass funnels.

c) Transfer soil sample to the filter paper.

d) Slowly add a total of 100 ml in two or more increments of the boiling water to the sample. Be careful not to lose any sample by run over, splashing or breaking through the filter paper.

e) Allow the sample to air dry overnight.

f) The soil sample is analyzed on the Leco Sulfur Analyzer following the manufactures specifications for sulfur.

3. Reporting:

a) H2O Extractable Sulfur is reported in percent using:
Total Sulfur – Sulfur remaining in the H2O-leached sample.

D. HCl Extractable Sulfur

1. Reagents and Apparatus:

a) Filter rack and glass Funnels.

b) S&S 589 white ribbon filter paper or equivalent.

c) Reagent grade HCl/ASTM Type II Reagent water.

d) Balance with 0.001g readability.

e) AgNO3 - 10g into 90 ml of ASTM Type II water bring to 100 ml volume. Keep reagent in an amber bottle.

2. Procedure:

a) Weigh a 1-2g sample.

b) Fold white ribbon filter paper and place inside the glass funnels.

c) Transfer soil sample to the filter paper.

d) Slowly add a total of 100 ml in two or more increments of the 2:3 HCl : $H_2O$ reagent to the sample. Be careful not to lose any sample by run over, splashing or breaking through the filter paper.

e) Rinse sample with deionized H2O until all traces of $Cl^-$ ions are removed. Verify the Cl ion by testing filtrate with 3 drops of AgNO3 to see if a precipitate forms. If a precipitate forms continue washing the sample with deionized water. If no precipitate forms continue with the procedure.

f) Allow the sample to air dry overnight.

g) Remove the soil from the filter paper and place in a tarred solo plastic cup. Record the weight of the sample.

h) The soil sample is analyzed on the Leco Sulfur Analyzer following the manufactures specifications for sulfur.

i) Weight Correction:

(1) This procedure is done to correct for weight loss due to dissolution during leaching the sample, since the Leco sulfur apparatus reports percent sulfur on the actual weight of the leached sample used for the determination

(2) Correction for the amount of sample dissolved is accomplished as in the following example:

% Sulfur Corrected = % Sulfur Uncorrected times
(1-(Initial weight-final weight)/initial weight).
Example:

Sample Weight before washing = 2.3211
Sample Weight after washing = 1.6922
Difference = 0.6289

0.6289/2.3211=0.27

Sulfur = 2.78

Then 2.78(1-0.27) = 2.03

3. Reporting:

a) Report (Total Sulfur-Weight corrected Sulfur in the extracted sample) as HCl Extractable %.

E. HNO3 Extractable Sulfur (if requested)

1. Reagents and Apparatus:

a) Balance with 0.001g readability

b) Hot plate.

c) Beakers.

d) Reagent grade HNO3/H2O

e) Type II Reagent Water

2. Procedure:

a) Weigh a soil sample of 1-2g of less than or equal to 200 mesh into a 150 ml beaker.

b) Add 50 ml of 1:7 HNO3/H2O.

c) Place sample on hot plate. Heat to near boiling cover and Continue to digest for six hours. (Do not allow sample to become dry.)

d) Let samples cool.

e) Filter the sample and rinse thoroughly to remove all traces of NO( approximately 200 ml of H2O).

f) Allow the samples to air dry.

g) Remove the soil from the filter paper and place in a tarred solo plastic cup. Record the weight of the sample.

h) Carefully transfer the sample to a Leco crucible.

i) Analyze the sample on the Leco Automatic Sulfur Analyzer following the manufactures specification for sulfur.

j) Weight Correction:

(1) This procedure is done to correct for weight loss due to dissolution during leaching the sample, since the Leco sulfur apparatus reports percent sulfur on the actual weight of the leached sample used for the determination.

(2) Correction for the amount of sample dissolved is accomplished as in the following example:

% Sulfur Corrected = % Sulfur Uncorrected times (1-(Initial weight-final weight)/initial weight).

Example:

Sample Weight before washing = 2.3211
Sample Weight after washing = 1.6922
Difference = 0.6289

0.27

Sulfur = 2.78

Then 2.78(1-0.27) = 2.03

3. Reporting:

a) Report as (Total Sulfur-Weight corrected Sulfur in the leached sample) as % HNO3 Extractable.

F. Residual Sulfur (if requested)

1. Residual Sulfur is calculated as follows:

Residual Sulfur = Total Sulfur - (HCl Extractable + HNO3 Extractable Sulfur)

G. Calculation of Acid Potential as Tons CaCO3/1000 tons soil.

1. Calculation:

Acid Potential = Total sulfur – HCL extractable Sulfur * 31.25

- is a factor which yields the Acid Potential in terms of tons CaCO3/1000 tons soil.

H. Neutralization Potential - Lime as CaCO3

1. Summary

The neutralization potential is to determine the neutralizing bases, including the carbonates, present in a given sample. A known volume of HCl is added to the sample. The sample is heated to ensure that the reaction goes to completion. The CaCO3 equivalent of the sample is obtained by determining the amount of unconsumed acid by titration with standardized sodium hydroxide.

2. Apparatus:

a) 100 ml beakers

b) Mettler DL 70 Autotitrator equipped with ST20 Autosampler

c) pH meter

3. Reagents:

   a) 1:3 HCl/H2O

   b) 0.1 N HCl certified.

   c) 0.5 N HCl certified.

   d) 0.25 N NaOH certified.

   e) Potassium Acid Phthalate primary standard grade.

4. Standardizing Reagents:

   a) Standardize the NaOH solution by weighing 1.00g Potassium acid phthalate into three disposable beakers. Write down the exact weight and enter into the titrator program when requested. Titrate with certified 0.25 NaOH to the break point using the DL70 autotitrator and DL70 routine CAL1. The routine will add sufficient DI water, titrate to the dynamic[2] end point, and calculate the NaOH normality automatically.

      (1) Verify the standardization of the Hydrochloric Acid solution by placing three 10 ml aliquots of the HCl solution into a plastic disposable beaker. Titrate to the end point using routine CAL 3. The method calculates the HCL normality automatically.

5. Procedure:

[2] The dynamic endpoint is that part of the titration curve where the slope is at a maximum. It has been found that when particulates are present in the sample, this means of end point determination yields results that are much more reproducible and accurate than a preset endpoint. Unfortunately this requires the use of an autotitrator with this capability.

a) In lieu of determining the fizz rate, place a 1.0g sample in an Erlenmeyer flask. (If the sample is low in neutralization potential then 0.1N HCl should be used.)

b) Add 10 ml of 0.50/0.10 N HCL slowly to the sample.

c) Add 75 ml of deionized water and reflux for 1 minute to drive off CO2. The reaction is complete when no gas evolution is visible and particles settle evenly over the bottom of the flask. Let cool.

d) Calibrate the pH meter according to the pH manual.

e) Set cooled sample on the stir plate with the stir bar in the sample. Insert the pH probe, keeping the stir bar from hitting the probe.

f) The pH of the solution should read less than 2.0[3] If the pH is less than 2.0, proceed with the titration step. If the pH is greater that 2.0 repeat the above steps using half the amount of sample used. A reagent blank is required.

g) After transferring the sample to a 100 ml titration beaker, titrate the sample using the 0.25 N NaOH to the end point using routine KA05 for 0.5 N HCl or KA04 for 0.1N HCl.

(1) **REAGENTS & APPARATUS**

(a) Mettler DL70 ES Titrator with auto sampler tray, automatic stirrer and a 20 ml Burette with 0.01 ml precision in delivery.

(b) Calibrated Mettler auto titrator cups. (Cups are calibrated from 20 ml to 100 ml with 20 ml increments.)

(c) Standard Sodium Hydroxide 0.25N spike solution Fisher Scientific Certified Standard.

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[3] See White, W.W. III; Cox, R. L.; Lapakko, K. A. *STATIC-TEST METHODS MOST COMMONLY USED TO PREDICT ANCID MINE DRAINAGE: Practical Guidelines for Use and interpretation* p. 13

(2) **PROCEDURE**

(a) Calibration:

(i) Titrant verification: (This is done when a new lot of Titrant is received. See section 4.)

(b) Daily pH electrode Calibration:

(i) Obtain pH Buffer solutions pH 4, pH 7, pH 10.

(ii) Pour into the titrator cup approximately 60 mls.

(iii) Place sample cups in the auto sampler.

(iv) Select Analysis from Main Menu.

(v) Add routine (Press Run.)

(vi) Type KC01 (Press run twice)

(vii) Type in identity of buffers and press run after each buffer.

(viii) The titrator will then advance the sample tray and perform the calibration of the electrode.

(c) Sample Preparation

(d) Using the 100 ml calibrated Mettler Titrate Cups write the Lab # on the cup and pour prepared samples into the titration beakers.

(e) Place samples in the autosampler tray. (Remember to count the number in the run including the QC samples.)

(f) For QC samples: Write the Lab # on the cups and use the "chosen" QC sample to prepare and pour the original, duplicate, spike 1, spike 2, blank and blank spike. (A 50 mg addition of Calcium Carbonate is made to all spike samples prior to digestion.)

(g) After the Daily Calibration is done running, return to the method screen.

(h) Add routine (hit run)

(i) Type KA05/KA04 and enter the number of samples in the batch and press run. The next screen is for typing in the sample id. After completing the sample ID table press run twice and the Titrator will start. (If you have more than twenty samples then you must empty the determined samples out of the autosampler and add the remaining samples. The maximum number of samples is 32.) The titrator will then proceed to sequentially determine each sample using the dynamic endpoint. (The titrator is restrained to have a pH of 7.)

(j) Run reagent blanks by titrating the appropriate volumes of HCl with 0.25N NaOH

(3) Calculations:

(a) Neutralization Potential (NP) in tons is calculated by the method using the equation below:

50

$$\text{Tons Ca CO3/Kton} = \frac{(\text{Volume acid} \times \text{Normality of acid} - \text{Volume base} \times \text{Normality of base}) * 50}{\text{Sample Weight}}$$

I. Calculation of Acid/Base Accounting Potential as Tons CaCO3/1000 tons

1. Calculation

ABA Potential = Neutralization Potential – Acid Potential

## IV. QUALITY CONTROL

A. All sample runs will include a Known Control, a Duplicate, a Blank, and a Spiked Blank for at least every 20 samples.

B. Duplicates must achieve an RPD of less than 35%, or the sample set must be reanalyzed.

C. Known Control samples must be within statistical control limits as determined using the Shewhart control limits.

D. Spiked Blanks must recover 80-120 % of true value

## V. REFERENCES:

A. EPA- 600/2-78-054. Field and Laboratory methods Applicable to Overburden and Minesoils. Industrial Environmental Research Laboratory, Office of Research and Development, U.S. EPA, Cincinnati.

B. EPA-670/2-74-070. Mine Spoil Potentials for Soil and Water Quality. Nation Environmental Research Center, Office of Research and Development, U.S. EPA, Cincinnati.

C. A.S.T.M. D744 Standard Method for Accelerated Weathering of Solid Materials Using Modified Humidity Cell.

D. Society for Mining, Metallurgy, and Exploration, Inc. *Prediction of the Behavior of Mining and Processing Wastes in the Environment*. Richard W. Lawrence, 1990 Pgs 115-121.

E. Operating manual for the LECO Sulfur Furnace.

F. Operating manual for the Mettler DL70 Autotitrator.

| Kennecott Environmental and Industrial Hygiene Laboratory 9600 W. 2100 S., Magna, UT 84044 | SOP NO. KEL-5010.06 REVISION NO. 6 | DATE 6-16-00 PAGE 15 OF 15 |
|---|---|---|

# AMMENDMENT

(The reporting format is not typically placed in KEL SOPs. Therefore it will be listed as an amendment to the ABA SOP.)

The following analytes will be reported for Acid Base Accounting:

Total Sulfur
Hot water Extractable Sulfur (if requested)
HCl Extractable Sulfur
HNO3 Extractable Sulfur (if requested)
Residual Sulfur (if requested)
Acid Potential
Neutralization Potential
Acid/Base Accounting Potential

# Appendix C:
# Resolution Project Acid-Base Accounting Data
# For Scavenger Tailings

## APPENDIX C
## RESOLUTION PROJECT ACID-BASE ACCOUNTING DATA FOR SCAVENGER TAILINGS

| Sample ID | Borehole ID | Sulfide sulfur (weight percent) | AGP[a] (T $CaCO_3$/kT)[e] | ANP[b] (T $CaCO_3$/kT) | NNP[c] (T $CaCO_3$/kT) | NPR[d] |
|---|---|---|---|---|---|---|
| **INDIVIDUAL COMPOSITES** | | | | | | |
| 5H-1 | RES-005H | 0.030 | 0.94 | 3.90 | 2.96 | 4.2 |
| 5H-2 | RES-005H | 0.030 | 0.94 | 2.00 | 1.07 | 2.1 |
| 5H-3 | RES-005H | 0.110 | 3.44 | 0.00 | -3.44 | 0.0 |
| 5H-4 | RES-005H | 0.350 | 10.94 | 3.80 | -7.13 | 0.3 |
| 5H-5 | RES-005H | 0.100 | 3.13 | 0.00 | -3.13 | 0.0 |
| 5H-6 | RES-005H | 0.050 | 1.56 | 2.59 | 1.03 | 1.7 |
| 5H-7 | RES-005H | 0.050 | 1.56 | 0.00 | -1.56 | 0.0 |
| 5H-8 | RES-005H | 0.060 | 1.88 | 0.00 | -1.88 | 0.0 |
| 5H-9 | RES-005H | 0.040 | 1.25 | 1.14 | -0.11 | 0.9 |
| 5H-10 | RES-005H | 0.170 | 5.31 | 0.93 | -4.38 | 0.2 |
| 5H-11 | RES-005H | 0.080 | 2.50 | 0.00 | -2.50 | 0.0 |
| 5H-12 | RES-005H | 0.360 | 11.25 | 16.97 | 5.72 | 1.5 |
| 5H-13 | RES-005H | 0.110 | 3.44 | 2.46 | -0.98 | 0.7 |
| 5I-1 | RES-005I | 0.070 | 2.19 | 6.64 | 4.45 | 3.0 |
| 5I-2 | RES-005I | 0.070 | 2.19 | 6.93 | 4.74 | 3.2 |
| 5I-3 | RES-005I | 0.100 | 3.13 | 5.82 | 2.69 | 1.9 |
| 5I-4 | RES-005I | 0.170 | 5.31 | 17.07 | 11.76 | 3.2 |
| 5I-5 | RES-005I | 0.180 | 5.63 | 1.06 | -4.57 | 0.2 |
| 5I-6 | RES-005I | 0.170 | 5.31 | 2.26 | -3.06 | 0.4 |
| 5I-7 | RES-005I | 0.090 | 2.81 | 8.91 | 6.10 | 3.2 |
| 5I-8 | RES-005I | 0.100 | 3.13 | 8.18 | 5.05 | 2.6 |
| 5I-9 | RES-005I | 0.180 | 5.63 | 6.83 | 1.21 | 1.2 |
| 5I-10 | RES-005I | 0.120 | 3.75 | 5.21 | 1.46 | 1.4 |
| 5I-11 | RES-005I | 0.060 | 1.88 | 9.16 | 7.29 | 4.9 |
| 5I-12 | RES-005I | 0.240 | 7.50 | 0.80 | -6.70 | 0.1 |
| 5K-2 | RES-005K | 0.400 | 12.50 | 0.00 | -12.50 | 0.0 |
| 5K-3 | RES-005K | 0.200 | 6.25 | 0.00 | -6.25 | 0.0 |
| 5K-4 | RES-005K | 0.440 | 13.75 | 0.00 | -13.75 | 0.0 |
| 5K-5 | RES-005K | 0.310 | 9.69 | 1.02 | -8.67 | 0.1 |
| 5K-6 | RES-005K | 0.090 | 2.81 | 4.93 | 2.12 | 1.8 |
| 5K-7 | RES-005K | 0.110 | 3.44 | 5.05 | 1.61 | 1.5 |
| 5K-8 | RES-005K | 0.090 | 2.81 | 2.19 | -0.62 | 0.8 |
| 5K-9 | RES-005K | 0.180 | 5.63 | 4.83 | -0.80 | 0.9 |
| 5K-10 | RES-005K | 0.120 | 3.75 | 3.47 | -0.28 | 0.9 |
| 5K-11 | RES-005K | 0.020 | 0.63 | 0.95 | 0.33 | 1.5 |
| 5K-12 | RES-005K | 0.020 | 0.63 | 0.00 | -0.63 | 0.0 |
| 6D-1 | RES-006D | 0.070 | 2.19 | 0.00 | -2.19 | 0.0 |
| 6D-2 | RES-006D | 0.440 | 13.75 | 0.00 | -13.75 | 0.0 |
| 6D-3 | RES-006D | 0.130 | 4.06 | 1.14 | -2.93 | 0.3 |
| 6D-4 | RES-006D | 0.120 | 3.75 | 3.73 | -0.02 | 1.0 |
| 6D-5 | RES-006D | 0.100 | 3.13 | 3.71 | 0.58 | 1.2 |
| 6D-6 | RES-006D | 0.100 | 3.13 | 1.13 | -1.99 | 0.4 |
| 6D-7 | RES-006D | 0.040 | 1.25 | 1.14 | -0.11 | 0.9 |
| 6D-8 | RES-006D | 0.150 | 4.69 | 2.37 | -2.32 | 0.5 |
| 7_7A-1 | RES-007 | 0.740 | 23.13 | 3.77 | -19.36 | 0.2 |
| 7_7A-2 | RES-007 | 0.440 | 13.75 | 0.20 | -13.55 | 0.0 |
| 7_7A-3 | RES-007 | 0.270 | 8.44 | 1.43 | -7.01 | 0.2 |
| 7_7A-4 | RES-007A | 0.110 | 3.44 | 0.20 | -3.24 | 0.1 |
| 7_7A-5 | RES-007A | 0.160 | 5.00 | 2.66 | -2.34 | 0.5 |
| 7_7A-6 | RES-007A | 0.300 | 9.38 | 0.19 | -9.18 | 0.0 |
| 7_7A-7 | RES-007A | 0.310 | 9.69 | 3.85 | -5.84 | 0.4 |
| 7_7A-8 | RES-007A | 0.220 | 6.88 | 0.20 | -6.68 | 0.0 |
| 7_7A-9 | RES-007A | 0.150 | 4.69 | 5.04 | 0.35 | 1.1 |
| 7_7A-10 | RES-007A | 0.140 | 4.38 | 5.12 | 0.74 | 1.2 |
| 7_7A-11 | RES-007A | 0.270 | 8.44 | 7.24 | -1.19 | 0.9 |
| 7_7A-12 | RES-007A | 0.100 | 3.13 | 9.98 | 6.85 | 3.2 |
| 7_7A-13 | RES-007A | 0.090 | 2.81 | 5.06 | 2.25 | 1.8 |
| 7_7A-14 | RES-007A | 0.070 | 2.19 | 3.88 | 1.69 | 1.8 |
| 7_7A-15 | RES-007A | 0.250 | 7.81 | 6.24 | -1.57 | 0.8 |

## APPENDIX C
## RESOLUTION PROJECT ACID-BASE ACCOUNTING DATA FOR SCAVENGER TAILINGS

| Sample ID | Borehole ID | Sulfide sulfur (weight percent) | AGP[a] ($T\ CaCO_3/kT$)[e] | ANP[b] ($T\ CaCO_3/kT$) | NNP[c] ($T\ CaCO_3/kT$) | NPR[d] |
|---|---|---|---|---|---|---|
| **INDIVIDUAL COMPOSITES** | | | | | | |
| 7_7A-16 | RES-007A | 0.370 | 11.56 | 6.28 | -5.28 | 0.5 |
| 7_7A-17 | RES-007A | 0.170 | 5.31 | 6.33 | 1.02 | 1.2 |
| 7_7A-18 | RES-007A | 0.150 | 4.69 | 5.03 | 0.34 | 1.1 |
| 7_7A-19 | RES-007A | 0.130 | 4.06 | 5.11 | 1.05 | 1.3 |
| 7_7A-20 | RES-007A | 0.090 | 2.81 | 5.11 | 2.29 | 1.8 |
| 7C-1 | RES-007C | 0.310 | 9.69 | 0.00 | -9.69 | 0.0 |
| 7C-2 | RES-007C | 0.510 | 15.94 | 0.21 | -15.72 | 0.0 |
| 7C-3 | RES-007C | 0.450 | 14.06 | 0.22 | -13.85 | 0.0 |
| 7C-4 | RES-007C | 0.260 | 8.13 | 0.21 | -7.91 | 0.0 |
| 7C-5 | RES-007C | 0.500 | 15.63 | 2.60 | -13.03 | 0.2 |
| 7C-6 | RES-007C | 1.020 | 31.88 | 0.21 | -31.66 | 0.0 |
| 7C-7 | RES-007C | 0.360 | 11.25 | 1.40 | -9.85 | 0.1 |
| 7C-8 | RES-007C | 0.350 | 10.94 | 2.63 | -8.30 | 0.2 |
| 7C-9 | RES-007C | 0.090 | 2.81 | 0.20 | -2.61 | 0.1 |
| 7C-10 | RES-007C | 0.310 | 9.69 | 1.28 | -8.41 | 0.1 |
| 7C-11 | RES-007C | 0.100 | 3.13 | 0.21 | -2.92 | 0.1 |
| 9A-1 | RES-009A | 0.830 | 25.94 | 2.50 | -23.44 | 0.1 |
| 9A-2 | RES-009A | 0.580 | 18.13 | 4.71 | -13.41 | 0.3 |
| 9A-3 | RES-009A | 0.240 | 7.50 | 2.06 | -5.44 | 0.3 |
| 9A-4 | RES-009A | 0.140 | 4.38 | 0.78 | -3.59 | 0.2 |
| 9A-5 | RES-009A | 0.120 | 3.75 | 0.72 | -3.03 | 0.2 |
| 9A-6 | RES-009A | 0.070 | 2.19 | 1.72 | -0.47 | 0.8 |
| 9A-7 | RES-009A | 0.480 | 15.00 | 0.00 | -15.00 | 0.0 |
| 9A-8 | RES-009A | 0.210 | 6.56 | 0.76 | -5.80 | 0.1 |
| 9A-9 | RES-009A | 0.230 | 7.19 | 3.18 | -4.01 | 0.4 |
| 9A-10 | RES-009A | 0.050 | 1.56 | 1.74 | 0.17 | 1.1 |
| 9A-11 | RES-009A | 0.060 | 1.88 | 0.72 | -1.15 | 0.4 |
| 9A-12 | RES-009A | 0.140 | 4.38 | 0.00 | -4.38 | 0.0 |
| 9A-13 | RES-009A | 0.100 | 3.13 | 6.55 | 3.42 | 2.1 |
| 9A-14 | RES-009A | 0.170 | 5.31 | 2.70 | -2.62 | 0.5 |
| 9A-15 | RES-009A | 0.240 | 7.50 | 1.77 | -5.73 | 0.2 |
| 9A-16 | RES-009A | 0.030 | 0.94 | 5.86 | 4.92 | 6.2 |
| 9A-17 | RES-009A | 0.080 | 2.50 | 3.89 | 1.39 | 1.6 |
| 9A-18 | RES-009A | 0.030 | 0.94 | 5.07 | 4.13 | 5.4 |
| 9A-19 | RES-009A | 0.080 | 2.50 | 3.36 | 0.86 | 1.3 |
| 9D-1 | RES-009D | 0.440 | 13.75 | 4.68 | -9.07 | 0.3 |
| 9D-2 | RES-009D | 0.470 | 14.69 | 0.75 | -13.94 | 0.1 |
| 9D-3 | RES-009D | 0.210 | 6.56 | 1.81 | -4.75 | 0.3 |
| 9D-4 | RES-009D | 0.220 | 6.88 | 0.00 | -6.88 | 0.0 |
| 9D-5 | RES-009D | 0.380 | 11.88 | 0.76 | -11.11 | 0.1 |
| 9D-6 | RES-009D | 0.440 | 13.75 | 54.40 | 40.65 | 4.0 |
| 9D-7 | RES-009D | 0.170 | 5.31 | 68.48 | 63.17 | 12.9 |
| 9D-8 | RES-009D | 0.450 | 14.06 | 4.37 | -9.69 | 0.3 |
| 9D-9 | RES-009D | 0.290 | 9.06 | 5.11 | -3.95 | 0.6 |
| 9D-10 | RES-009D | 0.270 | 8.44 | 1.92 | -6.52 | 0.2 |
| 9D-11 | RES-009D | 0.100 | 3.13 | 1.78 | -1.35 | 0.6 |
| 9D-12 | RES-009D | 0.100 | 3.13 | 6.82 | 3.69 | 2.2 |
| 9D-13 | RES-009D | 0.100 | 3.13 | 4.19 | 1.06 | 1.3 |
| 9D-14 | RES-009D | 0.100 | 3.13 | 2.00 | -1.13 | 0.6 |
| 9F-1 | RES-009F | 0.070 | 2.19 | 0.00 | -2.19 | 0.0 |
| 9F-2 | RES-009F | 0.130 | 4.06 | 0.00 | -4.06 | 0.0 |
| 9F-3 | RES-009F | 0.030 | 0.94 | 37.66 | 36.72 | 40.2 |
| 9F-4 | RES-009F | 0.140 | 4.38 | 0.00 | -4.38 | 0.0 |
| 9F-5 | RES-009F | 0.130 | 4.06 | 0.00 | -4.06 | 0.0 |
| 9F-6 | RES-009F | 0.150 | 4.69 | 57.40 | 52.72 | 12.2 |
| 9F-7 | RES-009F | 0.160 | 5.00 | 6.86 | 1.86 | 1.4 |
| 9F-8 | RES-009F | 0.170 | 5.31 | 8.57 | 3.26 | 1.6 |
| 9F-9 | RES-009F | 0.300 | 9.38 | 6.61 | -2.76 | 0.7 |
| 14-1 | RES-014 | 0.230 | 7.19 | 0.91 | -6.28 | 0.1 |

## APPENDIX C
## RESOLUTION PROJECT ACID-BASE ACCOUNTING DATA FOR SCAVENGER TAILINGS

| Sample ID | Borehole ID | Sulfide sulfur (weight percent) | AGP[a] ($T\ CaCO_3/kT$)[e] | ANP[b] ($T\ CaCO_3/kT$) | NNP[c] ($T\ CaCO_3/kT$) | NPR[d] |
|---|---|---|---|---|---|---|
| **INDIVIDUAL COMPOSITES** | | | | | | |
| 14-2 | RES-014 | 0.330 | 10.31 | 2.72 | -7.59 | 0.3 |
| 14-3 | RES-014 | 0.240 | 7.50 | 8.95 | 1.45 | 1.2 |
| 14-4 | RES-014 | 0.050 | 1.56 | 0.00 | -1.56 | 0.0 |
| 14-5 | RES-014 | 0.020 | 0.63 | 7.35 | 6.73 | 11.8 |
| 14-6 | RES-014 | 0.040 | 1.25 | 7.81 | 6.56 | 6.3 |
| 14-7 | RES-014 | 0.060 | 1.88 | 9.38 | 7.50 | 5.0 |
| 14-8 | RES-014 | 0.230 | 7.19 | 6.74 | -0.45 | 0.9 |
| 14-9 | RES-014 | 0.090 | 2.81 | 7.40 | 4.59 | 2.6 |
| 14-10 | RES-014 | 0.090 | 2.81 | 0.72 | -2.10 | 0.3 |
| 14-11 | RES-014 | 0.030 | 0.94 | 9.65 | 8.72 | 10.3 |
| 14-12 | RES-014 | 0.060 | 1.88 | 8.81 | 6.93 | 4.7 |
| 15B-1 | RES-015B | 0.020 | 0.47 | 4.50 | 4.03 | 9.6 |
| 15B-2 | RES-015B | 0.020 | 0.48 | 2.80 | 2.32 | 5.8 |
| 15B-3 | RES-015B | < 0.01 | 0.31 | 2.70 | 2.39 | 8.7 |
| 15B-4 | RES-015B | < 0.01 | 0.31 | 8.70 | 8.39 | 28.1 |
| 15B-5 | RES-015B | < 0.01 | 0.31 | 12.20 | 11.89 | 39.4 |
| 15B-6 | RES-015B | 0.010 | 0.39 | 10.90 | 10.51 | 27.9 |
| 15B-7 | RES-015B | < 0.01 | 0.31 | 3.40 | 3.09 | 11.0 |
| 15B-8 | RES-015B | < 0.01 | 0.31 | 2.90 | 2.59 | 9.4 |
| 15B-9 | RES-015B | < 0.01 | 0.31 | 8.90 | 8.59 | 28.7 |
| 15B-10 | RES-015B | < 0.01 | 0.31 | 9.20 | 8.89 | 29.7 |
| 16A-1 | RES-016A | 0.070 | 2.05 | 22.30 | 20.25 | 10.9 |
| 16A-2 | RES-016A | 0.060 | 2.00 | 20.50 | 18.50 | 10.3 |
| 16A-3 | RES-016A | 0.050 | 1.54 | 21.50 | 19.96 | 14.0 |
| 16A-4 | RES-016A | 0.040 | 1.12 | 25.10 | 23.98 | 22.4 |
| 16A-5 | RES-016A | 0.030 | 0.83 | 28.10 | 27.27 | 33.9 |
| 16A-6 | RES-016A | 0.040 | 1.28 | 4.90 | 3.62 | 3.8 |
| 16A-7 | RES-016A | 0.020 | 0.63 | 4.10 | 3.47 | 6.5 |
| 16A-8 | RES-016A | 0.060 | 1.98 | 23.10 | 21.12 | 11.7 |
| 16A-9 | RES-016A | 0.060 | 1.98 | 35.30 | 33.32 | 17.8 |
| 16A-10 | RES-016A | 0.060 | 2.00 | 23.30 | 21.30 | 11.7 |
| 16A-11 | RES-016A | 0.070 | 2.13 | 17.30 | 15.17 | 8.1 |
| 16A-12 | RES-016A | 0.050 | 1.55 | 17.40 | 15.85 | 11.2 |
| 16A-13 | RES-016A | 0.050 | 1.41 | 20.80 | 19.39 | 14.8 |
| 17F-1 | RES-017F | 0.226 | 7.06 | 0.00 | -7.06 | 0.0 |
| 17F-2 | RES-017F | 0.616 | 19.25 | 0.53 | -18.72 | 0.0 |
| 17F-3 | RES-017F | 0.377 | 11.78 | 0.00 | -11.78 | 0.0 |
| 17F-4 | RES-017F | 0.148 | 4.63 | 1.73 | -2.90 | 0.4 |
| 17F-5 | RES-017F | 0.112 | 3.50 | 9.13 | 5.63 | 2.6 |
| 17F-6A | RES-017F | 0.470 | 14.69 | 31.34 | 16.65 | 2.1 |
| 17F-7 | RES-017F | 0.156 | 4.88 | 6.89 | 2.01 | 1.4 |
| 17F-8 | RES-017F | 0.218 | 6.81 | 9.76 | 2.95 | 1.4 |
| 17F-9 | RES-017F | 0.192 | 6.00 | 9.91 | 3.91 | 1.7 |
| 17F-10 | RES-017F | 0.277 | 8.66 | 10.25 | 1.59 | 1.2 |
| 17F-11 | RES-017F | 0.128 | 4.00 | 3.92 | -0.08 | 1.0 |
| 17F-12 | RES-017F | 0.150 | 4.69 | 1.50 | -3.19 | 0.3 |
| 17F-13 | RES-017F | 0.186 | 5.81 | 0.00 | -5.81 | 0.0 |
| 17F-14 | RES-017F | 0.235 | 7.34 | 6.12 | -1.22 | 0.8 |
| 17F-15 | RES-017F | 0.225 | 7.03 | 2.80 | -4.23 | 0.4 |
| 17G-1 | RES-017G | 0.187 | 5.86 | 1.25 | -4.61 | 0.2 |
| 17G-2 | RES-017G | 0.175 | 5.49 | 1.21 | -4.28 | 0.2 |
| 17G-3 | RES-017G | 0.207 | 6.49 | 0.44 | -6.05 | 0.1 |
| 17G-4 | RES-017G | 0.316 | 9.91 | 1.22 | -8.69 | 0.1 |
| 17G-5 | RES-017G | 0.204 | 6.40 | 0.00 | -6.40 | 0.0 |
| 17G-6 | RES-017G | 0.212 | 6.65 | 0.56 | -6.09 | 0.1 |
| 17G-7 | RES-017G | 0.128 | 4.01 | 3.26 | -0.75 | 0.8 |
| 17G-8 | RES-017G | 0.272 | 15.08 | 61.94 | 46.86 | 4.1 |
| 17G-9 | RES-017G | 0.147 | 4.61 | 0.82 | -3.79 | 0.2 |
| 17G-10 | RES-017G | 0.180 | 5.64 | 2.99 | -2.65 | 0.5 |

## APPENDIX C
## RESOLUTION PROJECT ACID-BASE ACCOUNTING DATA FOR SCAVENGER TAILINGS

| Sample ID | Borehole ID | Sulfide sulfur (weight percent) | AGP[a] (T $CaCO_3$/kT)[e] | ANP[b] (T $CaCO_3$/kT) | NNP[c] (T $CaCO_3$/kT) | NPR[d] |
|---|---|---|---|---|---|---|
| **INDIVIDUAL COMPOSITES** | | | | | | |
| 17G-11 | RES-017G | 0.155 | 4.86 | 0.00 | -4.86 | 0.0 |
| 17G-12 | RES-017G | 0.126 | 3.95 | 5.66 | 1.71 | 1.4 |
| 17G-13 | RES-017G | 0.127 | 3.98 | 0.57 | -3.41 | 0.1 |
| 17G-14 | RES-017G | 0.129 | 4.04 | 0.71 | -3.33 | 0.2 |
| 17G-15 | RES-017G | 0.123 | 3.86 | 0.16 | -3.70 | 0.0 |
| 17G-16 | RES-017G | 0.126 | 3.95 | 1.65 | -2.30 | 0.4 |
| 17N-1 | RES-017N | 0.245 | 7.66 | 0.00 | -7.66 | 0.0 |
| 17N-2 | RES-017N | 0.166 | 5.19 | 0.79 | -4.40 | 0.2 |
| 17N-3 | RES-017N | 0.133 | 4.16 | 0.97 | -3.18 | 0.2 |
| 17N-4 | RES-017N | 0.258 | 8.06 | 0.00 | -8.06 | 0.0 |
| 17N-5 | RES-017N | 0.135 | 4.22 | 0.00 | -4.22 | 0.0 |
| 17N-6 | RES-017N | 0.118 | 3.69 | 1.55 | -2.14 | 0.4 |
| 17N-7 | RES-017N | 0.126 | 3.94 | 0.00 | -3.94 | 0.0 |
| 17N-8 | RES-017N | 0.112 | 3.50 | 2.32 | -1.18 | 0.7 |
| 17N-9 | RES-017N | 0.168 | 5.25 | 10.52 | 5.27 | 2.0 |
| 17N-10 | RES-017N | 0.116 | 3.63 | 7.82 | 4.19 | 2.2 |
| 17N-11 | RES-017N | 0.094 | 2.94 | 11.09 | 8.15 | 3.8 |
| 17N-12 | RES-017N | 0.070 | 2.19 | 0.86 | -1.32 | 0.4 |
| 17N-13 | RES-017N | 0.064 | 2.00 | 0.19 | -1.81 | 0.1 |
| 17N-14 | RES-017N | 0.101 | 3.16 | 12.06 | 8.91 | 3.8 |
| 17N-15 | RES-017N | 0.083 | 2.59 | 28.56 | 25.97 | 11.0 |
| 17N-16 | RES-017N | 0.078 | 2.44 | 37.29 | 34.86 | 15.3 |
| 23B-1 | RES-023B | 0.513 | 16.03 | 6.92 | -9.11 | 0.4 |
| 23B-2 | RES-023B | 0.407 | 12.72 | 13.94 | 1.22 | 1.1 |
| 23B-3 | RES-023B | 0.441 | 13.78 | 9.16 | -4.62 | 0.7 |
| 23B-4 | RES-023B | 0.445 | 13.91 | 5.54 | -8.37 | 0.4 |
| 23B-5 | RES-023B | 0.340 | 10.63 | 7.12 | -3.51 | 0.7 |
| 23B-6 | RES-023B | 0.166 | 5.19 | 7.81 | 2.62 | 1.5 |
| 23B-7 | RES-023B | 0.247 | 7.72 | 10.43 | 2.71 | 1.4 |
| 23B-8 | RES-023B | 0.623 | 19.47 | 3.17 | -16.30 | 0.2 |
| 23B-9 | RES-023B | 0.116 | 3.63 | 8.71 | 5.08 | 2.4 |
| 23B-10 | RES-023B | 0.078 | 2.44 | 9.55 | 7.11 | 3.9 |
| 23B-11 | RES-023B | 0.134 | 4.19 | 9.46 | 5.27 | 2.3 |
| 23B-12 | RES-023B | 0.216 | 6.75 | 3.96 | -2.79 | 0.6 |
| 25A-1 | RES-025A | 0.336 | 10.50 | 1.65 | -8.85 | 0.2 |
| 25A-2 | RES-025A | 0.214 | 6.69 | 0.00 | -6.69 | 0.0 |
| 25A-3 | RES-025A | 0.208 | 6.50 | 0.00 | -6.50 | 0.0 |
| 25A-4 | RES-025A | 0.125 | 3.91 | 0.00 | -3.91 | 0.0 |
| 25A-5 | RES-025A | 0.110 | 3.44 | 2.21 | -1.23 | 0.6 |
| 25A-6 | RES-025A | 0.138 | 4.31 | 0.00 | -4.31 | 0.0 |
| 25A-7 | RES-025A | 0.508 | 15.88 | 1.60 | -14.28 | 0.1 |
| 25A-8 | RES-025A | 0.119 | 3.72 | 4.25 | 0.53 | 1.1 |
| 25A-9 | RES-025A | 0.136 | 4.25 | 8.22 | 3.97 | 1.9 |
| 25A-10 | RES-025A | 0.094 | 2.94 | 7.68 | 4.74 | 2.6 |
| 25A-11 | RES-025A | 0.086 | 2.69 | 0.23 | -2.46 | 0.1 |
| 25A-12 | RES-025A | 0.080 | 2.50 | 5.41 | 2.91 | 2.2 |
| 25A-13 | RES-025A | 0.060 | 1.88 | 7.01 | 5.13 | 3.7 |
| 25A-14 | RES-025A | 0.020 | 0.63 | 4.75 | 4.12 | 7.5 |
| 25A-15 | RES-025A | 0.020 | 0.63 | 1.43 | 0.80 | 2.3 |
| 27-1 | RES-027 | 0.252 | 7.88 | 3.67 | -4.21 | 0.5 |
| 27-2 | RES-027 | 0.141 | 4.41 | 0.00 | -4.41 | 0.0 |
| 27-3 | RES-027 | 0.209 | 6.53 | 0.00 | -6.53 | 0.0 |
| 27-4 | RES-027 | 0.217 | 6.78 | 1.78 | -5.00 | 0.3 |
| 27-5 | RES-027 | 0.229 | 7.16 | 3.71 | -3.45 | 0.5 |
| 27-6 | RES-027 | 0.223 | 6.97 | 2.94 | -4.03 | 0.4 |
| 27-7 | RES-027 | 0.208 | 6.50 | 0.00 | -6.50 | 0.0 |
| 27-8 | RES-027 | 0.204 | 6.38 | 1.07 | -5.30 | 0.2 |
| 27-9 | RES-027 | 0.215 | 6.72 | 2.39 | -4.33 | 0.4 |
| 27-10 | RES-027 | 0.205 | 6.41 | 0.00 | -6.41 | 0.0 |

## APPENDIX C
## RESOLUTION PROJECT ACID-BASE ACCOUNTING DATA FOR SCAVENGER TAILINGS

| Sample ID | Borehole ID | Sulfide sulfur (weight percent) | AGP[a] (T $CaCO_3$/kT)[e] | ANP[b] (T $CaCO_3$/kT) | NNP[c] (T $CaCO_3$/kT) | NPR[d] |
|---|---|---|---|---|---|---|
| **INDIVIDUAL COMPOSITES** | | | | | | |
| 27-11 | RES-027 | 0.214 | 6.69 | 0.00 | -6.69 | 0.0 |
| 27-12 | RES-027 | 0.217 | 6.78 | 3.86 | -2.92 | 0.6 |

[a] AGP = acid generating potential

[b] ANP = acid neutralizing potential

[c] NNP = net neutralization potential

[d] NPR = neutralization potential ratio

[e] T $CaCO_3$/kT = tons of equivalent calcium carbonate per thousand tons of rock

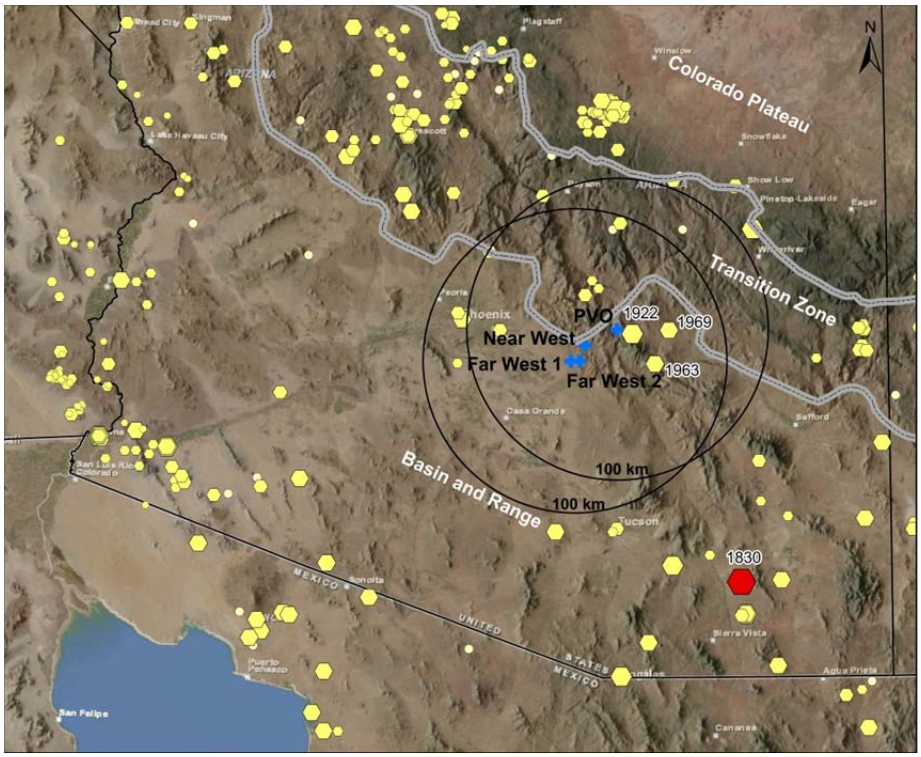
See Section 3.2.2.1 for further explanation of terms

# APPENDIX I

Site-Specific Hazard Analyses for the
Resolution Mining Company Tailings Storage Facilities
Options, Southern Arizona

**FINAL REPORT**

# SITE-SPECIFIC SEISMIC HAZARD ANALYSES FOR THE RESOLUTION MINING COMPANY TAILINGS STORAGE FACILITIES OPTIONS, SOUTHERN ARIZONA




*Prepared for*

Resolution Copper Mining

3 June 2013

*Prepared by*

URS

**Ivan Wong, Eliza Nemser, Mark Dober, Susan Olig, Jacqueline Bott, and Fabia Terra**
Seismic Hazards Group, URS Corporation
1333 Broadway, Suite 800, Oakland, California 94612
and
**Robert Darragh and Walter Silva**
Pacific Engineering & Analysis
856 Seaview Drive, El Cerrito, California 94530

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102 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Kocaeli – Afyon (000) for Near West Site

103 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Kocaeli – Afyon (000) for Near West Site

104 Spectral Match to Horizontal 5,000-Year Return Period 0.2 Sec CMS Spectrum, 1979 Imperial Valley – Cerro Prieto (147) for Pinto Valley Site

105 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 0.2 Sec CMS Spectrum, 1979 Imperial Valley – Cerro Prieto (147) for Pinto Valley Site

106 Spectral Match to Horizontal 5,000-Year Return Period 0.2 Sec CMS Spectrum, 1995 Kozani – Kozani (L) for Pinto Valley Site

107 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 0.2 Sec CMS Spectrum, 1995 Kozani – Kozani (L) for Pinto Valley Site

108 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Chi-Chi – KAU046 (E) for Pinto Valley Site

109 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Chi-Chi – KAU046 (E) for Pinto Valley Site

110 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Chi-Chi – KAU081 (E) for Pinto Valley Site

111 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Chi-Chi – KAU081 (E) for Pinto Valley Site

112 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 2002 Denali – Fire Station 1 (090) for Pinto Valley Site

113 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 2002 Denali – Fire Station 1 (090) for Pinto Valley Site

114 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 2002 Denali – Valdez City Hall (090) for Pinto Valley Site

115 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 2002 Denali – Valdez City Hall (090) for Pinto Valley Site

116 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Kocaeli – Afyon (000) for Pinto Valley Site

117 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Kocaeli – Afyon (000) for Pinto Valley Site

118 Spectral Match to Horizontal 5,000-Year Return Period 0.2 Sec CMS Spectrum, 1979 Imperial Valley – Cerro Prieto (147) for Far West 1 Site

119 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 0.2 Sec CMS Spectrum, 1979 Imperial Valley – Cerro Prieto (147) for Far West 1 Site

120 Spectral Match to Horizontal 5,000-Year Return Period 0.2 Sec CMS Spectrum, 1995 Kozani – Kozani (L) for Far West 1 Site

121 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 0.2 Sec CMS Spectrum, 1995 Kozani – Kozani (L) for Far West 1 Site

122 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Chi-Chi – KAU046 (E) for Far West 1 Site

123 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Chi-Chi – KAU046 (E) for Far West 1 Site

124 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Chi-Chi – KAU081 (E) for Far West 1 Site

125 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Chi-Chi – KAU081 (E) for Far West 1 Site

126 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 2002 Denali – Fire Station 1 (090) for Far West 1 Site

127 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 2002 Denali – Fire Station 1 (090) for Far West 1 Site

128 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 2002 Denali – Valdez City Hall (090) for Far West 1 Site

129 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 2002 Denali – Valdez City Hall (090) for Far West 1 Site

130 Spectral Match to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Kocaeli – Afyon (000) for Far West 1 Site

131 Time Histories Spectrally Matched to Horizontal 5,000-Year Return Period 1.0 Sec CMS Spectrum, 1999 Kocaeli – Afyon (000) for Far West 1 Site

At the request of Resolution Mining Company (RMC), this report presents the results of site-specific probabilistic seismic hazard analyses (PSHA) and deterministic seismic hazard analyses (DSHA) of four sites for the RMC tailings storage facilities options in southern Arizona. The four sites include two sites within the proposed Far West Tailings Management Area: Far West 1 (on alluvium) (33.216° N latitude and -111.296° W longitude) and Far West 2 (on hard rock) (33.217°N latitude and -111.234°W longitude); one site in the proposed Near West Tailings Management Area (33.313°N latitude and -111.195°W longitude); and one site in the proposed Pinto Valley Operations (PVO) Tailings Management Area (33.405°N latitude and -110.968°W longitude) (Figure 1). Far West sites 1 and 2 are located in northern Pinal County, 80 and 86 km southeast of Phoenix and 117 km and 115 km north of Tucson, respectively (Figures 1 and 2). The Near West site, 14 km northeast of Far West 1 and also in northern Pinal County, is located 85 km southeast of Phoenix and 125 km north of Tucson. The PVO site is located in southwestern Gila County, 23 km northeast of the Near West site, 104 km east of Phoenix and 132 km north of Tucson (Figures 1 and 2).

## 1.1 PURPOSE

The objective of this study is to estimate the levels of ground motions that could be exceeded at specified annual frequencies (or return periods) at the sites and to compare the probabilistic hazard results with the results of a DSHA. The Resolution Copper Project is located in the Basin and Range Province of southern Arizona, near (within 12 km of) the southern boundary of the Transition Zone (Figure 2). Southern Arizona has a low level of seismicity (Figure 2). The four sites at which we computed the hazard are located 49 to 56 km southeast of the Sugarloaf fault zone, the nearest Quaternary fault source (Figure 3).

In this study, geologic and seismologic data were used to evaluate and characterize potential seismic sources, the likelihood of earthquakes of various magnitudes occurring on those sources, and the likelihood of the earthquakes producing ground motions over a specified level. This study incorporates data from seismotectonic and ground motion studies in the region, which were previously performed by URS Corporation for: Phelps Dodge Sierrita Inc. for the Sierrita Tailing Dam in Green Valley, Arizona (Wong *et al*., 2008b); Freeport-McMoran Copper and Gold Miami Operations for the Miami Tailing Dams in Claypool, Arizona (Wong *et al.*, 2008a); Freeport-McMoran Copper & Gold Inc. for the Morenci Mine Tailing Dams (Wong *et al*., 2011); the U.S. Bureau of Reclamation for Granite Reef Diversion Dam and Theodore Roosevelt Dam, Salt River Project, southern Arizona (URS Corporation, 2002), and the U.S. Fish and Wildlife Service for Lake Roberts Dam, New Mexico (URS Corporation, 2011). This evaluation was limited in scope with respect to input data; we relied solely on available data and information and no field investigations were performed for this analysis.

The PSHA methodology used in this study for assessing ground motion hazard allows for the explicit inclusion of the range of possible interpretations of components in the seismic hazard model, including seismic source characterization and ground motion estimation. Uncertainties in models and parameters are incorporated into the PSHA through the use of logic trees (Figure 4). The following report presents the seismic source characterization, the ground motion prediction models used in the PSHA and DSHA, the probabilistic and deterministic ground motion hazard results, site response analysis, selection of the design earthquake, and development of time histories.

## 1.2 DESIGN GUIDANCE

As stated in Appendix E "Engineering Design Guidance" of the Arizona Mining BADCT Guidance Manual:

*The minimum design earthquake is the maximum probable earthquake (MPE). The MPE is defined as the maximum earthquake that is likely to occur during a 100-year intervals (80% probability of not being exceeded in 100 years) and shall not be less than the maximum historical event. The design earthquake may apply to structures with a relatively short design life (e.g., 10 years) and minimum potential threat to human life or the environment.*

*Where human life is potentially threatened, the maximum credible earthquake (MCE) should be used. MCE is the maximum earthquake that appears capable of occurring under the presently known tectonic framework.*

- *Potential threat to human life or the environment*
- *Facility life*
- *Potential future property development downstream of the embankment or earth structure*
- *Seismic history in the area*

The MPE 80% probability of not being exceeded in 100 years has an equivalent return period of about 450 years.

## 1.3 SCOPE OF WORK

The following scope of work was performed.

### *Task 1 – Review of Previous Seismic Hazard Studies*

Any previous geologic and seismic hazard studies performed for the project sites will be reviewed.

### *Task 2 – Seismic Source Characterization*

All local and regional active faults surrounding the site that may be significant in terms of ground shaking hazard will be included in the site-specific PSHA. Fault parameters that will be characterized include geometry and rupture dimensions, maximum earthquake, nature and amount of slip for the maximum earthquake, and rate and nature of earthquake recurrence. URS has developed a seismic source model for southern Arizona as a result of numerous analyses. The model will be reviewed and updated for the sites. In particular, we will contact scientists who may be working in the region to determine whether our model needs to be updated. The hazard from crustal background seismicity will be included in the analysis using regional seismic source zones and Gaussian smoothing.

### *Task 3 – Evaluation of Historical and Contemporary Seismicity*

The historical and contemporary seismicity will be evaluated in the site region based on an updated seismicity catalog. Historical ground shaking at the project site from past events will be evaluated. Recurrence rates of the historical seismicity for defined regional seismic source zones may be updated, if necessary, for input into the PSHA.

### *Task 4 – Site Characterization*

All available geological, geophysical, and geotechnical information on each site will be reviewed. Of particular importance is shear-wave velocity ($V_S$) data so that a $V_S30$ (time averaged $V_S$ in the top 30 m) for the project sites can be computed. $V_S30$ is an input parameter into several of the ground motion prediction models. If $V_S$ data are not available, a $V_S30$ will be estimated based on the foundation geology. The epistemic uncertainty in $V_S30$ will be addressed in the hazard analyses.

### *Task 5– Probabilistic Seismic Hazard Analysis*

Based on our seismic source model for the region and ground motion prediction models, site-specific probabilistic hazard will be calculated at the three project sites. State-of-the-art ground motion prediction models will be used in the PSHA and DSHA including the recent Pacific Earthquake Engineering Research (PEER) Center's Next Generation of Attenuation (NGA) models.

Hazard curves and Uniform Hazard Spectra (UHS) at 5% damping will be calculated. The hazard will be deaggregated at selected periods to characterize the controlling earthquakes. The probabilistic hazard will be compared with the 2008 U.S. Geological Survey National Hazard Maps, which are for a firm rock site condition ($V_S30$ of 760 m/sec).

### *Task 6 – Deterministic Seismic Hazard Analysis*

A DSHA will be performed for the most significant seismic sources to the project sites using the NGA ground motion prediction models. The ground motions from the controlling deterministic earthquakes will be compared to the UHS from the PSHA.

### *Task 7 – Conditional Mean Spectra*

Based on the UHS, deaggregation, and the structural periods of interest Conditional Mean Spectra (CMS) were computed at the selected design return period.

### *Task 8 – Design Earthquakes*

In accordance with the Arizona Mining Guidance Manual BADCT and existing U.S. practice, operation and design earthquake ground motions will be selected for each project site based on the results of the PSHA.

### *Task 9 – Development of Time Histories*

Five horizontal-component time histories were developed for each site by spectral matching of the CMS.

### *Task 10 – Final Report*

The approach and results of all tasks will be described and summarized in a draft report. The draft report will be submitted to RMC for their review and their comments will be addressed in the final report.

## 1.4 ACKNOWLEDGMENTS

The analyses of the Far West, Near West and PVO sites were performed by the following personnel of URS Corporation:

| | |
|---|---|
| Seismic Source Characterization | Susan Olig and Jacqueline Bott |
| Ground Motion Analyses | Mark Dober and Ivan Wong |
| Time History Development | Jacqueline Bott and Mark Dober |
| Report Preparation | Eliza Nemser, Susan Olig, Ivan Wong, Jacqueline Bott, and Fabia Terra |

Ivan Wong was the Project Manager. Our thanks to Sergio Gonzalez and Frank Deal of RCM and Howard Plewes and Kate Patterson of Klohn Crippen Berger for their support and assistance. Our appreciation to Melinda Lee for her assistance in the preparation of this report and to Phil Pearthree of the Arizona Geological Survey for providing information.

The PSHA approach used in this study is based on the model developed principally by Cornell (1968). The occurrence of earthquakes on a fault is assumed to be a Poisson process. The Poisson model is widely used and is a reasonable assumption in regions where data are sufficient to provide only an estimate of average recurrence rate (Cornell, 1968). When there are sufficient data to permit a real-time estimate of the occurrence of earthquakes, the probability of exceeding a given value can be modeled as an equivalent Poisson process in which a variable average recurrence rate is assumed. The occurrence of ground motions at the site in excess of a specified level is also a Poisson process, if (1) the occurrence of earthquakes is a Poisson process, and (2) the probability that any one event will result in ground motions at the site in excess of a specified level is independent of the occurrence of other events.

The probability that a ground motion parameter "*Z*" exceeds a specified value "z" in a time period "t" is given by:

$$p(Z > z) = 1\text{-}e^{-\nu(z)\cdot t} \qquad (1)$$

where $\nu(z)$ is the annual mean number (or rate) of events in which *Z* exceeds *z*. It should be noted that the assumption of a Poisson process for the number of events is not critical. This is because the mean number of events in time t, $\nu(z)\bullet t$, can be shown to be a close upper bound on the probability $p(Z > z)$ for small probabilities (less than 0.10) that generally are of interest for engineering applications. The annual mean number of events is obtained by summing the contributions from all sources, that is:

$$\nu(z) = \sum_{n} \nu_n(z) \qquad (2)$$

where $\nu_n(z)$ is the annual mean number (or rate) of events on source n for which *Z* exceeds *z* at the site. The parameter $\nu_n(z)$ is given by the expression:

$$\nu_n(z) = \sum_{i}\sum_{j} ß_n(m_i)\bullet p(R=r_j|m_i)\bullet p(Z>z|m_i,r_j) \qquad (3)$$

where:

$ß_n(m_i)$ = annual mean rate of recurrence of earthquakes of magnitude increment $m_i$ on source n;

$p(R=r_j|m_i)$ = probability that given the occurrence of an earthquake of magnitude $m_i$ on source n, $r_j$ is the closest distance increment from the rupture surface to the site;

$p(Z > z|m_i,r_j)$ = probability that given an earthquake of magnitude $m_i$ at a distance of $r_j$, the ground motion exceeds the specified level *z*.

The calculations were made using the computer program HAZ38 developed by N. Abrahamson. This program has been validated in the Pacific Earthquake Engineering Research (PEER) Center-sponsored "Validation of PSHA Computer Programs" Project (Thomas *et al.*, 2010).

## 2.1 SEISMIC SOURCE CHARACTERIZATION

Two types of earthquake sources are characterized in this PSHA: (1) fault sources; and (2) areal source zones (Section 4.1). Fault sources are modeled as three-dimensional fault surfaces and details of their behavior are incorporated into the source characterization. Areal source zones are

regions where earthquakes are assumed to occur randomly. Seismic sources are modeled in the hazard analysis in terms of geometry and earthquake recurrence.

The geometric source parameters for faults include fault location, segmentation model, dip, and thickness of the seismogenic zone. The recurrence parameters include recurrence model, recurrence rate (slip rate or average recurrence interval for the maximum event), slope of the recurrence curve (*b*-value), and maximum magnitude. Clearly, the geometry and recurrence are not totally independent. For example, if a fault is modeled with several small segments instead of large segments, the maximum magnitude is lower, and a given slip rate requires many more small earthquakes to accommodate a cumulative seismic moment. For areal source zones, only the areas, maximum magnitude, and recurrence parameters (based on the historical earthquake record) need to be defined.

Uncertainties in the seismic source parameters as described below, which were sometimes large, were incorporated into the PSHA using a logic tree approach (Figure 4). In this procedure, values of the source parameters are represented by the branches of logic trees with weights that define the distribution of values. A sample logic tree for a fault is shown on Figure 4. In general, three values for each parameter were weighted and used in the analysis. Statistical analyses by Keefer and Bodily (1983) indicate that a three-point distribution of 5th, 50th, and 95th percentiles weighted 0.185, 0.63, and 0.185 (rounded to 0.2, 0.6, and 0.2), respectively, is the best discrete approximation of a continuous distribution. Alternatively, they found that the 10th, 50th, and 90th percentiles weighted 0.3, 0.4, and 0.3, respectively, can be used when limited available data make it difficult to determine the extreme tails (i.e., the 5th and 95th percentiles) of a distribution. Note that the weights associated with the percentiles are not equivalent to probabilities for these values, but rather are weights assigned to define the distribution. We generally applied these guidelines in developing distributions for seismic source parameters with continuous distributions (e.g., $M_{max}$, fault dip, slip rate or recurrence) unless the available data suggested otherwise. Estimating the 5th, 95th, or even 50th percentiles is typically challenging and involves subjective judgment given limited available data.

### *Source Geometry*

In the PSHA, it is assumed that earthquakes of a certain magnitude may occur randomly along the length of a given fault or segment. The distance from an earthquake to the site is dependent on the source geometry, the size and shape of the rupture on the fault plane, and the likelihood of the earthquake occurring at different points along the fault length. The distance to the fault is defined to be consistent with the specific ground motion prediction model used to calculate the ground motions. The distance, therefore, is dependent on both the dip and depth of the fault plane, and a separate distance function is calculated for each geometry and each ground motion model. The size and shape of the rupture on the fault plane are dependent on the magnitude of the earthquake; larger events rupture longer and wider portions of the fault plane. We modeled the rupture dimensions following the magnitude-rupture length relationship of Wells and Coppersmith (1994).

### *Recurrence*

The recurrence relationships for the seismic sources are modeled using the truncated-exponentially Gutenberg-Richter, characteristic earthquake, and the maximum magnitude recurrence models (Section 4.1). These models are weighted (Figure 4) to represent our

judgment on their applicability to the sources. For the areal source zones, only a truncated exponential recurrence relationship is assumed to be appropriate.

We have used the general approach of Molnar (1979) and Anderson (1979) to arrive at the recurrence for the truncated exponential model. The number of events exceeding a given magnitude, N(m), for the truncated exponential relationship is

$$N(m) = \alpha(m^o)\frac{10^{-b(m-m^o)} - 10^{-b(m^u-m^o)}}{1 - 10^{-b(m^u-m^o)}} \quad (4)$$

where $\alpha(m^o)$ is the annual frequency of occurrence of earthquakes greater than the minimum magnitude, $m^o$; $b$ is the Gutenberg-Richter parameter defining the slope of the recurrence curve; and $m^u$ is the upper-bound magnitude event that can occur on the source. A $m^o$ of **M** 5.0 was used for the hazard calculations because smaller events are not considered likely to produce ground motions with sufficient energy to damage well-designed structures.

We have included the model where faults rupture with a "characteristic" magnitude on specific segments; this model is described by Aki (1983) and Schwartz and Coppersmith (1984). For the characteristic model, we have used the numerical model of Youngs and Coppersmith (1985). In the characteristic model, the number of events exceeding a given magnitude is the sum of the characteristic events and the non-characteristic events. The characteristic events are distributed uniformly over a $\pm$ 0.3 magnitude unit around the characteristic magnitude, and the remainder of the moment rate is distributed exponentially using the above equation with a maximum magnitude one unit lower than the characteristic magnitude (Youngs and Coppersmith, 1985).

The maximum magnitude model can be regarded as an extreme version of the characteristic model. We adopted the model proposed by Wesnousky (1986). In the maximum magnitude model, there is no exponential portion of the recurrence curve, i.e., no events can occur between the minimum magnitude of **M** 5.0 and the distribution about the maximum magnitude.

The recurrence rates for the fault sources are defined by either the slip rate or the average return time for the maximum or characteristic event and the recurrence *b*-value. The slip rate is used to calculate the moment rate on the fault using the following equation defining the seismic moment:

$$M_o = \mu A D \quad (5)$$

where $M_o$ is the seismic moment, $\mu$ is the shear modulus, A is the area of the rupture plane, and D is the slip on the plane. Dividing both sides of the equation by time results in the moment rate as a function of slip rate:

$$\dot{M}_o = \mu A S \quad (6)$$

where $\dot{M}_o$ is the moment rate and S is the slip rate. $M_o$ has been related to moment magnitude, **M**, by Hanks and Kanamori (1979):

$$\mathbf{M} = 2/3 \log M_o - 10.7 \quad (7)$$

Using this relationship and the relative frequency of different magnitude events from the recurrence model, the slip rate can be used to estimate the absolute frequency of different magnitude events.

The average return time for the characteristic or maximum magnitude event defines the high magnitude (low likelihood) end of the recurrence curve. When combined with the relative frequency of different magnitude events from the recurrence model, the recurrence curve is established.

## 2.2 GROUND MOTION PREDICTION

To characterize the ground motions at a specified site as a result of the seismic sources considered in the PSHA and DSHA, we used empirical ground motion prediction equations (models) for spectral accelerations. The models used in this study were selected on the basis of the appropriateness of the site conditions and tectonic environment for which they were developed (Figure 4; Section 4.3).

The uncertainty in ground motion prediction models was included in the PSHA by using the lognormal distribution about the median values as defined by the standard error associated with each model. Three standard deviations about the median value were included in the analysis.

The seismotectonic setting and historical seismicity of the Resolution Copper Project region is discussed below.

## 3.1 SEISMOTECTONIC SETTING

The Resolution Copper Project is located in south-central Arizona; we computed the hazard at four sites that are located between 80 to 104 km east-southeast of Phoenix, and 115 to 132 km north of Tucson (Figure 2). Arizona is divided into three physiographic and seismotectonic provinces: the Colorado Plateau in the northeast, the Basin and Range in the southwest, and the intervening Transition Zone that is roughly 40 to 100-km-wide and northwest-southeast trending (Figures 2 and 5). All three provinces are characterized by relatively few late Quaternary faults and low rates of seismicity. These regions are bounded to the east by the Rio Grande Rift, and to the west by the Salton Trough Province (Figure 5). The Far West, Near West and PVO sites are located in the Basin and Range Province, near (within 12 km of) the southern boundary of the Transition Zone (Figures 2, 3 and 5).

The southern Basin and Range Province is a block-faulted terrain of alternating mountain ranges and intervening valleys, bounded by moderately to steeply dipping normal faults. The mountains comprise igneous, metamorphic, and indurated sedimentary rocks of Precambrian through Tertiary age; the valleys are filled with undeformed sequences of fluvial and lacustrine sediments of Oligocene to Pleistocene age. There are differing estimates on the timing of initiation of Basin and Range extension; McQuarrie and Wernicke (2005) suggest that deformation began at 25 Ma, whereas Menges and Pearthree (1989) indicate that deformation may have commenced during the Miocene at 15 Ma. However, there is general consensus that major extension ceased at some time in the late Miocene or Pliocene, and the modern landscape is dominated by geomorphological landforms that indicate tectonic inactivity (Menges and McFadden, 1981). Relative tectonic quiescence in southern Arizona is also reflected by the low levels of historical seismicity and sparse evidence for Quaternary faulting. The southern Basin and Range Province is dominated by northwest-southeast-striking normal faults; however, the study area encompasses the transition from this northwest-southeast structural grain to a more north-south orientation as the province extends into northern Mexico.

The Transition Zone represents a tectonic transition from the relatively thin (~15 to 20 km) extended crust of the Basin and Range to the thick (~40 km) crust of the Colorado Plateau. Bedrock in the region consists primarily of Precambrian metamorphic and granitic plutonic rocks and Paleozoic sediments. The composition of late Cenozoic basin-fill sediments reflects widespread Tertiary volcanism in the region. The Transition Zone is characterized by north- to northwest-trending mountain ranges and intervening basins related mainly to Miocene and younger normal faulting (Menges and McFadden, 1981; Mack *et al.*, 2003). The topography of the Transition Zone is more subdued than that of the southern Basin and Range Province to the south: the ranges are less pronounced and the basins are smaller and less well-defined. The relatively subdued landforms, low to moderate levels of seismicity (Brumbaugh, 1987; Bausch and Brumbaugh, 1997), and relative lack of significant late Quaternary faulting (Pearthree *et al.*, 1983) have been interpreted to indicate geologically recent tectonic cessation of major extension in the region (Menges and McFadden, 1981). The few Quaternary normal faults that are mapped in the region generally trend northwest-southeast and are likely reactivated faults that originated during Basin and Range extension (Lockridge et al., 2012). Based on reconnaissance mapping

and limited paleoseismic studies, these faults have average recurrence intervals of tens to hundreds of thousands of years (Pearthree, 1998; Piety and Anderson, 1991).

Similar tectonic processes that characterize the Transition Zone dominate the southern Rio Grande rift that lies to the east of the Transition Zone, though Mack *et al.*, (2003) suggest that the two provinces can be differentiated using Plio-Pleistocene sedimentation records. Several major fault-bounded basins resulted from the late Miocene-Holocene deformation phase along the Rio Grande rift; these basins are filled with up to 150 m of sediment. In contrast, in the Transition Zone there is some evidence of post-Miocene faulting, but little evidence for Plio-Pleistocene sedimentation. On the basis of the fault-controlled sedimentation record, the boundary between the Transition Zone and the Rio Grande rift in southwestern New Mexico may be delineated along the western margin of the Palomas Basin. However, Machette (1998) places the western boundary of the southern Rio Grande rift further west to encompass the extent of north-trending Quaternary normal faults as far west as the Arizona/New Mexico border. According to this assessment, the sites would still be located in the Transition Zone though somewhat closer to the boundary with the Rio Grande rift (Figure 5).

The Colorado Plateau in northern Arizona is part of a large region that extends across southeastern Utah, northwestern New Mexico, and western Colorado. Physiographically and geologically distinct from the highly deformed Rocky Mountains to the north and east and the Basin and Range region to the south and west, the Colorado Plateau is characterized by relative tectonic stability and elevated topography dissected by rivers. Whereas major crustal deformation of the Colorado Plateau ceased at the end of Laramide orogeny (40 Ma), the region has been subject to about 2 km of epeirogenic uplift during the Cenozoic (Morgan and Swanberg, 1985). During uplift, the plateau acted as a coherent block, with only minor differential movements creating northerly-trending monoclines and associated structural basins. Contemporary seismicity in the Colorado Plateau Province is low to moderate, with widespread, generally small events that cannot be correlated with surface geological features (Wong and Humphrey, 1989).

The Salton Trough to the west of the Basin and Range marks the transition between ocean-floor spreading in the Gulf of California and right-lateral strike-slip faulting along the San Andreas fault zone. This region is one of the most seismically active areas in the western United States, characterized by right-lateral strike-slip faulting and elevated levels of contemporary seismicity with repeated events of **M** 6 to 7 during historical time. Slip rates on faults in this region are as high as 30 mm/yr (Working Group on California Earthquake Probabilities, 2008).

## 3.2 HISTORICAL SEISMICITY

A project catalog was compiled for an area encompassing southern Arizona and parts of neighboring states as shown in Figure 2. The principal earthquake data sources were catalogs from the Northern Arizona University regional catalog for 1830 through 2005 and the Advanced National Seismic Service (ANSS) for 1931 through the end of 2012. DuBois *et al*. (1982) also provided a valuable resource for Arizona earthquakes. As in most of the western U.S., the historical record extends back less than 200 years, which is a relatively short period compared to the recurrence intervals of most active crustal faults.

Only 7 earthquakes of **M** 5 or greater have occurred within 200 km of the Far West, Near West and PVO sites (Figure 2). The largest of these events is the supposed 1830's (?) intensity-based

magnitude ($M_I$) 7.0 (Modified Mercalli [MM] VII-IX) event whose location is estimated to be about 185 km southeast of the sites. This event is the first listed in the catalog and its location, size and date are based on the interpretation of second-hand information reported by an Apache medicine man to an Arizona pioneer in the 1850's (DuBois, *et al*. 1982). Descriptions of this earthquake include: "A loud rumbling noise was heard coming from the southwest"; "The whole earth split open from one side of the valley to the other sending forth a blue smoke heavenward for a mile"; and "A Great Spirit became very angry and knocked the people around for a few moments, making them feel as if they were drunk". Though this event is still listed in some catalogs, the Arizona Geological Survey (and the USGS) have removed this event from their catalog, stating that the account of the event is dubious, poorly dated and that the reported effects are rather extreme for a relatively young event for which no physical evidence has been found (Phil Pearthree, Arizona Geological Survey written communication, 2013). We have included this event in this report because of its presence in DuBois *et al.* (1982), but it has been removed from the earthquake recurrence calculations.

Historical seismicity in the site region is sparse with only 17 events within 100 km of the sites (Figure 2). The largest and closest event within 100 km of the sites is the MM VI event that occurred on 17 June 1922 and was located in the vicinity of the town of Miami, 44 km northeast of the Far West 1 site, 39 km northeast of the Far West 2 site, 32 km northeast of the Near West site and about 10.5 km east of the PVO site (Figures 2 and 6). DuBois *et al.* (1982) report the following for the event in Miami: "No damage was incurred in any instance. Caused considerable commotion in both the downtown and residential sections of this community. Inhabitants of the larger dwellings and business houses in and about Miami summarily lost interest in their various undertakings and took to the streets and open spaces. The temblor is said to have been particularly felt in the large structures of the town, in which the brunt of the shock was effectively borne up through the deep foundations." The earthquake was recorded on the seismograph in Tucson. The location and size of this event, however, are highly uncertain.

Two other moderate events of $M_L$ 4.1 and $M_L$ 4.4 occurred to the east of the sites in 1963 and 1969, respectively (Figures 2, 7 and 8). The 1963 Globe earthquake was not likely felt at the site locations (Figure 7), though the 1969 San Carlos event was likely felt, particularly PVO (Figure 8). The maximum intensity of these two events was MM VI with little to no damage reported. The felt area of the 1963 event is estimated at about 6,500 $km^2$ (DuBois, 1982) (Figures 7 and 8).

Although quite distant (about 285 km southeast of the sites), a notable earthquake of **M** 7.4 occurred on 5 May 1887 in northern Sonora, Mexico (DuBois *et al.*, 1982; Suter and Contreras, 2002; Figure 9). This earthquake ruptured the Pitaycachi, Teras, and Otates faults (Suter, 2008) and was felt throughout the region and as far away as Albuquerque, New Mexico and El Paso, Texas. In Phoenix, hanging chandeliers swung in every building (DuBois *et al*., 1982). A MM VI is estimated for the sites (Figure 9).

The following section discusses the characterization of the seismic sources and the ground motion prediction models selected and used in the PSHA and DSHA. The seismic source model used in this study was based on previous URS studies in the region (Wong *et al*., 2008a, 2008b, 2011; URS Corporation, 2011) and review of existing maps and reports as discussed in this section. No new geological or geophysical investigations were conducted for this study.

## 4.1 SEISMIC SOURCES

Seismic source characterization is concerned with three fundamental elements: (1) the identification, location and geometry of significant sources of earthquakes; (2) the maximum size of the earthquakes associated with these sources; and (3) the rate at which the earthquakes occur. The seismic source model includes crustal faults capable of generating larger, surface-faulting earthquakes (Section 4.1.1), and areal source zones, which account for background crustal seismicity that cannot be attributed to identified structures explicitly included in the seismic source model (Section 4.1.2).

### 4.1.1 Crustal Fault Sources

Fault parameters required in the PSHA include: (1) rupture model (including independent single plane and potentially linked models); (2) probability of activity; (3) fault geometry including rupture length, rupture width, fault orientation, and sense of slip; (4) maximum magnitude [$M_{max}$]; and (5) earthquake recurrence including both recurrence model and rates. These parameters are generally discussed further below. Selected faults that contribute the most to the hazard are specifically discussed in subsequent sections. We have explicitly incorporated the uncertainties in each parameter through the use of logic trees, as exemplified in Figure 4.

Faults were included in the analyses that were judged to potentially contribute to the probabilistic hazard at the site because of their activity, length, or proximity to the site region. We included known faults within 100 km of the sites (referred to herein as local faults) showing evidence for late Quaternary (≤ 130,000 years) activity or repeated Quaternary (≤ 1.6 million years) activity (Figure 3). We also included longer, more active faults in southern California and Baja California, such as the southern San Andreas fault, because from previous analyses in the region (e.g., Wong *et al*., 2008a; 2011), we know that these major fault sources can be significant contributors to the hazard at longer periods, despite their great distances.

The Pitaycachi fault, source of the 1887 Sonora earthquake, was not included in the hazard analysis because it is too distant (> 250 km away) and the slip rate is too slow (< ~0.1 mm/ yr) to potentially contribute to the hazard at the site. Additionally, previous geotechnical and hydrological studies (Klohn Crippen Berger, 2012; Montgomery and Associates, 2012) for the proposed tailings storage facilities have identified several faults near the sites, including the Elephant Butte fault near the Far West sites (Figures 10 and 11), the Concentrator and Conley Spring faults near the Near West site (Figure 12), and the West End, Gold Gulch, Dome and Jewel Hill faults near the PVO site (Figures 13 and 14). We considered, but did not include these nearby faults in our analysis because they appear to be old (> 1.6 million years old) and show negligible rates of activity based on our review of published and unpublished information, and consultation with Phil Pearthree at the Arizona Geological Survey. Several of these normal faults offset Tertiary rocks down-to-the-west and are compatible with the current extensional stress regime. However, they were not included in Quaternary fault compilations for Arizona (Pearthree *et al*., 1983; Pearthree, 1998) or the USGS Quaternary fault database because their

geomorphic expression is moderate to poor, they do not appear to displace Quaternary deposits (including middle Pleistocene alluvium), and indeed some traces are even buried by Tertiary volcanic and sedimentary rocks in some locations.

Specifically, the Elephant Butte fault was mapped by Ferguson and Skotnicki (1995) as extending from the Superstition Mountains south to about Comet Peak, and then continuing southward to Dromedary Peak as a buried structure. They note that although the Elephant Butte fault offsets the ~24-Ma Siphon Draw member of the Superstition Tuff, the fault is buried by Coffee Creek Mountain lavas, which are correlated to be slightly younger, but still middle Tertiary in age (Ferguson and Skotnicki, 1995). Montgomery and Associates (2012a) projected the Elephant Butte fault farther south of Dromedary Peak, roughly bisecting the Far West proposed site as two, northwest-striking, left-stepping en echelon faults, based on mapping of Bouger gravity anomalies (Figure 11). However, mapping of surficial deposits in the area (Huckleberry, 1993; Spencer *et al*., 1998) shows the faults are buried by late and middle Pleistocene alluvium as well as Tertiary conglomerate (Figure 15), consistent with a pre-Quaternary age.

The north-south striking Concentrator fault (Figure 12) bounds the eastern side of the Superior Basin (Peterson, 1969), and includes multiple branches as mapped by Richard and Spencer (1998). None of the traces appear to offset Quaternary deposits (Spencer *et al*., 1998). The northern 5 km of the western branch, closest to Superior, has the best geomorphic expression with a moderate topographic escarpment, and this branch appears to be the main basin-bounding splay. However, this branch is buried by Miocene rhyolitic and basaltic rocks (units Tr and Tb of Richard and Spencer, 1998), and thus appears to be pre-Quaternary (Figure 16).

The west-northwest striking Conley Spring fault is located a few kilometers east of the Concentrator fault (Figure 12) and was mapped by Richard and Spencer (1998), but not referred to by name. Montgomery and Associates (2012a) show this fault cutting Quaternary alluvium (unit Qal, Figure 12). However, this Qal unit appears to be erroneously labeled because both Richard and Spencer (1998) and Spencer *et al*. (1998) label this unit as Tta, the 18.6-Ma Apache Leap Tuff, and they do not show the Conley Spring fault offsetting any Quaternary deposits. Indeed, the fault has poor geomorphic expression overall and in some locations north of Highway 66, they show the fault buried by older alluvium, suggesting it is an older structure as well.

The seismic source model used in this study includes characterization of four local faults or fault zones: Carefree, Horseshoe, Sugarloaf and Whitlock Wash (Figure 3). Faults are generally modeled as single, independent, planar sources, simplified from the complex zones shown on Figure 3. Table 1 shows the parameters for local faults. Our characterization of local faults herein is revised and updated from our previous probabilistic seismic hazard analysis for a tailings dam near Miami, AZ (Wong *et al.*, 2008a), based on data compiled in the USGS Quaternary Fault and Fold Database (http://earthquake.usgs.gov/hazards/qfaults/) and sources listed in Table 1.

Maximum magnitudes were estimated for local faults using the empirical relationships of Wells and Coppersmith (1994) for all types of faults, as noted in the footnotes of Table 1. None of the local faults are blind, and minimum seismogenic depths were assumed to be 0 km. We assumed maximum seismogenic depths of 12 km (weighted 0.3), 15 km (weighted 0.5), and 17 km (weighted 0.2), primarily based on the maximum depth of historical seismicity in the region.

Fault dips were averages over the entire seismogenic crust. Although near-surface fault dip data are available for many of the faults, crustal dip data are lacking. We assumed default dips of 50° (weighted 0.6) ±15° (weighted 0.2) for all the local faults, which all show dominantly normal slip. This default fault dip distribution is after recommendations made by the Basin and Range Province Earthquake Working Group II (BRPEWGII; Lund, 2012; see Issue G4) to the U.S. Geological Survey (USGS) regarding crustal-scale dips for typical range-bounding normal faults in the Basin and Range province to be used in the next update of the National Hazard Maps. This distribution was based on focal plane and aftershock data for historical surface-rupturing earthquakes in the Basin and Range Province, as well as normal faults worldwide (see presentation by Crone at: http://geology.utah. gov/ghp/workgroups /pdf/brpewg/BRPEWGII _Presentations.pdf).

Recurrence models can significantly impact hazard calculations and we considered truncated exponential, maximum magnitude, and characteristic recurrence models for this analysis. Observations of historical seismicity and paleoseismic investigations suggest that characteristic behavior is more likely for individual faults, whereas seismicity in areal zones best fits a truncated exponential model (Schwartz and Coppersmith, 1984; Youngs and Coppersmith, 1985). The maximum magnitude model is an extreme version of the characteristic model (Wesnousky, 1986). We favored (weighted 0.6) the characteristic model for all local fault sources and assigned equal weights of 0.2 to the exponential and maximum magnitude models.

In assigning probabilities of activity for local fault sources, we considered both the likelihood that the fault is structurally capable of independently generating earthquakes, and the likelihood that it is still active within the modern stress field. We incorporated many factors in assessing these likelihoods, such as: orientation in the modern stress field, fault geometry (length, continuity, and dip), relation to other faults, age of youngest movement, rates of activity, geomorphic expression, amount of cumulative offset, and any evidence for a non-tectonic origin. Faults with definitive evidence for repeated Quaternary activity were generally assigned probabilities of being active (seismogenic) of 1.0 (Table 1). The probability of activity for faults that do not show definitive evidence for repeated Quaternary activity was individually judged based on available data and the criteria explained above. Resulting values range from 0.9 to 1.0 (Table 1) and the specific reasons for assigning probabilities less than 1.0 to a particular fault are generally given in the comments column of Table 1.

As recurrence interval data are generally lacking for local faults, we used slip rates to characterize rates of fault activity (Table 1). We considered all available long- (≤ 1.6 Ma) and short-term (≤ 130 ka) data in developing slip rate distributions, but we preferred short-term data whenever possible. In addition to the time period, we also considered the type and quality of data in determining rates. Preferred slip rates (generally weighted 0.6) are primarily based on data in the USGS Quaternary fault database and as noted in the comments column of Table 1. Maximum and minimum values (each generally weighted 0.2) are typically selected to represent 95th and 5th percentile values as previously discussed in Section 2, unless the available data suggest otherwise as noted in the comments column of Table 1 (see also local fault summaries in Wong *et al*., 2008a). Note that from our previous hazard analysis in the area (Wong *et al*., 2008a) we found that none of the local faults contributed significantly to the hazard so we do not include detailed local fault specific discussions herein.

Our characterization of southern California faults was modified from our recent hazard analysis in the region (Wong *et al*., 2011a). We included the five most significant fault or shear zones:

the San Andreas, San Jacinto-Imperial, Elsinore, Garlock, and Eastern California. These plate-boundary structures are all long, complex, and highly-active fault zones or systems that have been extensively studied. The source characterization of these faults used in this study is from the 2007 CGS/USGS Uniform California Earthquake Rupture Forecast (UCERF) model (Working Group on California Earthquake Probabilities [WGCEP], 2008). Tables 2a through 2e show the parameters used for the southern California faults. The UCERF seismic source model was used in the development of the California portion of the 2008 National Hazard Maps (Petersen *et al.*, 2008). One of the most significant changes in the 2008 UCERF model from the previous 2002 model (Cao *et al.*, 2003) is in the method of characterization of some of the major faults including the San Andreas, San Jacinto, Elsinore, and Garlock faults. Specifically, instead of defining rupture segments with slip rates to define the rate of earthquake recurrence, WGCEP (2008) divided the faults into sections, which may or may not be rupture segments, based on variations in geometry, slip rate, and other physical characteristics. WGCEP used paleoseismic data to develop a model of the rate of earthquake ruptures per section, independent of the rupture history of adjacent sections (i.e., excluding *a priori* models of rupture segmentation). From that, and again using paleoseismic data, they compiled a list of all possible rupture scenarios involving rupture of one or more sections, and developed a rate of recurrence of ruptures for each scenario based on the initial "a priori" or "geologic insight" model moment balanced by slip rate. WGCEP used two different magnitude-area relationships, weighted equally, to calculate the rate of events. This approach depends more heavily on paleoseismic observations and geologic constraints and less on models of rupture segmentation. We have adopted the method and rupture rates of the WGCEP (2008) for the San Andreas and other southern California faults and have incorporated them into our analysis (Tables 2b and 2e).

The southern San Andreas fault system is the most significant fault source to the hazard at all the sites, and so it is discussed further below. The Sugarloaf fault zone is the closest Quaternary fault to the sites so it is also discussed (Figure 3).

### *Southern San Andreas Fault System*

The right-lateral strike-slip San Andreas fault zone is the most significant structure accommodating North American-Pacific plate motion, accounting for up to 70% of the relative plate motion along most of its length. The southern San Andreas fault zone includes the section of the fault south of the creeping segment in central California. This part of the fault has generated two large historical earthquakes, the 1857 **M** 7.8 to 8 Ft. Tejon that ruptured the Parkfield through Mojave South sections, and an **M** ~7½ earthquake in 1812 that ruptured the North San Bernardino and Mojave South and possibly Mojave North sections. In addition, the northernmost Parkfield section has experienced numerous moderate earthquakes (**M** ~6) in the historical period, the most recent of which occurred in 2004.

The 2007 WGCEP (2008) has developed a new characterization of the San Andreas fault that differs considerably from that of previous working groups (e.g., WGCEP, 1988; 1995; Cao *et al*., 2003). We use a simplified version of their fault characterization and earthquake recurrence models to model the southern San Andreas fault. They include three alternative deformation models to describe how slip is distributed between the southern San Andreas and other faults in the area including the San Jacinto fault; we use only their preferred model.

Changes in the 2007 UCERF model (WGCEP, 2008) from the 2002 model of Cao *et al.* (2003) include modification to the sectioning, geometry, recurrence and slip rates on the fault. WGCEP

(2008) divide the southern San Andreas fault zone into ten sections, a departure from earlier working groups who divided it into six rupture segments (e.g., WGCEP, 1988, 1995; Cao *et al.*, 2003). The sections of the 2007 Working Group are not necessarily rupture segments and do not imply a specific earthquake model; rather, they are defined based on distinct geological characteristics that may or may not relate to earthquake rupture characteristics. We have adopted the divisions of the 2007 Working Group, with the following sections: Parkfield (PK), a 36-km-long section extending from Parkfield to the town of Cholame; Cholame (CH), extending southeast 62 km from Cholame; Carrizo (CC), a 59-km-long segment extending to the southern end of the Carrizo Plain; Big Bend (BB), a 50-km-long stretch ending at the intersection with the east-west-striking Garlock fault; Mojave North (NM), which extends 40 km from the Garlock fault to Elizabeth Lake, the northern end of the "Mojave segment" used by previous working groups; Mojave South (SM), a 100-km-long section similar to the former "Mojave segment", that traverses the southeastern edge of the Mojave desert from Elizabeth Lake to near Cajon Pass, about halfway between Wrightwood and Lost Lake; San Bernardino Mountains North (NSB), which extends about 35 km southeast from Cajon Pass to the intersection with the Mill Creek fault and the northern end of an region of structural complexity called the San Gorgonio Pass knot (WGCEP, 2008); San Bernardino South (SSB) and San Gorgonio Pass-Garnet Hill, also referred to as Banning-Garnet Hill (BG), which pass through the complex San Gorgonio Pass region and are northwest-striking strike-slip and slightly more west-striking reverse oblique-slip faults, respectively; and last, Coachella Valley (CO), which starts at the junction with the Mission Creek fault where the SAF again regains its northwest strike, and ends at the Salton Sea (WGCEP, 2008).

Slip rates on several of the newly defined sections also have changed in the UCERF model, reflecting both the new sectioning and more recent geologic and geodetic data. The San Andreas fault zone has the highest slip rate of any fault in California. On the Parkfield, Cholame, Carrizo and Big Bend sections, the average late Holocene slip rate is about 34-35 mm/yr, consistent with previous estimates (Sieh and Jahns, 1984; Sims, 1994). The slip rate decreases southward as more slip is transferred to other structures of the San Andreas fault system, especially the San Jacinto fault. As a consequence, the average slip rate on the southern sections of the fault decreases from about 27±7 mm/yr in the Mojave North section to about 20±6 mm/yr on the southernmost Coachella Valley section.

WGCEP (2008) account for new paleoseismic data obtained at several sites along the fault, and use a new approach to incorporating those data. Paleoseismic data and recurrence information for the fault sections nearest the sites are summarized below.

The northernmost Parkfield section ruptured with about 1.5 m of slip during the 1857 earthquake. It has also had repeated independent ruptures (WGCEP, 2008). Independent rupture is probably the most common mode of failure for this section, but it clearly can also rupture during large events on sections to the south. WGCEP (2008) assign an average recurrence interval of about 25 years, with the bulk of events occurring as independent ruptures and few with one or more other sections.

Investigations of the Las Yeguas site on the Cholame section have identified 2 to 4 surface rupturing events since 1058 AD, with the penultimate event occurring between 1030 and 1460 AD, suggesting an average recurrence interval of about 240 years, although this is poorly constrained (Stone *et al*., 2002; Young *et al*., 2002). Single-event displacement data from the Cholame section come largely from studies of the 1857 rupture, but these yield highly variable

results. Sieh (1978) and Lienkamper (2001) both measured offset geomorphic features but found that average slip in 1857 was about 3.5 m and 6 m respectively. Runnerstrom *et al.* (2002) analyzed pre- and post-earthquake wide-aperture survey data and determined that displacement as large as 16 ± 6 m occurred in 1857, indicating that more than half of the total slip might occur off the main fault. WGCEP (2008) consider it likely that the Cholame section sometimes ruptures in large events like that of 1857 and sometimes in smaller independent ruptures or with Parkfield. They assign it a recurrence interval of 150 years because it may include events recorded at Carrizo paleoseismic sites.

WGCEP (2008) has subdivided the Carrizo segment, as defined by previous working groups, into three sections, based on changes in fault strike and amount of slip in the 1857 event. The Carrizo section is the northernmost and extends to the sharp change in fault strike at the south end of the Carrizo Plain and had about 8 m of slip on average in 1857. Sims (1994) found a record of 5 to 6 earthquakes at Phelan Creek in the Carrizo section with an average recurrence interval of 150 to 300 years. Grant and Sieh (1994) found evidence of five earthquakes at Bidart Fan since 1218 AD, yielding an average recurrence interval of about 160 years. However, they concluded that the timing has been irregular, and 350-400 years of quiescence preceded the 1857 earthquake, with about 100 years between earlier events. More recent investigations at Bidart Fan support a short recurrence interval of about 88±14 years over the last six events (Akciz *et al*., 2010), but that the preceding events were separated by more than 200 years, consistent with a model of clustered ruptures (Grant Ludwig and Akciz, 2012). Estimates of single-event displacement vary widely for this section. Sieh and Jahns (1984) argued for ca. 10 to 12 m offsets in the last three earthquakes, whereas Grant and Sieh (1993) observed displacements of 6.5 to 7 m in 1857. Another surveying study found wide-aperture displacement of about 11 m in 1857 (Grant and Donnellan, 1994). A study by Liu *et al.* (2004) found that the last six displacements ranged from 1.4 to 8.0 m, with three events between 7.5 and 8.0 m. The inconsistency between the short intervals, large displacements, and well-supported slip rate has not been resolved for the Carrizo section. More recent work suggests that the earlier inferences of large displacements may be incorrect and that most displacements, including that in 1857, were closer to 5 m (Grant Ludwig *et al*., 2010; Zielke *et al*., 2010.) The WGCEP (2008) decreased the average recurrence interval to acknowledge the new work but recognize unresolved discrepancies with older studies and use 150 years.

The Big Bend section was included in the former Carrizo segment, includes the more westerly striking section of the fault and extends through a region of transpression, with associated thrust faulting, to the junction with the Garlock fault. Slip in 1857 decreased from about 8 to about 6 m from the Carrizo to Big Bend sections. Two paleoseismic sites yield a possibly incomplete record suggesting 2 to 3 events in 500 years, longer than that of the Carrizo section (Lindvall *et al*., 2002). WGCEP (2008) assign a recurrence interval for Big Bend of 175 years, based on correlation modeling and the inference that some events might be missing from the record. They suggest it could be the source of the relocated 12/21/1812 earthquake of Toppozada *et al*. (2002). Recent paleoseismic data from the Frazier Mountain site suggests the average recurrence interval on this section over the last 1,000 years about 122 years (Scharer *et al*., 2011). The earthquake rate may, therefore be modified in the next UCERF iteration, but we retain the values in the published WGCEP (2008) model.

WGCEP (2008) use the recurrence interval data determined from paleoseismic studies and a method of assessing the probability that a specific rupture scenario is consistent with the

paleoseismic record to determine a rupture recurrence rate for each of the ten sections. They use slip rates to moment balance the *a priori* recurrence rates to develop final moment-balanced rupture rates for all possible rupture scenarios. We have adopted these rates for use in our model. The table of rupture rates appears in Table 2b.

#### *Sugarloaf Fault Zone*

The Sugarloaf fault zone is expressed as a low, fairly continuous east-facing fault scarp as much as 5 m high at the contact between Precambrian granite and Tertiary basin fill sediments along the western margin of the small sedimentary basin on the flank of the Mazatzal Mountains (Pearthree *et al*., 1995) (Figure 1). The relief across the fault is minimal, indicating relatively little Quaternary activity (Pearthree, 1998). Stream bank exposures show down-to-the-east displacement on a northwest-striking fault plane dipping 70° to 80° to the northeast. Fault scarps on alluvium are rare and are poorly preserved. Paleoseismic trenching shows that the fault offsets late to latest Pleistocene deposits, but middle to upper Holocene deposits are not displaced (Pearthree *et al*., 1995). There is evidence for multiple Quaternary events, yet, the timing of individual events cannot be constrained (Pearthree *et al*., 1995; Pearthree, 1998). A preferred slip rate of 0.02 ± 0.01 mm/yr is calculated from ~ 1 m of vertical displacement in late Pleistocene (ca. 50 to 100 ka) deposits. A preferred maximum magnitude of **M** 6.5, the minimum magnitude for surface-faulting, was assumed for this 8-km long short fault in the PSHA. A slightly larger magnitude, **M** 6.6, was assumed for the DSHA.

### 4.1.2 Crustal Background Earthquakes

The hazard from crustal background (floating or random) earthquakes that are not associated with the known or mapped faults must be incorporated into the PSHA. Earthquake recurrence estimates in the site region and maximum magnitudes are required to assess the hazard from background earthquakes. In this study, we have adopted the zonation model for background earthquakes based on the physiographic zone boundaries of Peirce (1984). The site is located close to the boundary of two seismotectonic zones: the southern Arizona Basin and Range and the Transition Zone between the Colorado Plateau and the Basin and Range (Figures 2 and 5). However, in the PSHA model we combined the two zones because there were not enough earthquakes in each zone to determine earthquake recurrence for the two separate zones. The recurrence parameters were developed using the historical seismicity catalog for the period 1830 to 2012.

The earthquake recurrence of the site region assumes the truncated exponential form of the Gutenberg-Richter relationship of $\log N = a - bM$. Dependent events were removed using the approach of Youngs *et al.* (2000). Additional earthquakes associated with known faults, in this case aftershocks of the 1887 Pitaycachi earthquake, were also removed as these events were not removed using the approach described above as the main shock was outside of our catalog area. The catalog was then divided by the seismotectonic province boundaries, in this case the combined southern Arizona Basin and Range and Transition Zone.

Completeness intervals were estimated based on previous studies in the region and Stepp plot analysis of the catalog (Stepp, 1972). The Stepp plot (Figure 17) was developed by calculating the average annual number of independently occurring events in each half magnitude increment for both of the combined source zone. These values are plotted as a function of time before present. If the rate of earthquake occurrence is relatively uniform over time (horizontal line), it

indicates that the catalog is complete for this period of time. When the catalog is not complete, the curves begin to diverge downwards from a relatively horizontal line on the log-log plots. After adjusting the earthquake catalog for dependent events and completeness, 34 events remained in the range **M** 3.5 to 6.5 for the combined southern Arizona Basin and Range and Transition Zone from which to estimate the recurrence for the study region. The recurrence was calculated using the maximum likelihood technique of Weichert (1980) for each province (Figure 18). The normalized *a*-value (by area) and the *b*-value computed for the combined source zone are -2.27 and 0.90 respectively. Included are the mean plus and minus one standard deviation curves. A maximum magnitude of **M** 6½ ± 0.3 was used for the seismic source zone.

Felzer (2008) used California seismicity for the U.S. National Hazard Maps to indicate that corrections should be made for both magnitude rounding and errors, before calculating seismicity rates (*a*-values). Felzer (2008) reports that *a*-values can also be overestimated as a result of magnitude errors in historical seismicity catalogs. The Gaussian distribution for magnitude errors is symmetrical but that of earthquake occurrence is asymmetrical. Thus magnitudes above a specific magnitude (e.g., **M** 5.2) have equal probabilities as magnitudes below a specific magnitude (e.g., **M** 4.8) because of the symmetrical Gaussian distribution, which does not reflect the reality that larger earthquakes are less frequent than smaller earthquakes. This results in an apparent increase in earthquakes for a particular magnitude (e.g., **M** 5.0), which is then carried into the recurrence calculations, thus increasing the seismicity rate. Again, if magnitude error is uniform throughout the catalog, then it is easy to fix, but when it varies throughout the catalog a correction can be made for each magnitude based on its error and the Gutenberg-Richter relationship and substituted for the reported magnitude. Then the actual seismicity rate (*a*-value) can be estimated. Again Felzer (2008) has tested this methodology using simulated catalogs and was able to recover the correct *a*-value with this method.

Both the corrections for magnitude error and magnitude rounding are incorporated into the recurrence estimates reported here for the combined seismic source zone. We were able to determine rounding by observing the magnitudes reported in the catalogs over time and estimated magnitude errors based on the work of Felzer (2008). For those earthquakes whose errors have been reported in the literature, these errors are included. Otherwise a standard error of 0.333 was assigned to pre-1960 earthquake magnitudes computed from MM intensity, 0.222 for instrumental magnitudes during 1940-1982, and 0.111 for all earthquakes occurring after 1982. These are similar to errors calculated during these periods for California (Felzer, 2008). First the recurrence was calculated from the seismic source zone catalog as described above. Then recurrence was re-calculated for each zone 200 times, first fixing the *b*-value obtained initially (0.90), and applying the two magnitude corrections discussed above for each iteration (first the rounding error, then the magnitude error for each magnitude in the catalog) to obtain an average corrected *a*-value (-2.35). This average corrected *a*-value is used in the PSHA.

Because of the limited duration of the historical catalog, we incorporated uncertainties in the recurrence parameters for the background seismicity into the hazard analysis. We used three b-values. This uncertainty of ± 0.13 includes the uncertainty in the b-value but also additional uncertainty due to the possibility that the historical record may not be a robust representation of the next 50 to 100 years.

The use of seismic source zones assumes that background earthquakes are uniformly (randomly) distributed throughout the seismogenic crust. However, some seismicity may be stationary through time (at least over the next few decades of interest) and can be smoothed using a

Gaussian filter. In the Gaussian smoothing approach, we smoothed the historical seismicity on a grid at 0.1 degree intervals to incorporate a degree of stationarity. The version of Gaussian smoothing adopted in this study (Frankel, 1995) is the same as that used in the National Hazard Maps (Petersen *et al.*, 2008). This scheme addresses both the spatial stationarity of seismicity and its randomness. We smoothed the historical background seismicity for the combined seismotectonic zones within 100 km of the site, using a spatial window of 25 km. Thus the hazard from seismicity that clusters in a specific seismic zone is retained spatially rather than being smoothed to a uniform distribution as in a seismic source zone.

## 4.2 SITE CHARACTERISTICS

Four locations in the three areas were selected to compute the seismic hazard: one site each in the Near West area and PVO, and two sites in the Far East area (Figure 1). We computed the hazard at a site in the PVO open pit shown on Figure 19. The PVO open pit is in ore-grade Precambrian quartz monzonite porphyry (Figures 13 and 14). For the Near West area, we computed the hazard at a site that sits on the Miocene Gila conglomerate (Tcu, Figure 16). For the Far West area, we considered two sites: Far West 1, on alluvium (Qal), near the western edge of the area, and Far West 2, which rests on the Early Proterozoic Pinal Schist at the eastern edge (pCpl, Figures 10 and 15). There are no site-specific shear-wave velocity ($V_S$) data for these sites. The NGA ground motion prediction models (Section 4.3) require $V_S30$, the time averaged $V_S$ in the top 30 m (100 ft) as input. We conducted a site response analysis for the Far West 1 site because of the presence of alluvium, which tends to amplify ground motions at moderate to high frequencies. (Section 6).

A $V_S30$ of 1200 m/sec, appropriate for firm to hard rock, was used for the sites that rest on Precambrian quartz monzonite and schist. The $V_S30$ may be higher than this value but the NGA ground motion prediction models are capped at about 1,200 m/sec. We selected a best estimate $V_S30$ value of 500 m/sec for the Near West site based on *in situ* shear-wave measurements performed on Gila Conglomerate at another mine site in the region. To incorporate the epistemic uncertainty in the $V_S30$ and variability beneath the site, we included an uncertainty of 100 m/sec so values of 400 and 600 m/sec were also used in the hazard calculations for the Near West site.

To develop a $V_S$ profile for the Far West 1 site, we examined the log from borehole FW15-R and an interpreted geologic cross-section based on gravity modeling (Montgomery & Associates, 2012) (Figure 10). Figure 66 shows our $V_S$ profile based on the limited data. The thickness of the alluvium and basalt fill deposits were accurately known from the borehole log but the extent of the basalt below 170 m and the lithology beneath the basalt are unknown. The depth to the Precambrian basement (Pinal schist) is 900 m based on the gravity modeling but a decrease in the density of the Apache Leap Tuff could bring the modeled depth to basement to 600 m (Mark Cross, Montgomery & Associates, written communication, January 2013).

The $V_S$ for each layer in Figure 66 was estimated based on data from other areas. The $V_S$ for the alluvium is based on numerous measurements of alluvium in the Salt Lake Valley (McDonald and Ashland, 2008). We could not find any information on basaltic fill deposits so the value of $400 \pm 100$ m/sec is estimated from fill deposits in Utah basins. The $V_S$ for basalt is adopted from $V_S$ measurements made in the eastern Snake River Plain (Woodward-Clyde Federal Services *et al.*, 1996). The Pinal schist $V_S$ assumes hard rock at depth.

## 4.3 GROUND MOTION PREDICTION MODELS

To estimate the ground motions in the PSHA and DSHA, we have used recently developed empirical ground motion prediction models appropriate for tectonically active crustal regions such as the western U.S. and subduction zones. The crustal relationships, developed as part of the NGA Project sponsored by PEER Center Lifelines Program, have been published and are available on the PEER website. The NGA models have a substantially better scientific basis than current relationships (e.g., Abrahamson and Silva, 1997) because they are developed through the efforts of five selected ground motion prediction developer teams working in a highly interactive process with other researchers who have: (a) developed an expanded and improved database of strong ground motion recordings and supporting information on the causative earthquakes, the source-to-site travel path characteristics, and the site and structure conditions at ground motion recording stations; (b) conducted research to provide improved understanding of the effects of various parameters and effects on ground motions that are used to constrain models; and (c) developed improved statistical methods to develop ground motion relationships including uncertainty quantification. The models have benefited greatly from a large amount of new strong motion data from large earthquakes (**M** > 7) at close distances (< 25 km). Data include records from the 1999 **M** 7.6 Chi Chi, Taiwan, 1999 **M** 7.4 Kocaeli, Turkey, and 2002 **M** 7.9 Denali, Alaska earthquakes. Review of the NGA relationships indicate that, in general, ground motions are significantly reduced particularly for very large magnitudes (**M** ≥ 7.5) compared to current relationships.

The models by Chiou and Youngs (2008), Campbell and Bozorgnia (2008), Abrahamson and Silva (2008), and Boore and Atkinson (2008) were used in the PSHA and DSHA. The models were weighted equally in the hazard analyses.

Other NGA input parameters include $Z_{1.0}$, the depth of a $V_S$ of 1.0 km/sec, and $Z_{2.5}$, the depth to a $V_S$ of 2.5 km/sec. Both parameters were used by some of the developers as proxies for basin effects. $Z_{1.0}$ is used by Chiou and Youngs (2008) and Abrahamson and Silva (2008) and $Z_{2.5}$ is only used in one model, Campbell and Bozorgnia (2008). Due to the lack of site-specific data, the default values of $Z_{1.0}$ and $Z_{2.5}$, based on the $V_S30$ from equations provided by the developers, were used in the PSHA. Other parameters such as depth to the top of rupture (zero for all faults that intersect the surface unless specified otherwise), dip angle, rupture width, and aspect ratio were specified for each fault or calculated within the PSHA code.

The hazard results for ground motions are described below and shown in Figures 20 to 63. For the PVO and Far West sites, the results are for a $V_S30$ of 1200 m/sec. For the Near West site, the results are for a $V_S30$ of 400 m/sec; the results for 500 and 600 m/sec are very similar. The embankments are the most critical elements of the planned operations and they have natural periods between 0.7 and 2 sec (H. Plewes, Klohn Crippen Berger, personal communication, January 2013).

## 5.1 PSHA RESULTS

The results of the PSHA for the four sites are presented in terms of ground motion as a function of annual exceedance probability. The annual exceedance probability is the reciprocal of the average return period. Figures 20 to 23 show the mean, median (50th percentile), 5th, 15th, 85th, and 95th percentile hazard curves for PGA at the four sites. The range of uncertainty between the 5th and 95th percentile fractiles is a factor of four at a return period of 5,000 years. These fractiles indicate the range of epistemic uncertainty about the mean hazard. The 1.0 sec horizontal spectral acceleration (Sa) hazard is shown on Figures 24 to 27. At the return periods of 100, 450, 5,000, and 10,000 years, the mean spectral values are listed in Table 3. The hazard can be characterized as low to moderate even at a long return period of 10,000 years.

The contributions of the various seismic sources to the mean PGA and 1.0 sec Sa hazard are shown on Figures 28 to 35. At PGA, the contribution from the background earthquakes in the combined southern Basin and Range/Transition Zone Province dominates the hazard; the distant San Andreas contributes more than the local faults at all return periods (Figures 28 to 31). At 1.0 sec Sa, the San Andreas fault controls the hazard, with the San Jacinto fault and the background earthquakes contributing more than the other faults in southern California and the local faults. (Figures 32 to 35). Although quite distant, the San Andreas fault controls the long-period hazard at the site due to the absence of any nearby active faults with high slip rates and the ability of the fault to generate large earthquakes (**M** ~8) at short recurrence intervals of hundreds of years.

We deaggregated the PGA and 1.0 sec Sa hazard by magnitude and distance bins. Figures 36 to 51 illustrate the contributions by events for return periods of 100 and 5,000 years. At PGA, for the 100-year return period, the contributions from the San Andreas and San Jacinto faults in southern California and the local background earthquakes are apparent in the bimodal peaks centered at **M** 5.5 at 50 km and **M** 7.5 at 400 km, respectively; the contribution from the local earthquakes is dominant (Figures 36 to 39). For the 5,000 year return period, the contribution is only from the background earthquakes from **M** 5 to **M** 7 at 0 to 75 km (Figures 40 to 43). At 1.0 sec Sa, for the 100-year return period there is a bimodal distribution, though the contribution from the distant southern California faults dominate, and the contribution from the nearby crustal sources is relatively small (Figures 44 to 47). For the 5,000-year return period, the contributions from the faults in southern California and the local background earthquakes are apparent in the bimodal peaks centered at **M** 6.25 at 25 km and **M** 8 at 400 km, respectively; the contribution from the local earthquakes is somewhat larger (Figures 48 to 51).

Figures 52 to 59 illustrate the sensitivity of the mean PGA and 1.0 sec horizontal Sa hazard to the choice of ground motion models. Each hazard curve is labeled with one of the models calculated using only that model. At PGA, for return periods less than about 500 years, Abrahamson and Silva (2008) gives the highest hazard (Figures 52 to 55). At all return periods, the 1.0 sec Sa hazard is significantly higher than the total mean hazard using the Abrahamson and Silva (2008) model (Figures 56 to 59).

Based on the magnitude and distance bins (Figures 36 to 51), the controlling earthquakes as defined by the modal magnitude M* and modal distance D* can be calculated. Epsilon is the difference between the logarithm of the ground motion amplitude and the modal logarithm of ground motion (for that M and R) measured in units of standard deviation ($\sigma$). Table 4 lists the M*, D*, and $\varepsilon$* for the four return periods (100, 450, 5,000, and 10,000 years) and for PGA and 1.0 sec horizontal Sa.

UHS for the four return periods are shown for the four sites on Figures 60 to 63. A UHS depicts the ground motions at all spectral periods at the same return period. The UHS for Near West at a $V_S30$ of 400 m/sec envelopes the UHS for 500 and 600 m/sec. Thus to capture the uncertainty in $V_S30$ and the random variability beneath the site, the enveloped spectra are used in future seismic safety evaluations of the site.

## 5.2 DSHA RESULTS

The most significant seismic source to the sites in a deterministic sense is the Sugarloaf fault. The maximum event that was modeled in the DSHA is a **M** 6.6 on the Sugarloaf fault at a rupture distance of 48.6 km from the Near West site, 54.6 km from Far West 1, 56.5 km from Far West 2, and 54.8 km from the PVO site. Figure 64 shows the median and 84th percentile 5%-damped horizontal acceleration response spectra. The same NGA models used in the PSHA were used in the DSHA. A $V_S30$ of 1200 m/sec was used for all sites except for Near West, for which a $V_S30$ of 400 m/sec was used.

Figure 65 shows a comparison of the horizontal deterministic spectra with UHS for a range of return periods for PVO. The 84th percentile spectrum has an equivalent return period of significantly less than 5,000 years.

## 5.3 COMPARISON WITH NATIONAL SEISMIC HAZARD MAPS

In the 2008 version of the U.S. Geological Survey's National Hazard Maps, which are the basis for the U.S. building code, the International Building Code, Petersen *et al.* (2008) have estimated probabilistic ground motions for the U.S. for the annual exceedance frequency of 2% in 50 years (2,475-year return period). The 2,475-year return period PGA values for a firm rock (NEHRP B/C; 760 m/sec) site condition at the PVO, Far West 1, Far West 2 and Near West sites are 0.13 g, 0.11 g, 0.12 g and 0.12 g, respectively. Our site-specific values for a 2,475-year return period using a $V_S30$ of 1200 m/sec are significantly lower at 0.07 g, 0.05 g and 0.05 g for the PVO, Far West 1 and Far West 2 sites, respectively (Table 3). Our site-specific value for a 2,475-year return period using a $V_S30$ of 400 m/sec for Near West is also significantly lower at 0.08 g (Table 3). The difference between our site-specific values and the National Hazard Maps can be partly attributed to our higher $V_S30$ at least for the hard rock sites. It should also be noted that the hazard from background earthquakes is distributed more widely in the National Hazard Maps due to their use of a large spatial window of 50 km in the Gaussian smoothing (Section 4.1.2).

The Far West 1 site is located on alluvium (Qal) and Quaternary and Tertiary basaltic fill deposits to a depth of 170 m (Figure 66). Beneath these deposits is hard rock, i.e., basalt. We performed a site-specific site response analysis to account for the expected site effects on ground motions at the site. Traditionally in the estimation of site-specific probabilistic ground motions for a soil site, a rock ground motion is calculated and modified by deterministic site response analyses derived for the soil column to arrive at the ground motions at the soil surface. In doing so, the annual exceedance probability of that soil motion is generally unknown, varies with period, and may be of a higher probability than the control (rock) motion. If a risk analysis is desired, the surface motions must be hazard consistent, i.e., the annual exceedance probability of the soil ground motion should be the same as the rock ground motion. In NUREG/CR-6728 (McGuire *et al.*, 2001), several site response approaches are recommended to produce soil motions consistent with the rock outcrop hazard. The approaches also incorporate the aleatory variabilities in the soil properties into the soil motions. McGuire *et al.* (2001) identified four basic approaches for determining the ground motions at a soil site. The approaches range from a PSHA using ground motion prediction models for the specific site (or location) of interest (Approach 4) to scaling the rock motion on the basis of a site response analysis using a broadband input motion (Approach 1). Conceptually, Approach 4 is the ideal approach and other approaches are approximations to it.

To compute the ground motions for Far West 1, we implemented Approach 3 as it is called (McGuire *et al.*, 2001; Bazzurro and Cornell, 2004). Approach 3 is a fully probabilistic analysis procedure which moves the site response, in an approximate way, into the hazard integral. The approach is described by Bazzurro and Cornell (2004) and NUREG/CR-6769 (McGuire *et al.*, 2002). In this approach, the hazard at the soil surface is computed by integrating the site-specific hazard curve at generic rock or soil level with the probability distribution of the amplification factors (Lee *et al.*, 1998; 1999). The site-specific amplification, relative to hard rock, is characterized by a suite of frequency-dependent amplification factors that can account for nonlinearity in soil response. Approach 3 involves approximations to the hazard integration using suites of transfer functions, which result in complete hazard curves at the ground surface for specific ground motion parameters (e.g., spectral accelerations) and a range of frequencies.

The basis for Approach 3 is a modification of the standard PSHA integration:

$$P[A_S>z] = \int\int\int P\left[ AF > \frac{z}{a} \middle| m,r,a \right] f_{M,R|A}\ (m,r;a) f_A(a) dm dr da \qquad (6\text{-}1)$$

where $A_S$ is the random ground-motion amplitude on soil at a certain natural frequency; z is a specific level of $A_S$; m is earthquake magnitude; r is distance; a is an amplitude level of the random rock ground motion, A, at the same frequency as $A_S$; $f_A(a)$ is derived from the rock hazard curve for this same frequency (namely it is the absolute value of its derivative); and $f_{M,R|A}$ is the deaggregated hazard (i.e., the joint distribution of M and R, given that the rock amplitude is level a). AF is an amplification factor defined as:

$$AF = A_S/a \qquad (6\text{-}2)$$

where AF is a random variable with a distribution that can be a function of m, r, and a. To accommodate epistemic uncertainties in site dynamic material properties, multiple suites of AF

may be used and the resulting hazard curves combined with weights to properly reflect mean hazard and fractiles.

Soil response is controlled primarily by the level of rock motion and m, so Equation 6-1 can be approximated by:

$$P[A_S>z] = \int\int P[AF > \frac{z}{a}(m,a)]f_{M|A}(m;a)f_A(a)dmda \qquad (6\text{-}3)$$

where r is dropped because it has an insignificant effect in most applications (McGuire *et al.*, 2001). To implement Equation 6-3, only the conditional magnitude distribution for relevant amplitudes of a is needed. $f_{M|A}(m;a)$ can be represented (with successively less accuracy) by a continuous function, with three discrete values or with a single point, (e.g., $m^1(a)$, the mean magnitude given a). With the latter, Equation 6-3 can be simplified to:

$$P[A>z] = \int\int P[AF > \frac{z}{a}|a,m^1(a)]f_A(a)da \qquad (6\text{-}4)$$

where, $f_{M|A}(m;a)$ has been replaced with $m^1$ derived from deaggregation. With this equation, one can integrate over the rock acceleration, a, to calculate $P[A_S>z]$ for a range of soil amplitudes, z.

## 6.1 IMPLEMENTATION OF APPROACH 3

In Approach 3, the following steps were performed:

- Randomization of base case site-dynamic material properties to produce a suite of velocity profiles as well as G/Gmax and hysteretic damping curves that incorporate site randomness.
- Computation of transfer functions (hereafter termed amplification factors) as characterized by a mean and distribution for each set of base case site properties using the RVT-based equivalent-linear site response model.
- Full integration of the fractile and mean hazard curves for the generic site condition in this case hard rock and amplification factors to arrive at a distribution of site-specific hazard curves.

Specifically, the suites of rock hazard curves are first combined into a single suite and site-specific amplification factors applied using Approach 3. Combining the empirical hazard curves, rather than applying Approach 3 to each suite independently, results in the same mean hazard—the desired product—but does not properly preserve the full epistemic variability in the fractile estimates. As a result, the range in probability reflected in the resulting fractiles is likely somewhat underestimated. Although the fractiles are likely not significantly in error since the differences in hazard fractiles between the empirical relations are not large, the site-specific hazard fractiles should not be used for hazard or risk assessment.

Approach 3 is implemented through a number of computer programs, which are described below. The computation of the amplification factors is the first phase of the calculations and is similar to what is done in other site-response approaches.

### 6.1.1 RVT-Based Equivalent-Linear Site Response Approach

To compute the ground motions at the ground surface, the results of the PSHA are modified using a site-response model. The conventional site response approach in quantifying the effects of soil and other unconsolidated sediments on strong ground motions involves the use of time histories compatible with the specified outcrop response spectra to serve as control (input) motions. The control motions are then used to drive a nonlinear computational formulation to transmit the motions through the profile.

The computational formulation that has been most widely employed to evaluate 1D site response assumes vertically-propagating plane S-waves. Departures of soil response from a linear constitutive relation are treated in an approximate manner through the use of the equivalent-linear formulation. The equivalent-linear formulation, in its present form, was introduced by Idriss and Seed (1968). A stepwise analysis approach was formalized into a 1D, vertically propagating S-wave code called SHAKE (Schnabel *et al*., 1972). Subsequently, this code has become the most widely used and validated analysis package for 1D site response calculations.

The computational scheme employed to compute the amplification factors in this study uses an alternative approach employing random vibration theory (RVT) (Silva and Lee, 1987). In this approach, as embodied in the computer program RASCALS, the control motion power spectrum is propagated through the 1D soil profile using the plane-wave propagators of Silva (1976). The power spectrum is derived from the uniform hazard spectrum by spectral matching assuming the controlling earthquake. In this formulation only SH waves are considered. Arbitrary angles of incidence may be specified. In this case, vertical incidence was assumed.

Inputs to RASCALS are as follows:

- Location of input and output motions within the site profile.
- Input (control) motions characterized by earthquake power spectra.
- Incidence angles of input motion.
- A representation of the rock and soil at the site, consisting of homogeneous layers with specified thickness, seismic velocity, and density.
- A representation of the dynamic material properties of the rock and soil at the site, consisting of strain-dependent shear modulus and damping curves for each layer.

Control motions (power spectral density) must be calculated for input into the site response analysis that are representative of the earthquake magnitude and distance dominating the hazard at the desired rate of exceedance. The basis for the control motions are the magnitude and distances specified by the hazard deaggregation. Control motions may be specified by a response spectrum, which is then followed by an RVT spectral match to generate a power spectral density. This is then input to the site column as an outcrop motion at the control point. Evaluation of site-response using the equivalent-linear site response model is based on convolution of appropriate control motions through randomized velocity profiles combined with randomized G/Gmax and hysteretic damping curves. The randomized profiles and curves are

generated from base case velocity and nonlinear dynamic properties. The convolutions yield transfer functions for 5%-damped response spectra and peak particle velocity.

For the computation of spectra for a site with uncertain properties and exhibiting a degree of lateral variability, a best-estimate (mean) base case velocity profile is developed and used to simulate a number of $V_S$ profiles. Additionally, strain-dependent shear modulus and hysteretic damping are also randomized about best-estimate base cases. A large number of simulations can be required to achieve stable statistics on the response. To achieve statistical stability, 30 randomizations were produced using the velocity correlation models for each base case velocity profile and each base case nonlinear dynamic property curve. In order to randomly vary the $V_S$ profile, a profile randomization scheme has been developed which varies both layer velocity and thickness. The randomization is based on a correlation model developed from an analysis of variance on about 500 measured $V_S$ velocity profiles (EPRI, 1993; Silva *et al.*, 1996). Profile depth (depth to competent material) is also varied on a site specific basis using a uniform distribution. The depth range is generally selected to reflect expected variability over the structural foundation as well as uncertainty in the estimation of depth to competent material.

### 6.1.2 Inputs and Analysis

Representative $V_S$ profiles of the site and shear modulus (G/Gmax) reduction and damping curves are required for the analysis. To perform the site response analysis, the PSHA calculations were rerun for a $V_S30$ of 270 m/sec. The NGA models have a sounder basis at around this $V_S30$ value as compared to hard rock because most of the PEER strong motion database is for soil. A generic $V_S$ profile with a $V_S30$ of 270 m/sec is used in the site response analysis in addition to the site-specific profile. The shallow $V_S$ profile described in Section 4.2 is the base case profile for the Far West 1 site (Figure 66). The top 750 m of the site-specific profile is appended to a standard western U.S. velocity profile at a $V_S$ of 1,800 m/sec. Thus the amplification factors are relative to a generic soil profile and not rock, which is the traditional approach used in site response analysis. Thirty randomized $V_S$ profiles were generated for each of three site-specific base case $V_S$ profiles using a soil correlation model developed by Silva *et al.* (1996). In addition to the best estimate profile, upper and lower base case profiles were calculated using a factor of 1.57 times the mean profile and divided by 1.57, respectively. This factor of 1.57 is used in the site response analysis for nuclear power plants (W. Silva, written communication, 2012).

Associated with each of the 30 randomized profiles was also a set of randomized dynamic material property curves. For the dynamic material properties, the EPRI (1993) and Peninsular Range curves for cohesionless soils (Silva *et al.*, 1996) were used to approximate a nonlinear response over the top 152 m (500 ft), with linear response below (Silva *et al.*, 1996). To accommodate the large uncertainty in nonlinear dynamic material properties, two sets of curves were used in the site-specific analyses. A subset of the EPRI (1993) curves was used for each profile to account for the possibility that the site may behave more linearly. The second set, termed Peninsular Range curves, use the EPRI (1993) 51 to 120 ft curves for 0 to 50 ft and the 501 to 1,000 ft curves for deeper materials and reflect much more linear response than the EPRI curves. The two sets of curves were given equal weights and are considered to cover the range in nonlinear dynamic material properties.

Based on the RASCALS runs for the 30 $V_S$ profiles for each base case profile, a probability distribution of amplification factors was calculated. Input control motions are computed using RASCALS for each set of 30 $V_S$ profiles and dynamic property curves. RASCALS is used for horizontal spectra using normally-incident and inclined SH-waves. For each control motion, mean and standard deviation are computed from the 30 response spectra (from 30 randomized profiles). Thirty realizations result in stable estimates. The mean response spectrum from the 30 convolutions is divided by the mean (log) spectrum for hard rock spectrum to produce the amplification factors. The amplification factors include the effects of the inherent aleatory variability (randomness) of the site properties about each base case and any possible effects of magnitude of the control motions. Epistemic variability (uncertainty) is captured in consideration of alternate base case (mean) profiles and properties.

RASCALS was used to generate control motions and acceleration power response spectra for two earthquakes, **M** 5.5 and 7.5, which are approximately the controlling earthquakes at the site at short- and long-period ground motions (Table 4). The events were placed at a suite of distances to produce expected median rock peak accelerations of 0.01, 0.05, 0.10, 0.20, 0.30, 0.40, 0.50, 0.75, 1.00, 1.25 and 1.50 g. The amplification factors (the ratios of the response spectra at the top of the site-specific profile to the generic soil profile [270 m/sec] profile) are a function of the reference peak acceleration (or SA), spectral frequency, and nonlinear soil response.

## 6.2 SITE-SPECIFIC HORIZONTAL RESULTS

The hazard curves derived from the PSHA and the amplification factors were multiplied to arrive at site-specific amplified hazard curves. The hazard curves calculated using the amplification factors from the **M** 5.5 and 7.5 earthquakes were weighted based on their contributions to the hazard at each spectral frequency. The uncertainty or epistemic variability in seismic hazard is typically represented by a set of weighted hazard curves. Using these sets of curves as discrete probability distributions, they can be sorted by the frequency of exceedance at each ground-motion level and summed into a cumulative probability mass function. When the cumulative probability mass function for a particular exceedance frequency equals or exceeds fractile y, then the exceedance frequency represents the $y^{th}$ fractile. The weighted-mean hazard curve is the weighted average of the exceedance frequency values. This approach is a standard practice in PSHA.

Figure 67 shows the ground surface spectra for several return periods resulting from the site response analysis. Also shown are the input hard rock UHS for the same return periods. The amplification is broadband in nature and is most significant at the long return periods (Figure 67). A factor of 2 to 2½ appears to be the largest amplification.

The following describes the CMS approach and CMS calculated for the four sites.

## 7.1 APPROACH

The UHS represents the spectral accelerations at each period based on the rates of occurrence of all nearby sources, the ground motion prediction models and the uncertainties in these models. It is a broader spectrum than is expected for any single event. This uniform hazard can be represented by a suite of spectra that individually more closely represent the spectral shape of expected events contributing to the UHS. At a given period, a spectrum can be computed based on the deaggregated magnitude, distance and epsilon at that period. Depending on the epsilon required to match the spectrum to the UHS, the expected shape of this spectrum is not necessarily the median predicted spectral shape. Given the epsilon at a target period, epsilon at all other periods can be determined using a correlation function. Thus, a CMS represents a more realistic shape of an event likely to cause the target spectral acceleration at the target period.

The CMS approach was developed for the purpose of using the results of a PSHA to develop input to the seismic evaluation of structures (i.e., performing dynamic response calculations). The approach provides a method for defining the ground motion response spectrum input to a structural response analysis, where the estimated response is linked to the PSHA result (the hazard curve for a spectral acceleration at a given period), and where the estimate of structural response is mean-centered (i.e., non-conservative). The CMS response spectrum is associated with a Sa level for a single-structure period or narrow period range (e.g. the fundamental period of the structure to be analyzed), at a specified annual frequency of exceedance or return period. By linking a response spectrum suited to input to structure response analyses to the PSHA results, it is possible to make statements about the likelihood of observing levels of structural response and potential damage.

The procedure to implement the CMS approach is described in Baker (2011) and is summarized here. The steps in the process as defined by Baker (2011) are:

***Step 1: Determine the Target Sa at a Given Period, and the Associated M, R and*** ε

For a specified annual frequency of exceedance (AFE) or return period, determine the target Sa from the mean hazard curve for Sa for the fundamental period of the structure to be analyzed. This period is denoted *T**. For this ground motion, obtain the mean magnitude (*M)*, distance (R), and ε from the PSHA deaggregation results. Depending upon the response characteristics of the structure or structures to be analyzed, CMS may need to be developed for several values of *T**.

***Step 2: Compute the Mean and Standard Deviation of the Response Spectrum, Given M and R***

For the mean M and R determined in Step 1, compute the mean and standard deviation of logarithmic spectral acceleration at all periods for a the mean magnitude and distance. These are provided by standard ground motion prediction (attenuation) models. The predicted mean and standard deviation, given magnitude, distance, period, etc., are denoted $\overline{\ln Sa}(M,R,T)$ and $\sigma_{\ln Sa}(T)$, respectively. The mean and standard deviation of the log spectral acceleration can be computed using the ground motion prediction models that were used in the PSHA itself. Since multiple ground motion models were used in the PSHA, a weighted estimate of the mean log Sa and the standard deviation can be used. Alternatively, a CMS can be developed for each ground motion prediction model and a weighted average taken to produce the final CMS.

***Step 3: Compute ε at Other Periods, Given ε(T*)***

Compute the "conditional mean" ε at other periods. The conditional mean ε at ε ($T^*$) was determined in Step 1. The conditional mean at other periods, $T_i$, is determined by,

$$\mu_{\varepsilon(Ti)|\varepsilon(T^*)} \tag{7-1}$$

where $\rho(T_i,T^*)$ is the correlation coefficient between ε for periods $T_i$ and $T^*$. This correlation coefficient, which is applicable to periods in the range 0.05 – 5 sec, is (Baker and Cornell 2006),

$$\rho(T_{\min},T_{\max}) = 1-\cos\left[\frac{\Pi}{2}-\left(0.359+0.163I_{(T_{\min}<0.189)}\ln(\frac{T_{\min}}{0.189})\ln(\frac{T_{\min}}{T_{\max}})\right)\right] \tag{7-2}$$

where $I_{(T_{\min}<0.189)}$ is an indicator function equal to 1 if $T_{min} < 0.189$ and 0 otherwise. $T_{min}$ and $T_{max}$ are the smaller and larger of the periods of interest, respectively.

***Step 4: Compute the Conditional Mean Spectrum***

The CMS is computed using the estimated log mean and standard deviation from Step 2 and the conditional mean $\varepsilon(T_i)$ values determined in Step 3. The CMS is estimated according to:

$$\mu_{\ln S_a(T_i)|\ln(S_a(T^*))} = \mu_{\ln S_a}(M,R,T_i) + \rho(T_i,T^*)\varepsilon(T^*)\sigma_{\ln S_a}(T_i) \tag{7-3}$$

The CMS is,

$$S_{a,CMS}(T) = \exp(\mu_{\ln(S_a(T_i)|\ln(S_a(T^*))}) \tag{7-4}$$

## 7.2 CMS

Short-period (0.20 sec) and long-period (1.0 sec) CMS have been computed for 5,000-year return period for the four sites (Figures 68 to 71). As discussed in Section 5.1, the hazard at the four sites at a 5,000-year return period is controlled by **M** 5.4 to 5.5 events at 1 to 2 km at short-periods and **M** 6.9 to 7.7 at 228 to 373 km at long-periods (Table 4). The 5,000-year return period CMS are tabulated in Table 6.

The hazard is very bimodal. Examination of the CMS shows how broad-banded the UHS is compared to more realistically shaped CMS (Figures 68 to 71).

Based on the BADCT Guidance Manual, Appendix E "Earthquake design parameters are usually selected based on professional judgment considering both probabilistic and deterministic analysis. Recent trends in dam safety have resulted in a probabilistic approach for defining seismic design ground motions. The U.S. Bureau of Reclamation uses a PSHA approach and return periods generally ranging from 10,000 to 50,000 years. The U.S. Committee on Large Dams (USCOLD) (now U.S. Society of Dams) and the International Committee on Large Dams (ICOLD) state that when using a probabilistic approach, an annual probability of 1 in 3,000 to 1 in 10,000 should be used (return periods of 3,000 to 10,000 years). The Federal Energy Regulatory Commission is currently adopting a risk-informed approach to dam safety, which requires the use of PSHA.

The difficulty with using DSHA for the basis for seismic design particularly in a region like southern Arizona is that the hazard is usually controlled by background earthquakes whose hazard cannot be explicitly addressed in a DSHA. Background earthquakes can occur anywhere in the site region at some probability and since DSHA does not consider the probability of occurrence, it cannot be used to compute the hazard at a site unless some arbitrary distance is selected. Hence we use PSHA to address the hazard from background earthquakes and as the basis for our recommendation for design earthquake ground motions.

Based on considerations of the downstream risk and consequences of failure of any of the potential tailings embankments in the four proposed locations, we recommend that the ground motions associated with a return period of 5,000 years be adopted for use in seismic design analysis. The recommended 5,000-year return period design UHS and CMS are shown on Figures 68 to 71 and tabulated in Tables 3 and 6. Figure 72 compares the recommended Design CMS for the four sites.

We developed 7 horizontal-component time histories for the design earthquake return period of 5,000 years. Because the response spectrum of a time history has peaks and valleys that deviate from the design response spectrum (target spectrum), it is necessary to modify the motion to improve its response spectrum compatibility. The procedure proposed by Lilhanand and Tseng (1988), as modified by Norm Abrahamson (written communication, 1999), was used to develop the acceleration time histories through spectral matching to the target (seed) spectrum. This time-domain procedure has been shown to be superior to previous frequency-domain approaches because the adjustments to the time history are only done at the time at which the spectral response occurs resulting in only localized perturbations on both the time history and the spectra (Lilhanand and Tseng, 1988).

To match the target spectrum, seed time histories should be from events of similar magnitude, distance (for duration), to a lesser extent site condition, and most importantly, spectral shape as the earthquake dominating the spectrum. The seed time-histories selected are based on the controlling earthquakes (Table 4). Table 5 lists the seed time histories and they are shown on Figures 73 to 75. Because of the bimodal nature of the hazard at the RMC sites, we developed two histories for a spectral period of 0.2 sec for use in the analysis of any short-period structures and 5 time histories for the embankments that are long period (0.7 to 2 sec). The CMS at 0.2 and 1.0 sec were used as the target spectra.

The spectral matches and the resulting time histories are shown on Figures 76 to 131 with the response spectra calculated from the matched time histories. Shown with each set of time histories is the normalized Arias intensity or Husid plot, which provides an appropriate duration measure independent of the absolute amplitude level of the acceleration time history.

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## Table 1. Local Fault Parameters for Proposed Resolution Copper Tailings Sites

| FAULT NAME[1] | RUPTURE MODEL | MAXIMUM RUPTURE LENGTH[2] (km) | MAXIMUM MAGNITUDE[3] (Mw) | FAULT DIP[4] (degrees) | KNOWN OR SUSPECTED AGE OF YOUNGEST OFFSET | PROBABILITY OF ACTIVITY[5] | FAULT SLIP RATE[6] (mm/yr) | COMMENTS | REFERENCES |
|---|---|---|---|---|---|---|---|---|---|
| Carefree Fault Zone #947 | Independent (1.0) | 11 | 6.2 (0.3)<br>6.5 (0.5)<br>6.8 (0.2) | 35º W (0.2)<br>50º W (0.6)<br>65º W (0.2) | Middle Pleistocene to Late Quaternary (< 750 ka) | 1.0 | 0.002 (0.2)<br>0.01 (0.6)<br>0.02 (0.2) | NW-striking, W-down normal faults that divide a Precambrian granite pediment from tilted Tertiary volcanic rocks to the W in the McDowell Mountains. Scarps < 3 m high along a contact between the granite bedrock and middle Pleistocene alluvium. Skotnicki *et al.* (1997) interpret middle Pleistocene deposits are faulted; but Holocene and late Pleistocene deposits are not displaced. Slip rate is based on < 3 m offset in middle Pleistocene (~300 kyr) and older deposits (Pearthree, 1998). | Pearthree (1998)<br>Pearthree and Scarborough (1984)<br>Skotnicki *et al.* (1997) |
| Horseshoe Fault Zone #946 | Independent (1.0) | 21 | 6.3 (0.2)<br>6.6 (0.6)<br>6.9 (0.2) | 35º NE (0.2)<br>50º NE (0.6)<br>65º NE (0.2) | Holocene (<15 ka) | 1.0 | 0.01 (0.3)<br>0.04 (0.6)<br>0.1 (0.1) | Nearly perpendicular normal faults along the western and southern margins of the Horseshoe Basin, an asymmetric graben in the upland region between the Mazatzal Mountains and Humboldt Mountain. Trenches, scarp analyses and mapping indicate latest Pleistocene and Holocene faulting along the entire zone and two or more episodes of faulting since ~300 kyr. Scarp analyses, soil development, topographic relations, and fault trench results indicate a slip rate of about 0.04 ± 0.03 mm/yr; displacements of about 1.5 to 2 m, and recurrence intervals of approximately 100 kyr (Pearthree, 1998). Piety and Anderson (1991) estimate the paleoearthquakes were magnitude 6.5 to 7. Fault dip is generalized as NE, a combination of E on the northern section and N on southern section. Slip rate is based on < 5 ± 2.5 m of vertical displacement in the past 150 kyr (northern section) and < 2 m vertical displacement in the past 200 to 300 kyr on the southern section (Pearthree 1998). (~2 to 7.5m/150yr = 0.03 ± 0.02 mm/yr) (2m/200 to 300 kyr = 0.04 ± 0.03 mm/yr). | Menges and Pearthree (1983)<br>Pearthree (1998)<br>Pearthree *et al.* (1988)<br>Pearthree and Scarborough (1984)<br>Piety and Anderson (1990)<br>Piety and Anderson (1991) |
| Sugarloaf Fault Zone #945 | Independent (1.0) | 8 | 6.2 (0.3)<br>6.5 (0.5)<br>6.8 (0.2) | 35º NE (0.2)<br>50º NE (0.6)<br>65º NE (0.2) | Late to latest Pleistocene (< 130 ka) | 1.0 | 0.005 (0.3)<br>0.02 (0.6)<br>0.05 (0.1) | NW-striking normal fault that forms an asymmetric graben along the western flank of the Mazatzal Mountains. E-facing scarps are low but sharp and as much as 5 m high between granite bedrock and basin-fill deposits. Natural exposures and two trenches revealed late and latest Pleistocene deposits are offset, but middle to Holocene deposits are not faulted. Slip rate is based on < 1 m vertical displacement in the past 50 to 100 kyr Pearthree (1998). | Anderson *et al.* (1986)<br>Fugro National (1981)<br>Menges and Pearthree (1983)<br>Pearthree (1998)<br>Pearthree *et al.* (1995) |
| Whitlock Wash Fault #940 | Independent (1.0) | 23 | 6.4 (0.2)<br>6.7 (0.6)<br>7.0 (0.2) | 35º W (0.2)<br>50º W (0.6)<br>65º W (0.2) | Quaternary (< 1.6 Ma) | 0.9 | 0.005 (0.2)<br>0.01 (0.6)<br>0.02 (0.2) | Discontinuous N- to NW-striking, W-down normal faults along the eastern side of San Pedro Valley. Quaternary activity is suspected based on a prominent escarpment and faulting in Pliocene basin-fill deposits. No evidence of Quaternary movement has been found. Mapping on the southern zone revealed lower to middle Quaternary deposits that are not faulted. Probability of activity is assumed to be 0.9, as evidence for Quaternary activity is equivocal (Pearthree, 1998). The slip rate is unknown, but probably < 0.02 mm/yr (Pearthree1998). | Menges and Pearthree (1983)<br>Pearthree (1998)<br>Pearthree *et al.* (1988)<br>Shenk (1990) |

1 Known and suspected Quaternary faults within 100 km of the site, listed in order of closest distance. Fault name and number from Pearthree (1998) and USGS online Quaternary fault and fold database. Note that southern San Andreas fault source parameters are not included in this table due to their complexity.

2 Measured along strike and rounded to the nearest km.

3 Estimated using the empirical relation of Wells and Coppersmith (1994) for all fault types based on maximum surface rupture length. Fault lengths ≤ 10 km are too short to use for an accurate magnitude estimate. Rather, the maximum magnitude distribution is taken to be M= 6.5 ± 0.3, which is based on the minimum magnitude threshold for surface rupture in the Basin and Range Province (dePolo, 1994).

4 Dips are assumed averages for the seismogenic crust after Lund (2012)-see discussion in text.

5 Probability of activity considers the likelihood that a fault is an independent seismogenic structure capable of generating earthquakes within the modern stress field.

6 Rates are average net slip rates. All faults assumed to be pure normal slip (100% dip slip), so net slip was calculated from vertical slip by assuming the preferred fault dip. See also individual summaries in Wong et al. (2008a) for more discussion on the basis for slip rates. Recurrence models used in the analysis were: characteristic (weighted 0.6), maximum magnitude (weighted 0.2), and truncated exponential (weighted 0.2).

**Table 2a. Southern California and Baja California Fault Source Parameters Included in the Analyses[1]**

| Fault Name<br>fm2.1 (0.5) [7]<br>fm 2.2 (0.5) | P(a)[2] | Rupture Length (km) | Slip Rate (mm/yr) | SR unc.[3] | Aseismic Slip Factor[4] | Paleoseismic Recurrence Interval (yrs) | Sense of Slip[5] | Downdip Width (km) | Width unc. | Rupture Top (km) | Rupture Bottom (km) | Dip (degrees) | Dip Direction | Preferred Mmax ± 0.3[6] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **San Andreas Fault Zone [segmented (0.9)]** | | | | | | | | | | | | | | |
| San Andreas-1906 rupture | 1.0 | 473.0 | 24.0 | 3.0 | 0.0 | 300 | rl-ss | 13.0 | 2 | 0 | 13.0 | 90 | | 7.9 |
| San Andreas Parkfield | 1.0 | 36.4 | 34.0 | 5.0 | 0.8 | 24.5 | rl-ss | 10.2 | 2 | 0 | 10.2 | 90 | | 6.7 |
| San Andreas-Cholame | 1.0 | 62.5 | 34.0 | 5.0 | 0.0 | 155 | rl-ss | 12.0 | 2 | 0 | 12.0 | 90 | | 7.0 |
| San Andreas-Carrizo | 1.0 | 59.0 | 34.0 | 3.0 | 0.0 | 175 | rl-ss | 15.1 | 2 | 0 | 15.1 | 90 | | 7.1 |
| San Andreas-Big Bend | 1.0 | 49.7 | 34.0 | 3.0 | 0.0 | 175 | rl-ss | 15.1 | 2 | 0 | 15.1 | 90 | | 7.0 |
| San Andreas-Mojave N | 1.0 | 36.9 | 27.0 | 7.0 | 0.0 | 155 | rl-ss | 15.1 | 2 | 0 | 15.1 | 90 | | 6.8 |
| San Andreas-Mojave S | 1.0 | 97.6 | 29.0 | 7.0 | 0.0 | 130 | rl-ss | 13.1 | 2 | 0 | 13.1 | 90 | | 7.3 |
| San Andreas-San Bernardino N | 1.0 | 35.3 | 22.0 | 6.0 | 0.0 | 175 | rl-ss | 12.8 | 2 | 0 | 12.8 | 90 | | 6.8 |
| San Andreas-San Bernardino S | 1.0 | 43.4 | 16.0 | 6.0 | 0.0 | 200 | rl-ss | 12.8 | 2 | 0 | 12.8 | 90 | | 6.9 |
| San Andreas-San Gorgonio Pass/Garnet Hill | 1.0 | 55.9 | 10.0 | 6.0 | 0.0 | 225 | rl-ss | 19.3 | 2 | 0 | 16.4 | 58 | N | 7.0 |
| San Andreas-Coachella | 1.0 | 69.4 | 20.0 | 5.0 | 0.1 | 212 | rl-ss | 11.1 | 2 | 0 | 11.1 | 90 | | 7.1 |
| Rupture Scenarios (see SoSAF Table 2b) | | | | | | | | | | | | | | |
| **San Jacinto - Imperial Fault Zone [segmented (0.9)]** | | | | | | | | | | | | | | |
| Imperial | 1.0 | 45.8 | 20.0 | 5.0 | 0.1 | — | rl-ss | 14.7 | 2 | 0 | 14.6 | 82 | N | 6.9 |
| Superstition Hills | 1.0 | 36.2 | 4.0 | 2.0 | 0.1 | — | rl-ss | 12.6 | 2 | 0 | 12.6 | 90 | | 6.8 |
| Superstition Mountain | 1.0 | 26.3 | 5.0 | 3.0 | 0.1 | 395 | rl-ss | 12.4 | 2 | 0 | 12.4 | 90 | | 6.6 |
| San Jacinto-Borrego | 1.0 | 34.2 | 4.0 | 2.0 | 0.1 | 130 | rl-ss | 13.1 | 2 | 0 | 13.1 | 90 | | 6.7 |
| San Jacinto-Coyote Creek | 1.0 | 42.9 | 4.0 | 2.0 | 0.0 | 375 | rl-ss | 15.9 | 2 | 0 | 15.9 | 90 | | 6.9 |
| San Jacinto-Clark | 1.0 | 46.8 | 14.0 | 6.0 | 0.0 | 240 | rl-ss | 16.8 | 2 | 0 | 16.8 | 90 | | 7.0 |
| San Jacinto-Anza | 1.0 | 46.1 | 18.0 | 6.0 | 0.0 | 240 | rl-ss | 16.8 | 2 | 0 | 16.8 | 90 | | 7.0 |
| San Jacinto-Anza stepover | 1.0 | 24.2 | 9.0 | 4.0 | 0.0 | — | rl-ss | 16.8 | 2 | 0 | 16.8 | 90 | | 6.6 |
| San Jacinto-SJV stepover | 1.0 | 24.2 | 9.0 | 4.0 | 0.0 | — | rl-ss | 16.8 | 2 | 0 | 16.8 | 90 | | 6.6 |
| San Jacinto- San  Jacinto Valley | 1.0 | 18.5 | 18.0 | 6.0 | 0.0 | — | rl-ss | 18.5 | 2 | 0 | 18.5 | 90 | | 6.5 |
| San Jacinto-San Bernardino | 1.0 | 45.1 | 6.0 | 4.0 | 0.0 | 200 | rl-ss | 16.1 | 2 | 0 | 16.1 | 90 | | 6.9 |
| Rupture Scenarios (see Table 2c) | | | | | | | | | | | | | | |
| **Elsinore Fault Zone [segmented (0.9)]** | | | | | | | | | | | | | | |
| Elsinore-Coyote Mountain | 1.0 | 38.8 | 3.0 | 1.0 | 0.0 | 933 | rl-ss | 13.3 | 2 | 0 | 13.2 | 82 | NE | 6.8 |
| Elsinore-Julian | 1.0 | 75.4 | 3.0 | 1.0 | 0.0 | 2000 | rl-ss | 18.9 | 2 | 0 | 18.8 | 84 | NE | 7.3 |
| Elsinore-Temecula | 1.0 | 40.0 | 5.0 | 2.0 | 0.0 | 600 | rl-ss | 14.2 | 2 | 0 | 14.2 | 88 | NE | 6.8 |
| Elsinore-Temecula stepover | 1.0 | 11.8 | 2.5 | 2.0 | 0.0 | | rl-ss | 13.5 | 2 | 0 | 13.3 | 80 | NE | 6.3 |
| Elsinore-Glen Ivy stepover | 1.0 | 11.8 | 2.5 | 2.0 | 0.0 | | rl-ss | 13.5 | 2 | 0 | 13.3 | 80 | SW | 6.3 |
| Elsinore-Glen Ivy | 1.0 | 25.8 | 5.0 | 2.0 | 0.0 | 271 | rl-ss | 13.5 | 2 | 0 | 13.3 | 80 | SW | 6.6 |
| Elsinore-Whittier (fm2.1) (0.5) | 1.0 | 46.2 | 2.5 | 1.0 | 0.0 | — | rl-ss | 14.6 | 2 | 0 | 14.1 | 75 | NE | 6.9 |
| Elsinore-Whittier (fm2.2) (0.5) | 1.0 | 46.2 | 2.5 | 1.0 | 0.0 | — | rl-ss | 13.2 | 2 | 0 | 12.4 | 70 | NE | 6.9 |
| Rupture Scenarios (see Elsinore Table 2d) | | | | | | — | | | | | | | | |

**Table 2a. Southern California and Baja California Fault Source Parameters Included in the Analyses[1]**

| Fault Name<br>fm2.1 (0.5) [7]<br>fm 2.2 (0.5) | P(a)[2] | Rupture Length (km) | Slip Rate (mm/yr) | SR unc.[3] | Aseismic Slip Factor[4] | Paleoseismic Recurrence Interval (yrs) | Sense of Slip[5] | Downdip Width (km) | Width unc. | Rupture Top (km) | Rupture Bottom (km) | Dip (degrees) | Dip Direction | Preferred Mmax ± 0.3[6] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Earthquake Valley[7] | 1.0 | 20.4 | 2.0 | 1.0 | 0.0 | — | rl-ss | 18.8 | 2 | 0 | 18.8 | 90 | | 6.6 |
| Laguna Salada | 1.0 | 99.5 | 3.5 | 1.5 | 0.0 | — | rl-ss | 13.3 | 2 | 0 | 13.3 | 90 | | 7.3 |
| **Garlock Fault Zone [segmented (0.9)]** | | | | | | | | | | | | | | |
| Garlock-West | 1.0 | 97.6 | 6.0 | 3.0 | 0.0 | 1159 | ll-ss | 14.7 | 2 | 0 | 14.7 | 90 | | 7.3 |
| Garlock-Central | 1.0 | 110.7 | 7.0 | 2.0 | 0.0 | 1276 | ll-ss | 11.5 | 2 | 0 | 11.5 | 90 | | 7.3 |
| Garlock-East | 1.0 | 45.1 | 3.0 | 2.0 | 0.0 | — | ll-ss | 11.5 | 2 | 0 | 11.5 | 90 | | 6.8 |
| Rupture Scenarios (see Table 2e) | | | | | | | | | | | | | | |
| **SHEAR ZONES** | | | | | | | | | | | | | | |
| Eastern CA Shear zone | 0.5 | 219.0 | 4.0 | 2.0 | 0.0 | — | rl-ss | 14.0 | 2 | 0 | 14.0 | 90 | | 7.6 |

[1] Parameters are largely after the 2007 California Geological Survey/U.S. Geological Survey Uniform California Earthquake Rupture Forecast (UCERF) model (WGCEP, 2008).
[2] Probability of activity
[3] Uncertainty in slip rate value. Single number implies slip rates are modeled with slip rate value in "Slip Rate" column ± value in "SR unc.", with weightings of 0.2, 0.6, 0.2.
[4] Aseismic slip factor (ASF) is used to account for some fraction of aseismic slip due to fault creep by decreasing the effective coseismic rupture area (multiply fault area by 1-ASF to determine effective rupture area). A totally locked fault will have an ASF of 0 and a fully creeping fault will have an ASF of 1.0.
[5] (ss) strike slip, (r) reverse, (n) normal, (rl) rt. lateral, (ll) left lateral, (o) oblique
[6] Mmax obtained either from historical data or calculated from empirical magnitude-area (M-A) and/or magnitude-length (M-L) relationships. For strike-slip faults we used the average of Wells and Coppersmith (1994) M-L and Hanks and Bakun (2002) M-A relationships; for others, we used the average of Wells and Coppersmith (1994) M-L and M-A relationships.
[7] "fm2.1" and "fm2.2" refer to two alternative fault models used in the calculations, weighted equally. Refer to WGCEP (2008) for discussion.
[8] Earthquake Valley fault: not modeled as separate source for sites far from fault. Rather it is included in Elsinore calculations (Julian and Coyote Mtn segments).
[9] Values shown in this cell are not uncertainties in slip rate as described in note 2, but weights on the corresponding slip rates in the "Slip Rate" column.

**Table 2b. Maximum Magnitudes and Rupture Rates for the Southern San Andreas Fault***

| | Rupture Name (segments involved) | Area ($km^2$) | Ells-B Mag | H&B Mag | A-Priori Rate | Ells-B Rate | H&B Rate | Comments |
|---|---|---|---|---|---|---|---|---|
| | **Weight** | | | | **0.5** | **0.25** | **0.25** | |
| 1 | PK | 78 | 6.09 | 5.87 | 3.46E-02 | 2.49E-02 | 5.26E-02 | Rupture area is reduced from fault by 0.79 aseismic factor |
| 2 | CH | 750.2 | 7.08 | 6.9 | 5.00E-05 | 5.21E-05 | 5.46E-05 | |
| 3 | CC | 891.2 | 7.15 | 7 | 3.00E-04 | 1.60E-04 | 5.74E-05 | |
| 4 | BB | 751 | 7.08 | 6.9 | 3.00E-04 | 5.68E-04 | 5.26E-04 | |
| 5 | NM | 556.5 | 6.95 | 6.73 | 2.00E-04 | 1.05E-04 | 1.44E-04 | |
| 6 | SM | 1279 | 7.31 | 7.21 | 5.00E-04 | 6.45E-04 | 6.78E-04 | |
| 7 | NSB | 451.9 | 6.86 | 6.64 | 7.00E-04 | 7.12E-04 | 6.64E-04 | |
| 8 | SSB | 555.5 | 6.94 | 6.73 | 5.00E-05 | 5.10E-05 | 5.17E-05 | |
| 9 | BG | 843 | 7.13 | 6.97 | 5.00E-04 | 1.88E-04 | 1.35E-05 | |
| 10 | CO | 693.4 | 7.04 | 6.86 | 2.50E-03 | 6.70E-03 | 1.21E-02 | Rupture area is reduced from fault by 0.1 aseismic factor |
| 11 | PK+CH | 828.2 | 7.12 | 6.96 | 1.60E-03 | 4.36E-03 | 7.01E-03 | |
| 12 | CH+CC | 1641.4 | 7.42 | 7.36 | 3.00E-04 | 2.39E-04 | 2.15E-04 | |
| 13 | CC+BB | 1642.2 | 7.42 | 7.36 | 0 | 5.02E-06 | 5.07E-06 | |
| 14 | BB+NM | 1307.5 | 7.32 | 7.23 | 0 | 1.01E-06 | 1.01E-06 | |
| 15 | NM+SM | 1835.4 | 7.46 | 7.42 | 7.00E-04 | 4.95E-06 | 5.04E-06 | |
| 16 | SM+NSB | 1730.9 | 7.44 | 7.39 | 6.00E-04 | 8.79E-04 | 8.90E-04 | |
| 17 | NSB+SSB | 1007.4 | 7.2 | 7.07 | 8.00E-04 | 1.05E-03 | 1.22E-03 | |
| 18 | SSB+BG | 1398.5 | 7.35 | 7.26 | 9.00E-04 | 5.03E-06 | 4.95E-06 | |
| 19 | BG+CO | 1536.4 | 7.39 | 7.32 | 7.00E-04 | 2.83E-04 | 4.10E-04 | |
| 20 | PK+CH+CC | 1719.4 | 7.44 | 7.38 | 7.00E-04 | 4.26E-04 | 4.19E-04 | |
| 21 | CH+CC+BB | 2392.4 | 7.58 | 7.58 | 0 | 9.94E-07 | 9.93E-07 | |
| 22 | CC+BB+NM | 2198.7 | 7.54 | 7.53 | 0 | 1.00E-06 | 1.01E-06 | |
| 23 | BB+NM+SM | 2586.4 | 7.61 | 7.62 | 2.50E-04 | 1.88E-04 | 2.67E-04 | |
| 24 | NM+SM+NSB | 2287.4 | 7.56 | 7.55 | 1.00E-04 | 7.24E-05 | 6.69E-05 | |
| 25 | SM+NSB+SSB | 2286.4 | 7.56 | 7.55 | 4.00E-04 | 6.05E-04 | 7.55E-04 | |
| 26 | NSB+SSB+BG | 1850.4 | 7.47 | 7.43 | 4.00E-04 | 2.22E-04 | 3.05E-05 | |
| 27 | SSB+BG+CO | 2091.9 | 7.52 | 7.5 | 4.00E-04 | 2.23E-04 | 2.48E-04 | |
| 28 | PK+CH+CC+BB | 2470.4 | 7.59 | 7.59 | 4.00E-04 | 8.20E-04 | 8.34E-04 | |
| 29 | CH+CC+BB+NM | 2948.8 | 7.67 | 7.7 | 0 | 9.91E-07 | 9.99E-07 | |
| 30 | CC+BB+NM+SM | 3477.7 | 7.74 | 7.79 | 4.00E-04 | 1.95E-04 | 4.99E-06 | |
| 31 | BB+NM+SM+NSB | 3038.4 | 7.68 | 7.71 | 0 | 9.95E-07 | 1.00E-06 | |
| 32 | NM+SM+NSB+SSB | 2842.9 | 7.65 | 7.68 | 2.00E-04 | 1.04E-04 | 1.02E-04 | |
| 33 | SM+NSB+SSB+BG | 3129.4 | 7.7 | 7.73 | 3.00E-04 | 2.92E-04 | 1.97E-04 | |
| 34 | NSB+SSB+BG+CO | 2543.8 | 7.61 | 7.61 | 4.00E-04 | 2.23E-04 | 2.17E-04 | |
| 35 | PK+CH+CC+BB+NM | 3026.9 | 7.68 | 7.71 | 7.00E-04 | 1.54E-03 | 1.66E-03 | |
| 36 | CH+CC+BB+NM+SM | 4227.8 | 7.83 | 7.9 | 5.00E-04 | 4.16E-04 | 2.67E-04 | |
| 37 | CC+BB+NM+SM+NSB | 3929.6 | 7.79 | 7.86 | 1.00E-04 | 8.64E-05 | 5.55E-05 | |

*** From Table 3, Appendix G, WGCEP (2008)**

**Table 2b. Maximum Magnitudes and Rupture Rates for the Southern San Andreas Fault***

| | Rupture Name (segments involved) | Area ($km^2$) | Ells-B Mag | H&B Mag | A-Priori Rate | Ells-B Rate | H&B Rate | Comments |
|---|---|---|---|---|---|---|---|---|
| | **Weight** | | | | **0.5** | **0.25** | **0.25** | |
| 38 | BB+NM+SM+NSB+SSB | 3593.9 | 7.76 | 7.81 | 5.00E-05 | 4.92E-05 | 5.42E-05 | |
| 39 | NM+SM+NSB+SSB+BG | 3685.9 | 7.77 | 7.83 | 1.00E-04 | 6.19E-05 | 3.29E-05 | |
| 40 | SM+NSB+SSB+BG+CO | 3822.8 | 7.78 | 7.85 | 4.00E-04 | 3.58E-04 | 4.16E-04 | |
| 41 | PK+CH+CC+BB+NM+SM | 4305.9 | 7.83 | 7.92 | 2.00E-03 | 1.04E-03 | 6.43E-04 | |
| 42 | CH+CC+BB+NM+SM+NSB | 4679.8 | 7.87 | 7.96 | 0 | 9.91E-07 | 9.89E-07 | |
| 43 | CC+BB+NM+SM+NSB+SSB | 4485.1 | 7.85 | 7.94 | 1.00E-04 | 9.04E-05 | 6.76E-05 | |
| 44 | BB+NM+SM+NSB+SSB+BG | 4436.9 | 7.85 | 7.93 | 0 | 1.01E-06 | 1.01E-06 | |
| 45 | NM+SM+NSB+SSB+BG+CO | 4379.2 | 7.84 | 7.93 | 1.00E-04 | 6.01E-05 | 3.90E-05 | |
| 46 | PK+CH+CC+BB+NM+SM+NSB | 4757.8 | 7.88 | 7.97 | 5.00E-04 | 4.21E-04 | 3.49E-04 | |
| 47 | CH+CC+BB+NM+SM+NSB+SSB | 5235.3 | 7.92 | 8.03 | 5.00E-05 | 5.00E-05 | 5.09E-05 | |
| 48 | CC+BB+NM+SM+NSB+SSB+BG | 5328.1 | 7.93 | 8.04 | 5.00E-05 | 4.44E-05 | 3.00E-05 | |
| 49 | BB+NM+SM+NSB+SSB+BG+CO | 5130.2 | 7.91 | 8.02 | 5.00E-05 | 4.50E-05 | 4.70E-05 | |
| 50 | PK+CH+CC+BB+NM+SM+NSB+SSB | 5313.3 | 7.93 | 8.04 | 1.00E-04 | 1.00E-04 | 1.09E-04 | |
| 51 | CH+CC+BB+NM+SM+NSB+SSB+BG | 6078.2 | 7.98 | 8.12 | 0 | 9.95E-07 | 1.01E-06 | |
| 52 | CC+BB+NM+SM+NSB+SSB+BG+CO | 6021.5 | 7.98 | 8.11 | 1.00E-05 | 9.66E-06 | 9.24E-06 | |
| 53 | PK+CH+CC+BB+NM+SM+NSB+SSB+BG | 6156.3 | 7.99 | 8.12 | 5.00E-05 | 4.65E-05 | 4.09E-05 | |
| 54 | CH+CC+BB+NM+SM+NSB+SSB+BG+CO | 6771.6 | 8.03 | 8.18 | 0 | 1.01E-06 | 9.93E-07 | |
| 55 | PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO | 6849.7 | 8.04 | 8.18 | 1.00E-04 | 8.29E-05 | 6.59E-05 | |
| *Total* | | | | | *5.42E-02* | *4.88E-02* | *8.37E-02* | |

PK Parkfield
CH Cholame
CC Carrizo
BB Big Bend
NM Mojave North
SM Mojave South
NSB San Bernardino North
SSB San Bernardino South
BG San Gorgonio Pass-Garnet Hill (aka Banning-Garnet Hill)
CO Coachella

*** From Table 3, Appendix G, WGCEP (2008)**

**Table 2c. Maximum Magnitudes and Rupture Rates for the San Jacinto Fault***

| | Rupture Name (segments involved) | Area ($km^2$) | Ells-B Mag | H&B Mag | A-Priori Rate | Ells-B Rate | H&B Rate | Comments |
|---|---|---|---|---|---|---|---|---|
| | **Weight** | | | | **0.5** | **0.25** | **0.25** | |
| 1 | SBV | 725.7 | 7.06 | 6.88 | 2.31E-03 | 4.39E-04 | 4.42E-04 | |
| 2 | SJV (SJV+SJV stepover sections) | 686.7 | 7.04 | 6.85 | 2.43E-03 | 4.50E-04 | 4.49E-04 | |
| 3 | A (A+A stepover sections) | 1193.9 | 7.28 | 7.17 | 0 | 8.83E-05 | 8.82E-05 | |
| 4 | C | 786.1 | 7.1 | 6.93 | 0 | 8.87E-05 | 8.98E-05 | |
| 5 | CC | 681.5 | 7.03 | 6.85 | 8.89E-04 | 4.50E-04 | 4.48E-04 | |
| 6 | B | 403.6 | 6.81 | 6.59 | 4.82E-03 | 4.45E-04 | 4.43E-04 | Rupture area is reduced from fault by 0.1 aseismic factor |
| 7 | SM | 325.8 | 6.71 | 6.49 | 1.09E-03 | 1.50E-03 | 4.01E-03 | Rupture area is reduced from fault by 0.1 aseismic factor |
| 8 | SBV+SJV | 1412.4 | 7.35 | 7.27 | 1.32E-03 | 4.49E-04 | 4.41E-04 | |
| 9 | SJV+A | 1880.6 | 7.47 | 7.44 | 0 | 4.41E-04 | 4.50E-04 | |
| 10 | A+C | 1980.1 | 7.5 | 7.47 | 3.15E-03 | 1.21E-03 | 1.16E-03 | |
| 11 | A+CC | 1875.4 | 7.47 | 7.43 | 0 | 8.82E-05 | 9.00E-05 | |
| 12 | CC+B | 1085.1 | 7.24 | 7.12 | 8.89E-04 | 4.50E-04 | 4.47E-04 | |
| 13 | B+SM | 729.4 | 7.06 | 6.89 | 1.09E-03 | 4.40E-04 | 4.43E-04 | |
| 14 | SBV+SJV+A | 2606.4 | 7.62 | 7.62 | 0 | 4.47E-04 | 4.48E-04 | |
| 15 | SJV+A+C | 2666.8 | 7.63 | 7.64 | 0 | 4.48E-04 | 4.51E-04 | |
| 16 | SJV+A+CC | 2562.2 | 7.61 | 7.61 | 0 | 8.91E-05 | 8.93E-05 | |
| 17 | A+CC+B | 2279.1 | 7.56 | 7.55 | 0 | 9.02E-05 | 8.95E-05 | |
| 18 | CC+B+SM | 1411 | 7.35 | 7.27 | 8.89E-04 | 4.48E-04 | 4.40E-04 | |
| 19 | SBV+SJV+A+C | 3392.5 | 7.73 | 7.78 | 1.05E-03 | 4.49E-04 | 4.41E-04 | |
| 20 | SBV+SJV+A+CC | 3287.9 | 7.72 | 7.76 | 0 | 8.94E-05 | 9.03E-05 | |
| 21 | SJV+A+CC+B | 2965.8 | 7.67 | 7.7 | 0 | 8.82E-05 | 8.89E-05 | |
| 22 | A+CC+B+SM | 2604.9 | 7.62 | 7.62 | 0 | 8.93E-05 | 8.96E-05 | |
| 23 | SBV+SJV+A+CC+B | 3691.5 | 7.77 | 7.83 | 0 | 8.80E-05 | 8.97E-05 | |
| 24 | SJV+A+CC+B+SM | 3291.6 | 7.72 | 7.76 | 0 | 8.94E-05 | 9.03E-05 | |
| 25 | SBV+SJV+A+CC+B+SM | 4017.3 | 7.8 | 7.88 | 0 | 8.90E-05 | 8.82E-05 | |
| *Total* | | | | | *1.99E-02* | *9.04E-03* | *1.15E-02* | |

SBV San Bernardino Valley
SJV San Jacinto Valley
A Anza
C Clark
CC Coyote Creek
B Borrego Mountain
SM Superstition Mountain
Note: Does not include Imperial or Superstition Hills faults

*** From Table 3, Appendix G, WGCEP (2008)**

**Table 2d. Maximum Magnitudes and Rupture Rates for the Elsinore Fault***

| | Rupture Name (segments involved) | Area ($km^2$) | Ells-B Mag | H&B Mag | A-Priori Rate | Ells-B Rate | H&B Rate | E/HB ave Mag | Comments |
|---|---|---|---|---|---|---|---|---|---|
| | **Weight** | | | | **0.5** | **0.25** | **0.25** | | |
| 1 | W | 674.8 | 7.03 | 6.84 | 7.14E-04 | 9.27E-04 | 1.37E-03 | 6.94 | |
| 2 | GI (GI+GI stepover sections) | 488.6 | 6.89 | 6.67 | 2.55E-03 | 1.19E-03 | 2.19E-03 | 6.78 | |
| 3 | T (T+T stepover sections) | 734.9 | 7.07 | 6.89 | 6.10E-04 | 1.24E-04 | 3.46E-04 | 6.98 | |
| 4 | J | 1426.1 | 7.35 | 7.28 | 0 | 3.85E-05 | 2.48E-05 | 7.32 | |
| 5 | CM | 517.3 | 6.91 | 6.69 | 5.71E-04 | 1.04E-03 | 2.11E-03 | 6.80 | |
| 6 | W+GI | 1163.4 | 7.27 | 7.16 | 0 | 2.48E-05 | 1.42E-04 | 7.22 | |
| 7 | GI+T | 1223.5 | 7.29 | 7.19 | 8.90E-04 | 1.25E-04 | 1.25E-04 | 7.24 | |
| 8 | T+J | 2161 | 7.53 | 7.52 | 0 | 1.27E-04 | 1.26E-04 | 7.53 | |
| 9 | J+CM | 1943.3 | 7.49 | 7.45 | 0 | 1.74E-04 | 2.92E-04 | 7.47 | |
| 10 | W+GI+T | 1898.3 | 7.48 | 7.44 | 0 | 2.48E-05 | 9.07E-05 | 7.46 | |
| 11 | GI+T+J | 2649.6 | 7.62 | 7.63 | 0 | 1.26E-04 | 1.27E-04 | 7.63 | |
| 12 | T+J+CM | 2678.2 | 7.63 | 7.64 | 2.50E-04 | 2.83E-04 | 2.54E-04 | 7.64 | |
| 13 | W+GI+T+J | 3324.4 | 7.72 | 7.77 | 0 | 2.52E-05 | 2.48E-05 | 7.75 | |
| 14 | GI+T+J+CM | 3166.9 | 7.7 | 7.74 | 2.50E-04 | 1.83E-04 | 1.27E-04 | 7.72 | |
| 15 | W+GI+T+J+CM | 3841.7 | 7.78 | 7.85 | 0 | 2.49E-05 | 2.52E-05 | 7.82 | |
| *Total* | | | | | *5.84E-03* | *4.44E-03* | *7.37E-03* | | |

W Whittier
GI Glen Ivy
T Temecula
J Julian
CM Coyote Mountain

Note: Does not include Laguna Salada fault

*** From Table 3, Appendix G, WGCEP (2008)**

**Table 2e. Rupture Rates for the Garkock Fault***

| | Rupture Name (segments involved) | Area ($km^2$) | Ells-B Mag | H&B Mag | A-Priori Rate | Ells-B Rate | H&B Rate | Comments |
|---|---|---|---|---|---|---|---|---|
| | **Weight** | | | | **0.5** | **0.25** | **0.25** | |
| 1 | GE | 519.3 | 6.92 | 6.7 | 6.80E-04 | 3.61E-04 | 6.21E-04 | None. |
| 2 | GC | 1276.1 | 7.31 | 7.21 | 7.84E-05 | 9.26E-05 | 8.32E-05 | |
| 3 | GW | 1290.9 | 7.31 | 7.22 | 2.36E-04 | 2.19E-04 | 2.61E-04 | |
| 4 | GE+GC | 1795.4 | 7.45 | 7.41 | 7.84E-05 | 9.05E-05 | 8.32E-05 | |
| 5 | GC+GW | 2567.1 | 7.61 | 7.62 | 3.13E-04 | 5.99E-04 | 5.50E-04 | |
| 6 | GE+GC+GW | 3086.3 | 7.69 | 7.72 | 3.13E-04 | 5.83E-04 | 5.78E-04 | |
| *Total* | | | | | *1.70E-03* | *1.95E-03* | *2.18E-03* | |

GE Garlock East
GC Garlock Central
GW Garlock West

*** From Table 3, Appendix G, WGCEP (2008)**

**Table 3**
**UHS**

| Period (sec) | Far West 2 (rock) | | | | Near West (Tcu) | | | | Pinto Valley (rock) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 100-yr UHS | 450-yr UHS | 5,000-yr UHS | 10,000-yr UHS | 100-yr UHS | 450-yr UHS | 5,000-yr UHS | 10,000-yr UHS | 100-yr UHS | 450-yr UHS | 5,000-yr UHS | 10,000-yr UHS |
| 0.010 | 0.011 | 0.022 | 0.069 | 0.093 | 0.015 | 0.034 | 0.107 | 0.142 | 0.010 | 0.026 | 0.094 | 0.125 |
| 0.030 | 0.011 | 0.024 | 0.075 | 0.101 | 0.015 | 0.036 | 0.114 | 0.152 | 0.011 | 0.028 | 0.103 | 0.137 |
| 0.050 | 0.012 | 0.028 | 0.091 | 0.125 | 0.016 | 0.040 | 0.135 | 0.181 | 0.012 | 0.033 | 0.128 | 0.171 |
| 0.100 | 0.015 | 0.039 | 0.140 | 0.193 | 0.020 | 0.056 | 0.206 | 0.276 | 0.015 | 0.047 | 0.199 | 0.267 |
| 0.150 | 0.017 | 0.046 | 0.165 | 0.225 | 0.026 | 0.070 | 0.253 | 0.338 | 0.017 | 0.055 | 0.230 | 0.308 |
| 0.200 | 0.020 | 0.049 | 0.162 | 0.219 | 0.032 | 0.078 | 0.263 | 0.350 | 0.020 | 0.057 | 0.219 | 0.293 |
| 0.300 | 0.021 | 0.047 | 0.130 | 0.174 | 0.038 | 0.082 | 0.236 | 0.312 | 0.021 | 0.051 | 0.168 | 0.225 |
| 0.400 | 0.019 | 0.042 | 0.106 | 0.137 | 0.037 | 0.078 | 0.201 | 0.261 | 0.019 | 0.044 | 0.130 | 0.173 |
| 0.500 | 0.018 | 0.039 | 0.093 | 0.116 | 0.038 | 0.077 | 0.183 | 0.230 | 0.018 | 0.041 | 0.106 | 0.136 |
| 0.600 | 0.017 | 0.038 | 0.088 | 0.108 | 0.037 | 0.076 | 0.178 | 0.219 | 0.017 | 0.038 | 0.094 | 0.117 |
| 0.750 | 0.017 | 0.039 | 0.094 | 0.115 | 0.037 | 0.078 | 0.187 | 0.228 | 0.017 | 0.039 | 0.096 | 0.118 |
| 1.000 | 0.015 | 0.034 | 0.087 | 0.107 | 0.031 | 0.064 | 0.154 | 0.188 | 0.014 | 0.034 | 0.087 | 0.107 |
| 1.500 | 0.011 | 0.024 | 0.062 | 0.077 | 0.021 | 0.046 | 0.108 | 0.131 | 0.010 | 0.023 | 0.061 | 0.076 |
| 2.000 | 0.008 | 0.017 | 0.046 | 0.056 | 0.016 | 0.035 | 0.080 | 0.098 | 0.008 | 0.017 | 0.045 | 0.055 |
| 3.000 | 0.005 | 0.011 | 0.028 | 0.035 | 0.011 | 0.022 | 0.052 | 0.062 | 0.005 | 0.011 | 0.028 | 0.034 |
| 4.000 | 0.004 | 0.008 | 0.019 | 0.024 | 0.007 | 0.015 | 0.037 | 0.045 | 0.004 | 0.008 | 0.018 | 0.023 |
| 5.000 | 0.003 | 0.006 | 0.015 | 0.018 | 0.006 | 0.012 | 0.031 | 0.036 | 0.003 | 0.006 | 0.015 | 0.018 |
| 7.500 | 0.002 | 0.004 | 0.010 | 0.012 | 0.004 | 0.008 | 0.019 | 0.024 | 0.002 | 0.004 | 0.010 | 0.012 |
| 10.000 | 0.002 | 0.003 | 0.007 | 0.009 | 0.002 | 0.005 | 0.013 | 0.016 | 0.002 | 0.003 | 0.007 | 0.009 |

## Table 4
## Controlling Earthquakes

| | 100-yr UHS | 475-yr UHS | 5,000-yr UHS | 10,000-yr UHS |
|---|---|---|---|---|
| **Far West 2 (east)** | | | | |
| **PGA** | | | | |
| M* | 5.1 | 5.1 | 5.4 | 5.1 |
| D* (km) | 58 | 58 | 35 | 18 |
| ε* | 0.5 | 1.5 | 1.3 | 1.2 |
| **1.0 Sec SA** | | | | |
| M* | 7.4 | 7.9 | 7.6 | 7.0 |
| D* | 438 | 468 | 325 | 260 |
| ε* | 1.2 | 1.7 | 2.3 | 2.1 |
| **Far West 1 (west)** | | | | |
| **PGA** | | | | |
| M* | 5.1 | 5.1 | 5.4 | 5.4 |
| D* (km) | 58 | 58 | 40 | 29 |
| ε* | 0.5 | 1.5 | 16 | 1.5 |
| **1.0 Sec SA** | | | | |
| M* | 7.4 | 7.9 | 6.9 | 7.0 |
| D* | 445 | 435 | 228 | 260 |
| ε* | 1.4 | 1.8 | 2.1 | 2.1 |
| **Near West** | | | | |
| **PGA** | | | | |
| M* | 5.1 | 5.1 | 5.4 | 5.4 |
| D* (km) | 58 | 58 | 38 | 26 |
| ε* | 0.4 | 1.6 | 1.7 | 1.5 |
| **1.0 Sec SA** | | | | |
| M* | 7.3 | 7.9 | 7.7 | 7.7 |
| D* | 435 | 435 | 373 | 370 |
| ε* | 1.2 | 1.6 | 2.2 | 2.2 |
| **Pinto Valley** | | | | |
| **PGA** | | | | |
| M* | 5.1 | 5.1 | 5.5 | 5.6 |
| D* (km) | 33 | 33 | 33 | 30 |
| ε* | -0.1 | 0.8 | 2.0 | 2.0 |
| **1.0 Sec SA** | | | | |
| M* | 7.1 | 7.3 | 7.1 | 7.2 |
| D* | 405 | 358 | 248 | 280 |
| ε* | 1.4 | 1.7 | 2.1 | 2.1 |

**Table 5**
**Far West 1 Soil UHS**

| Period (sec) | Far West 1 | | | |
|---|---|---|---|---|
| | 100-yr UHS SA (g) | 450-yr UHS SA (g) | 5,000-yr UHS SA (g) | 10,000-yr UHS SA (g) |
| 0.010 | 0.011 | 0.022 | 0.067 | 0.090 |
| 0.030 | 0.011 | 0.023 | 0.072 | 0.099 |
| 0.050 | 0.012 | 0.027 | 0.088 | 0.121 |
| 0.100 | 0.014 | 0.038 | 0.135 | 0.187 |
| 0.150 | 0.017 | 0.045 | 0.159 | 0.219 |
| 0.200 | 0.020 | 0.049 | 0.157 | 0.213 |
| 0.300 | 0.021 | 0.046 | 0.127 | 0.169 |
| 0.400 | 0.019 | 0.042 | 0.104 | 0.135 |
| 0.500 | 0.018 | 0.039 | 0.093 | 0.115 |
| 0.600 | 0.017 | 0.038 | 0.088 | 0.108 |
| 0.750 | 0.017 | 0.039 | 0.095 | 0.116 |
| 1.000 | 0.015 | 0.035 | 0.087 | 0.107 |
| 1.500 | 0.011 | 0.024 | 0.063 | 0.078 |
| 2.000 | 0.008 | 0.017 | 0.046 | 0.057 |
| 3.000 | 0.005 | 0.011 | 0.029 | 0.035 |
| 4.000 | 0.004 | 0.008 | 0.019 | 0.024 |
| 5.000 | 0.003 | 0.006 | 0.015 | 0.018 |
| 7.500 | 0.002 | 0.004 | 0.010 | 0.012 |
| 10.000 | 0.002 | 0.003 | 0.007 | 0.009 |

## Table 6
## 5,000-Year Return Period CMS

| Period (s) | Far West 1 | | Far West 2 | | Near West | | Pinto Valley | |
|---|---|---|---|---|---|---|---|---|
| | 0.2 Sec SA | 1.0 Sec SA | 0.2 Sec SA | 1.0 Sec SA | 0.2 Sec SA | 1.0 Sec SA | 0.2 Sec SA | 1.0 Sec SA |
| 0.010 | 0.090 | 0.017 | 0.057 | 0.010 | 0.087 | 0.014 | 0.078 | 0.010 |
| 0.020 | 0.090 | 0.017 | 0.058 | 0.010 | 0.088 | 0.014 | 0.080 | 0.010 |
| 0.030 | 0.095 | 0.016 | 0.062 | 0.010 | 0.093 | 0.013 | 0.085 | 0.010 |
| 0.050 | 0.111 | 0.015 | 0.075 | 0.009 | 0.110 | 0.012 | 0.101 | 0.009 |
| 0.075 | 0.136 | 0.013 | 0.095 | 0.008 | 0.135 | 0.011 | 0.126 | 0.008 |
| 0.100 | 0.163 | 0.014 | 0.111 | 0.008 | 0.161 | 0.011 | 0.147 | 0.008 |
| 0.150 | 0.231 | 0.021 | 0.148 | 0.012 | 0.227 | 0.017 | 0.196 | 0.012 |
| 0.200 | 0.269 | 0.034 | 0.162 | 0.018 | 0.263 | 0.027 | 0.219 | 0.018 |
| 0.250 | 0.231 | 0.051 | 0.126 | 0.025 | 0.221 | 0.040 | 0.180 | 0.025 |
| 0.300 | 0.199 | 0.068 | 0.101 | 0.032 | 0.188 | 0.052 | 0.151 | 0.032 |
| 0.400 | 0.143 | 0.097 | 0.067 | 0.043 | 0.134 | 0.073 | 0.109 | 0.043 |
| 0.500 | 0.109 | 0.127 | 0.048 | 0.053 | 0.100 | 0.095 | 0.081 | 0.053 |
| 0.750 | 0.060 | 0.189 | 0.024 | 0.075 | 0.054 | 0.138 | 0.045 | 0.075 |
| 1.000 | 0.038 | 0.213 | 0.015 | 0.087 | 0.034 | 0.154 | 0.030 | 0.087 |
| 1.500 | 0.019 | 0.155 | 0.007 | 0.057 | 0.017 | 0.107 | 0.016 | 0.057 |
| 2.000 | 0.011 | 0.115 | 0.004 | 0.040 | 0.010 | 0.076 | 0.010 | 0.040 |
| 3.000 | 0.004 | 0.068 | 0.002 | 0.022 | 0.004 | 0.043 | 0.005 | 0.022 |
| 4.000 | 0.002 | 0.044 | 0.001 | 0.013 | 0.002 | 0.027 | 0.003 | 0.013 |
| 5.000 | 0.001 | 0.030 | 0.001 | 0.009 | 0.001 | 0.018 | 0.002 | 0.009 |
| 7.500 | 0.001 | 0.016 | 0.000 | 0.005 | 0.001 | 0.010 | 0.001 | 0.005 |
| 10.000 | 0.000 | 0.009 | 0.000 | 0.003 | 0.000 | 0.005 | 0.000 | 0.003 |

**Table 7**
**Seed Time Histories**

| Year | Earthquake | M | Station | Comp. | Closest Distance (km) | $V_S30$ (m/s) | PGA (g) |
|---|---|---|---|---|---|---|---|
| 1999 | Chi-Chi, Taiwan | 7.6 | KAU046 | E | 162 | 204 | 0.023 |
| 1999 | Chi-Chi, Taiwan | 7.6 | KAU081 | E | 161 | 272 | 0.027 |
| 2002 | Denali, Alaska | 7.9 | Anchorage - New Fire Station #1 | 090 | 267 | 275 | 0.018 |
| 2002 | Denali, Alaska | 7.9 | Valdez City Hall | 090 | 239 | 275 | 0.027 |
| 1999 | Kocaeli, Turkey | 7.5 | Afyon Bay | 000 | 208 | – | 0.013 |
| 1979 | Imperial Valley, California | 6.5 | Cerro Prieto | 147 | 15 | 660 | 0.169 |
| 1995 | Kozani, Greece | 6.4 | Kozani | L | 20 | 660 | 0.215 |

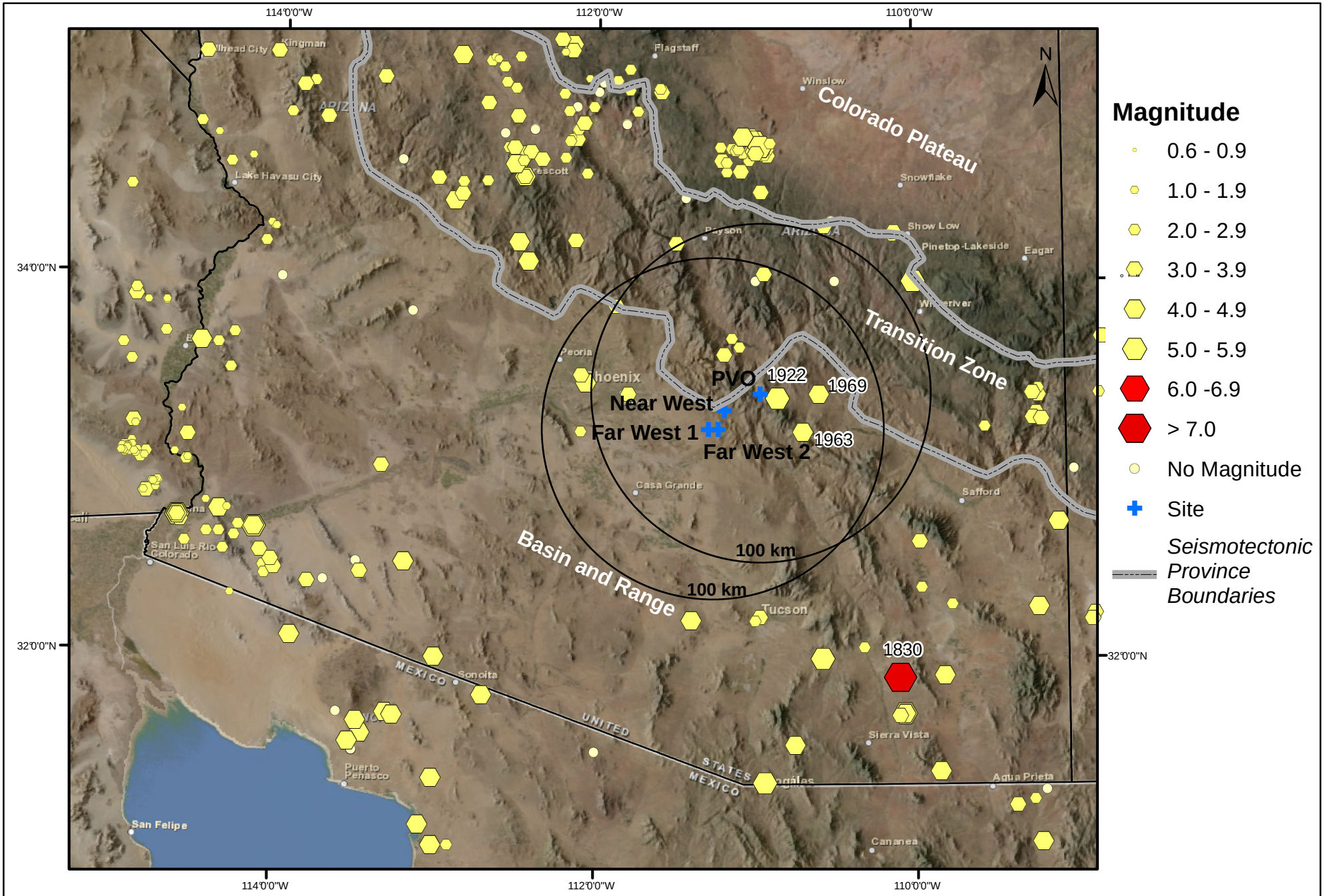



N

0 10 20 40 60 Kilometers

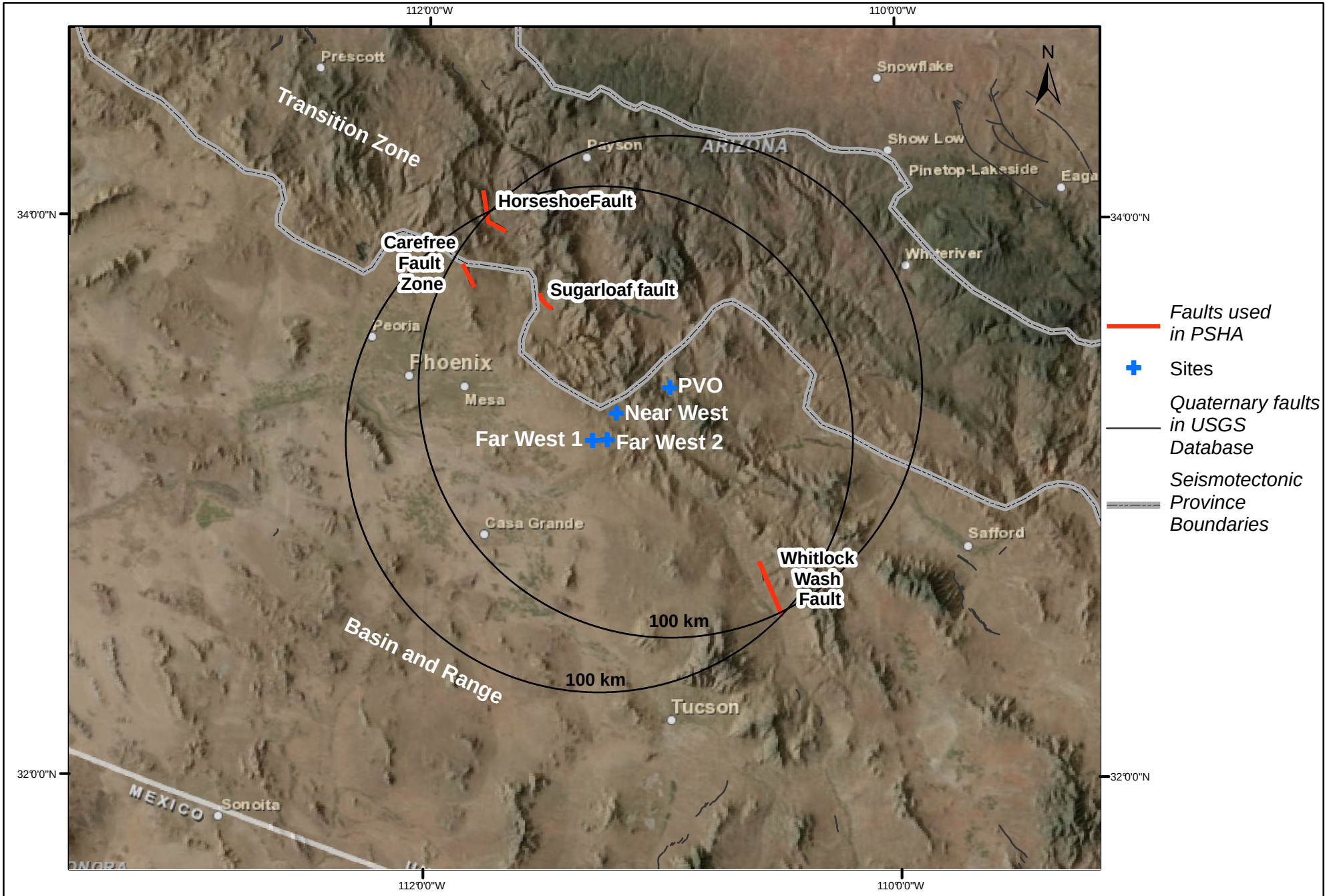
0 5 10 20 30 40 Miles

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | SITE LOCATIONS | Figure 1 |



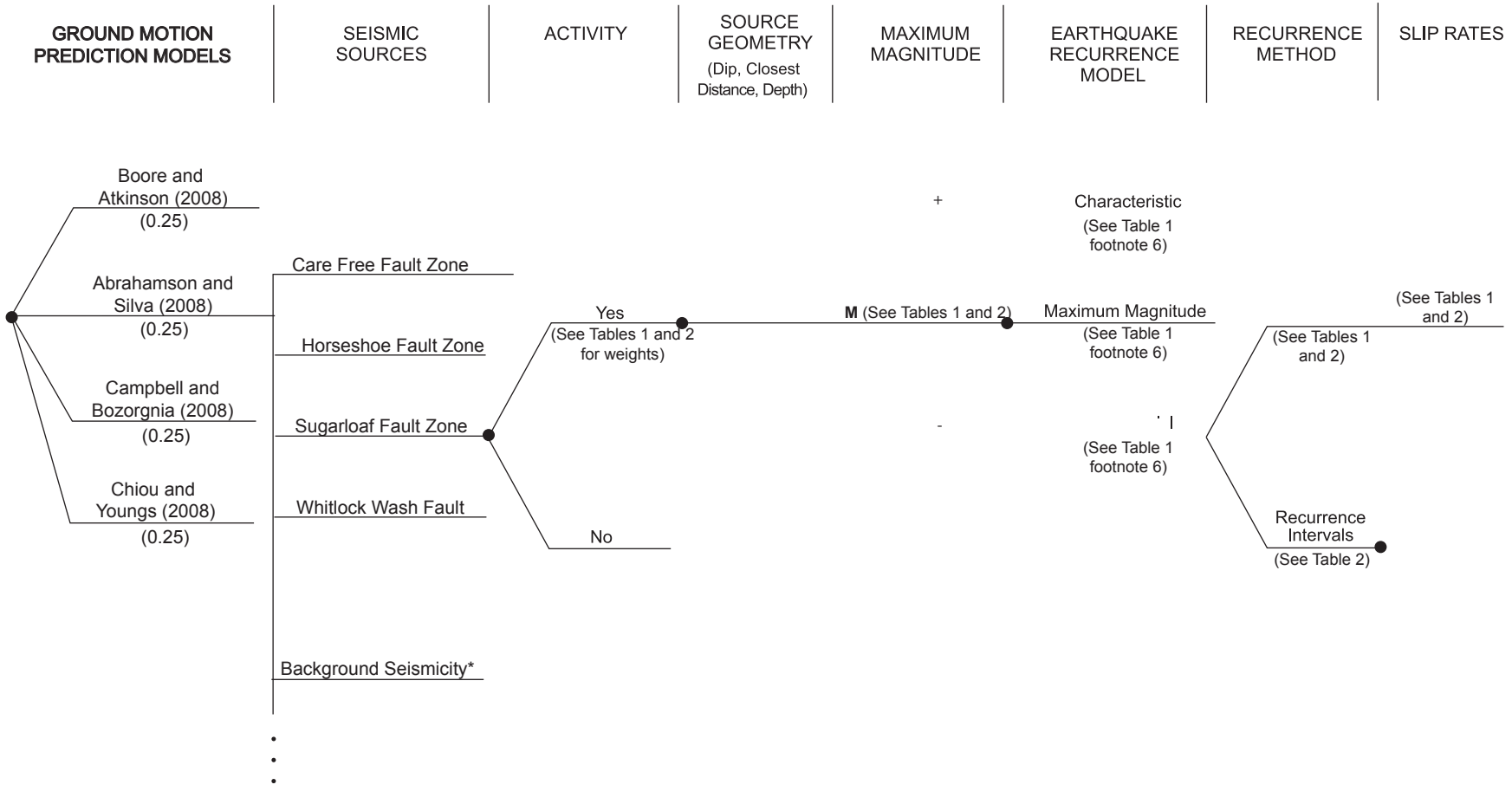

| | | |
|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | HISTORICAL SEISMICITY IN THE SITE REGION, 1830-2012 |

Figure 2



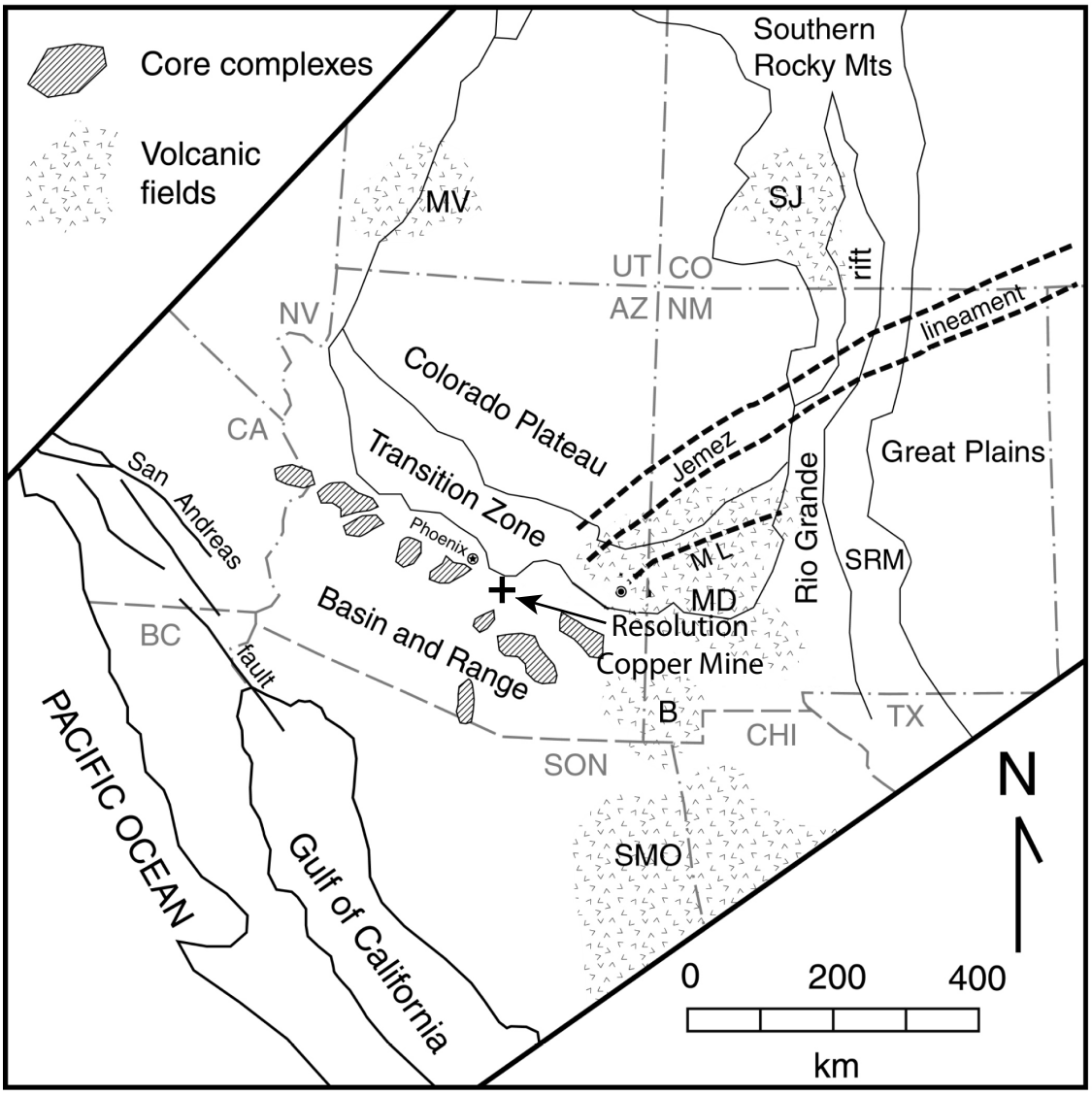

| | | |
|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | SEISMIC SOURCES INCLUDED IN THE PSHA |

Figure 3



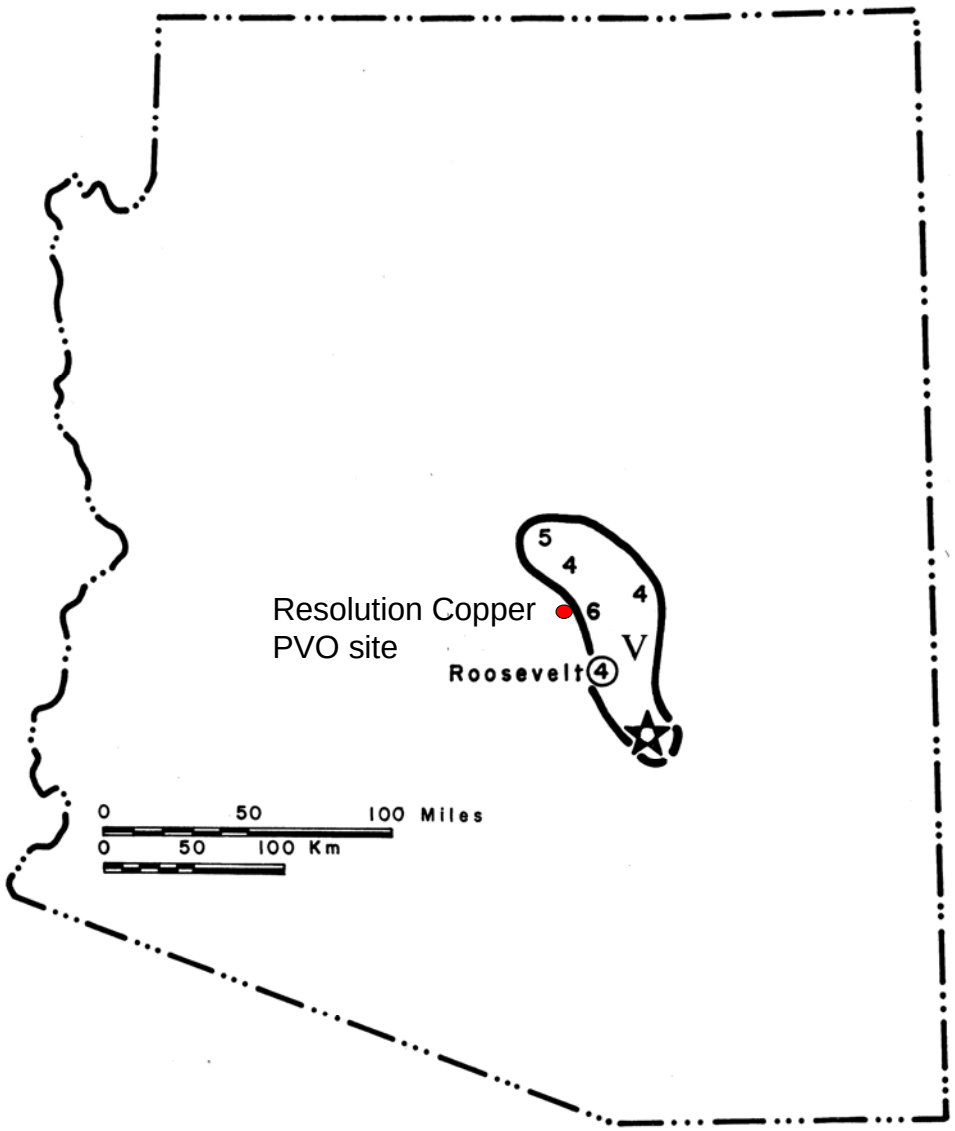

*Treated as areal source zone and with Gaussian Smoothing, each weighted 50 percent.

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | SEISMIC HAZARD MODEL LOGIC TREE | Figure 4 |




Modified from: Drewes *et al.* (1985)

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | SEISMOTECTONIC SETTING | Figure 5 |




From DuBois (1982)

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | ISOSEISMAL MAP FOR THE 1922<br>MM VI ($M_l$ 5) MIAMI EARTHQUAKE | Figure<br>6 |

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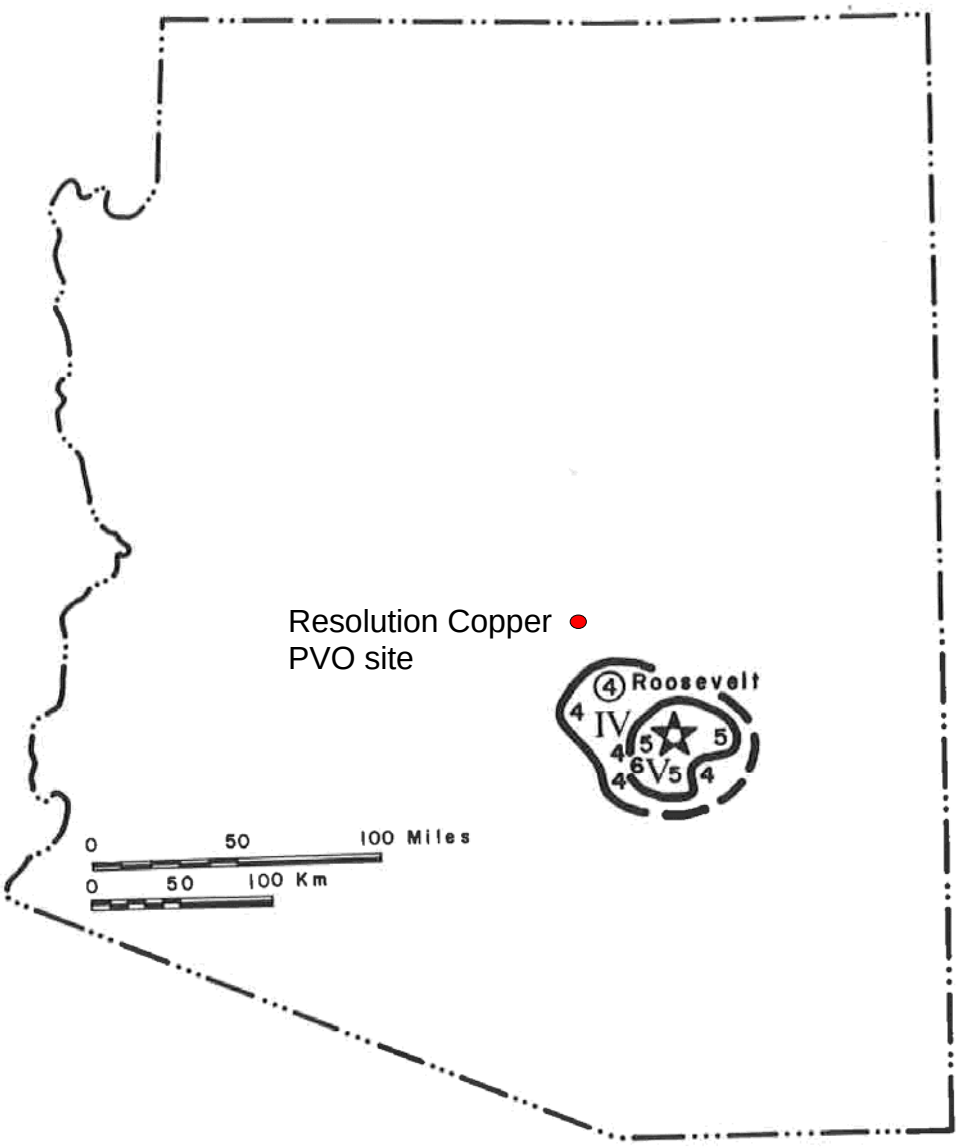


From DuBois (1982)

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | ISOSEISMAL MAP FOR THE 1963 $M_L$ 4.1 GLOBE EARTHQUAKE | Figure 7 |

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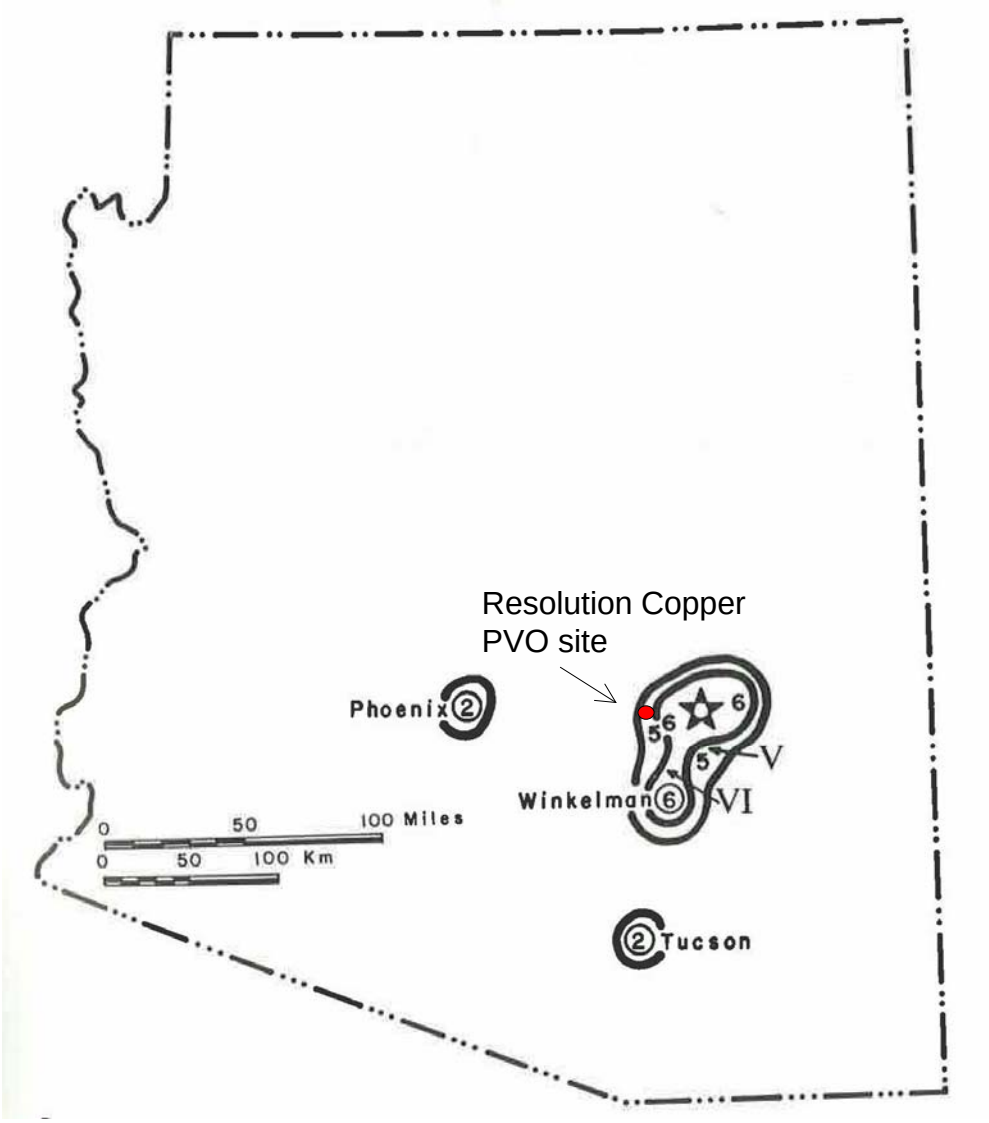
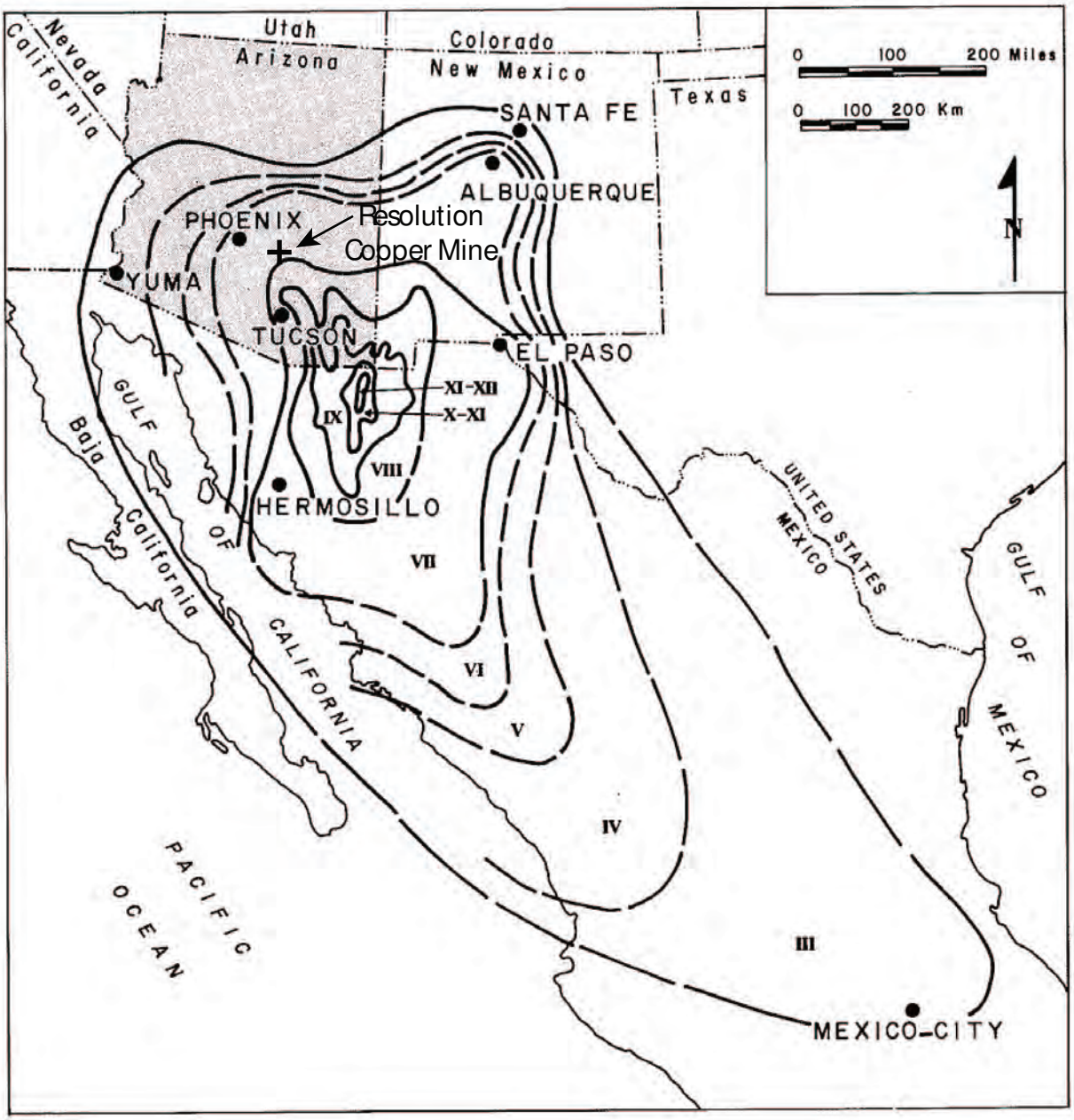



From DuBois (1982)

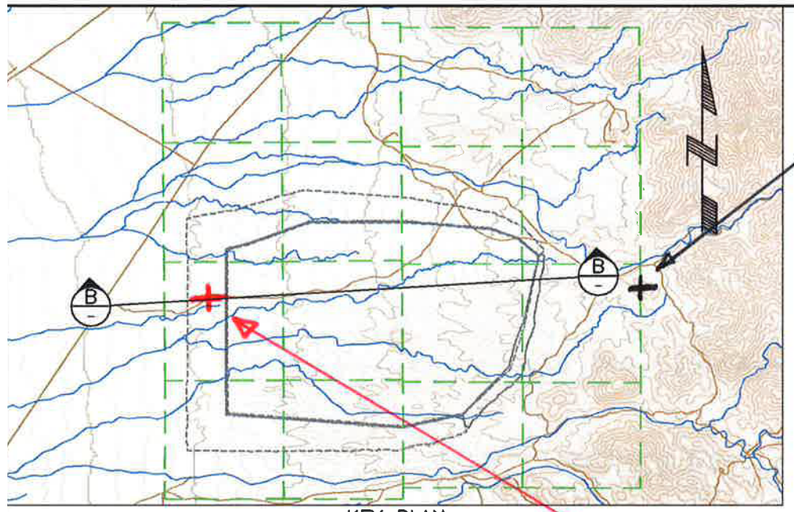
| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | ISOSEISMAL MAP FOR THE 1969 $M_L$ 4.4 SAN CARLOS EARTHQUAKE | Figure 8 |

W:\x_wcfs\PROJECTS\Resolution Copper Mine\Figures\Isoseismal maps\1969 isoseismal.grf




Modified From DuBois et al., 1982

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | ISOSEISMAL MAP OF THE 3 MAY 1887 M 7.4 SONORA, MEXICO EARTHQUAKE | Figure 9 |

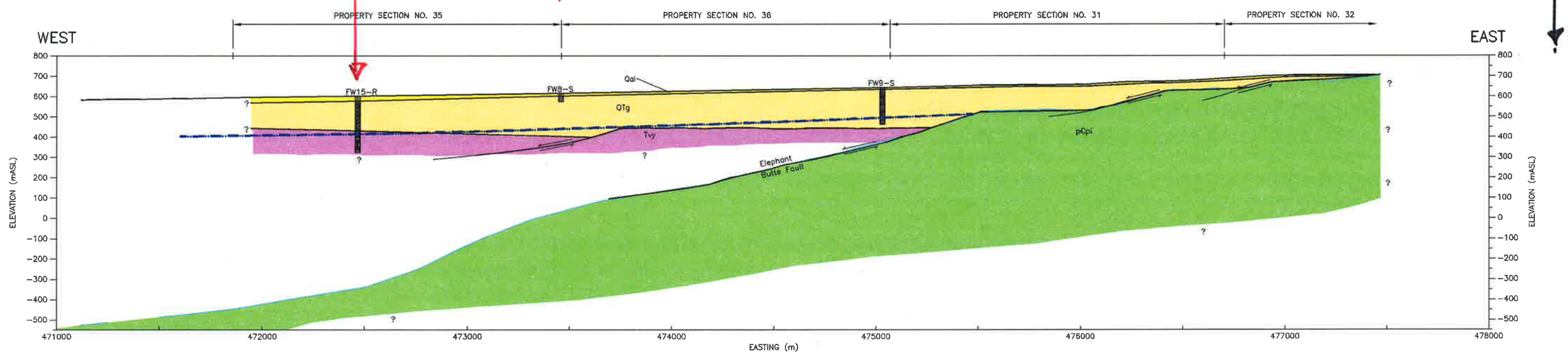



KEY PLAN
SCALE: NTS

+ Hard Bedrock site for SHA

Alluvium site for SHA

Hard Bedrock Site




SECTION B
SCALE A 3,1

LEGEND

- QUATERNARY ALLUVIUM (Qal)
- QUATERNARY AND TERTIARY BASIN-FILL DEPOSITS (QTg)
- TERTIARY YOUNGER VOLCANICS (Tvy)
- PRECAMBRIAN PINAL SCHIST (pCpi)
- FAULT
- INTERPRETED TOP OF BEDROCK FROM HGI GRAVITY MODELING (APPENDIX G)
- GROUNDWATER LEVEL ELEVATION (MAY 22, 2012)

NOT FOR CONSTRUCTION

DRAFT

To be read with Klohn Crippen Berger report dated

CLIENT

PROJECT

RESOLUTION PROJECT
FAR WEST TAILINGS MANAGEMENT PRE-FEASABILITY STUDY

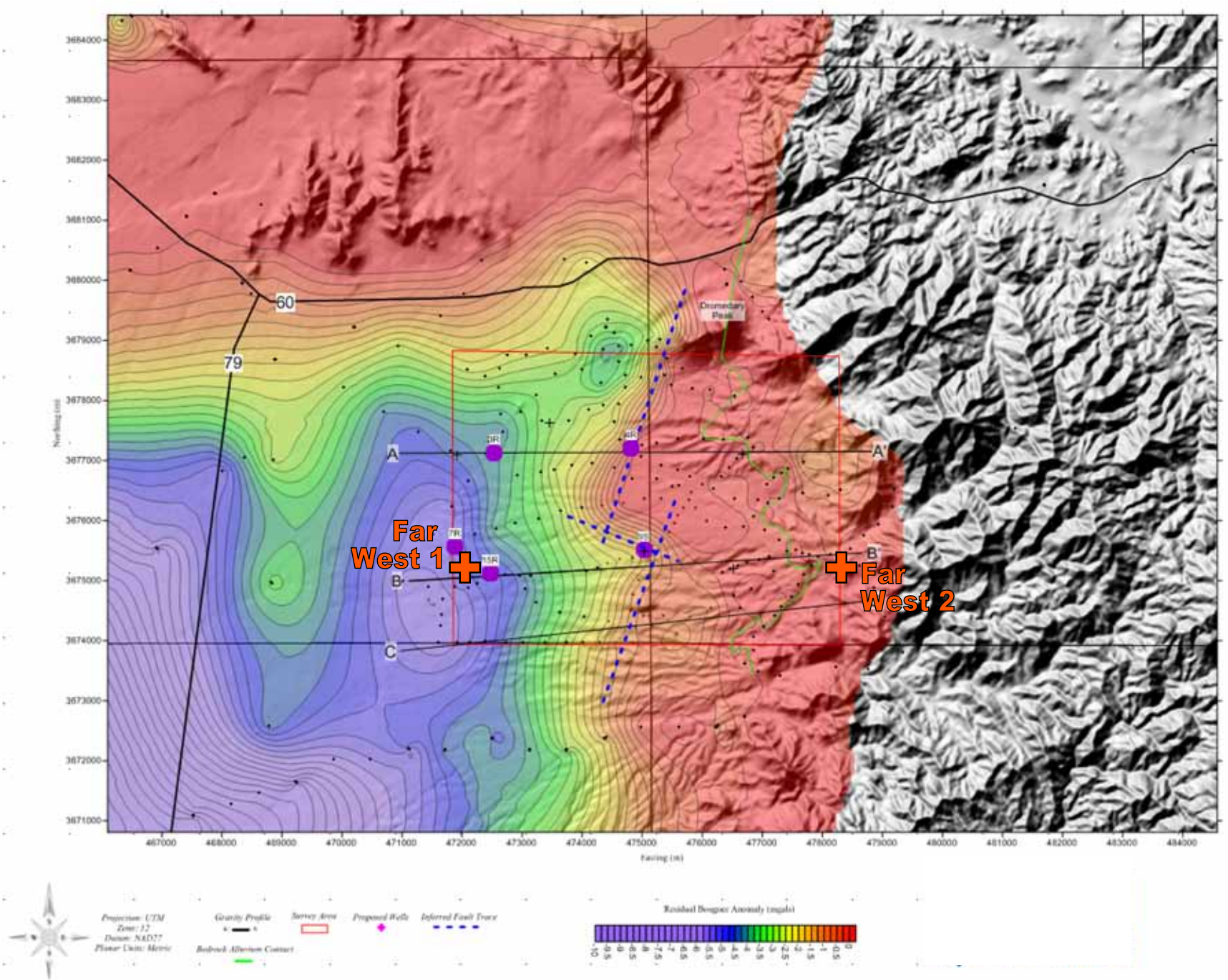
URS

Project No. 26818581

Resolution Copper Mining, Arizona

FAR WEST GEOLOGIC CROSS SECTION SHOWING ALLUVIUM AND ROCK SITE LOCATIONS

Figure 10




Source: Hydro Geophysics (2012)

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resoultion Copper Mining, Arizona | FAR WEST FOCUSED RESIDUAL BOUGER ANOMALY MAP | Figure 11 |

R. 11 E. | R. 12 E. | R. 13 E.

482,500 | 485,000 | 487,500 | 490,000 | 492,500 | 495,000

3,697,500 | 3,695,000 | 3,692,500 | 3,690,000 | 3,687,500 | 3,685,000 | 3,682,500 | 3,680,000

T. 1 N. | T. 1 S. | T. 2 S.

Near West Cleaner Tailings Site

Boyce Thompson Arboretum

Town of Superior

Queen Creek

Conley Spr

Main Fault

Concentrator Fault

Mine Workings

A | A' | B | B'

## EXPLANATION

- Apache Leap Tuff Aquifer Monitor Well
- Deep Groundwater System Monitor Well
- West Plant Monitor Well
- Shaft
- Historic/Current Point of Groundwater Withdrawal
- Exploration Borehole
- Spring
- Watershed Boundary
- Silver King Canyon Site
- Whitford Canyon Site
- Happy Camp Site
- Arizona Trail
- Resolution Claims

### Geologic Structural Features

- Fault; dashed where approximately located; dotted where concealed. Bar and Ball on Downthrown Side.
- 40 — Strike and Dip of Beds
- 30 — Strike and Dip of Metamorphic Foliation
- 15 — Strike and Dip of Igneous Foliation

### Geologic Units

- d-Holocene Disturbed Surficial Deposits
- Qyc- Holocene Active Alluvium
- Qtc-Holocene & Pleistocene Tallus & Colluvium
- Qy-Holocene Low Terrace & Alluvial Fan Deposits
- Qml-Late Pleistocene to Middle Pleistocene Alluvium Undifferentiated
- Qm-Mid Pleistocene Dissected Alluvial Fan & Terrace Deposits
- Ql-Late Pleistocene Moderately Dissected Alluvial Fan & Terrace Deposits
- Qo-Early Pleistocene Deeply Dissected Alluvium Undifferentiated
- Qs-Quaternary Surficial Deposits
- Qtc-Holocene & PleistoceneTalus & Colluvium
- Qal-Quaternary Alluvium
- QTl-Holocene or Pliocene Landslide Deposits
- Tcu-Miocene Conglomerate
- Tsu-Miocene Sandstone
- Tt-Miocene Tuff (poorly welded)
- Tfp-Mid Miocene to Early Miocene Felsic Lava Flows Picketpost Mountain
- Tfpt-Mid Miocene to Early Miocene Tuffs Picketpost Mountain
- Tb-Mid Miocene to Early Miocene Basalt Picket Post Mountain
- Tg2-Miocene Granitoid Stock of Wood Camp Canyon
- Trdu-Middle Miocene Undifferentiated Felsic Lava
- Tal-Early Miocene Apache Leap Tuff
- Trdt-Early Miocene Undifferentiated Felsic Tuffs
- Tev-Early Miocene Volcanic Rocks
- Tsl-Miocene to Late Oligocene Clastic Rocks
- TKpg-Late Cretaceous or Paleocene Porphyry of Government Hlll
- Kqd-Late Cretaceous Quartz Diorite of Peachville Wash
- ?n-Naco Formation
- M§s-Mississipian/Devonian/Cambrian Undifferentiated Escabrosa, Martin & Bolsa
- Cb-Bolsa Quartzite
- Yad-Mid Proterozoic Apache Group, Troy Quartzite & Diabase
- Yd-Mid Proterozoic Diabase
- Ya-Mid Proterozoic Apache Group
- Yg2-Mid Proterozoic Porphyritic Biotite Granite
- Xgd-Early Proterozoic Granodiorite to Granite
- Xp-Early Proterozoic Pinal Schist
- Xpc-Pinal Schist Calc - Silicate & Amphibolite Facies
- Xpp-Pinal Schist - Phyllite Facies

(Geology from Spencer and others, 1998; Faults from Peterson, 1969, and Spencer and Richard, 1995)

DRAFT

0 1,000 2,000 Meters

0 2,000 4,000 6,000 8,000 Feet

A A' Location of Hydrogeologic Section

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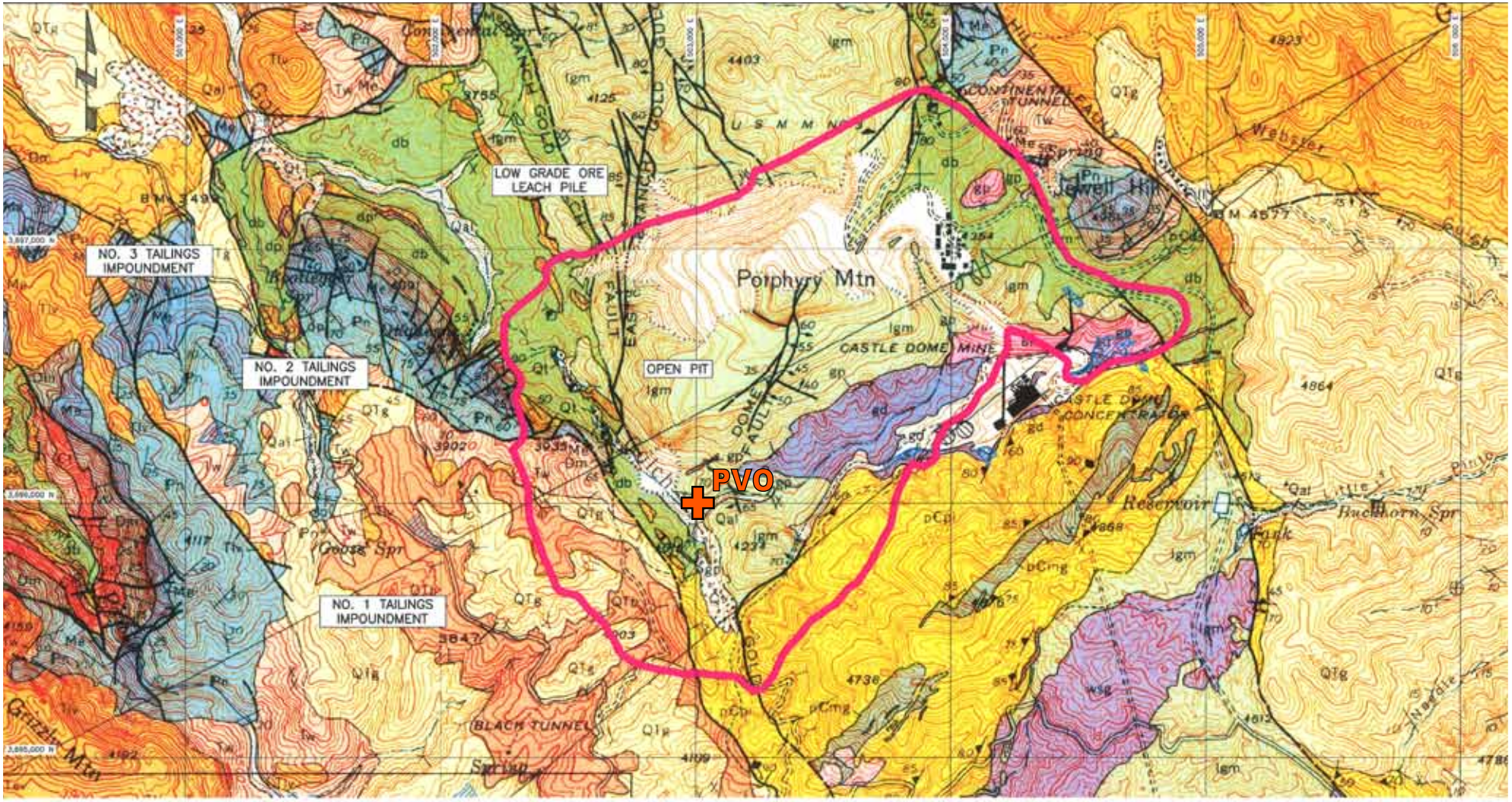
Project No. 26818581

Resolution Copper Mining, Arizona

NEAR WEST GEOLOGIC MAP SHOWING MAPPED LOCAL FAULTS

Figure 12

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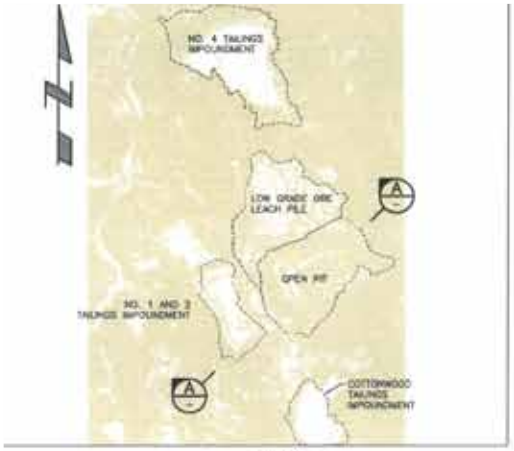
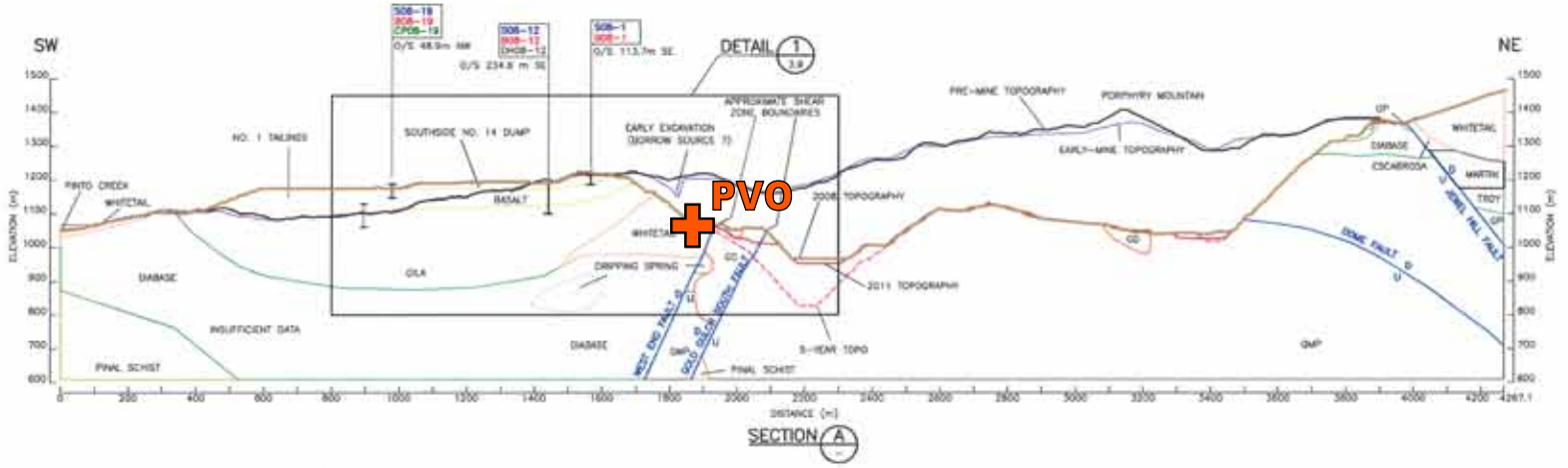
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | PVO GEOLOGIC MAP | Figure 13 |




KEY MAP




## GEOLOGIC UNIT NAMES AND ABBREVIATIONS

- LO LEACHED ORE
- TA TAILINGS
- WR WASTE ROCK DUMP
- Qal QUATERNARY ALLUVIUM
- QTb TERTIARY–QUATERNARY BASALT
- QTg TERTIARY–QUATERNARY GILA CONGLOMERATE
- Td TERTIARY DACITE
- Tw TERTIARY WHITETAIL CONGLOMERATE
- Dp LARAMIDE DIORITE
- Ap LARAMIDE APLITE
- Gp LARAMIDE GRANITE PORPHYRY
- Ba LARAMIDE INTRUSIVE BRECCIA
- Gd LARAMIDE GRANODIORITE
- Sg LARAMIDE SCHULTZE GRANITE
- Pc PENNSYLVANIAN–PERMIAN NACO LIMESTONE
- Ma MISSISSIPPIAN ESCABROSA LIMESTONE
- Dm DEVONIAN MARTIN LIMESTONE
- Cl CAMBRIAN TROY QUARTZITE
- Db PRECAMBRIAN DIABASE
- pCdg PRECAMBRIAN DRIPPING SPRING QUARTZITE
- pCp PRECAMBRIAN PIONEER FORMATION
- GMP PRECAMBRIAN QUARTZ MONZONITE (PORPHYRY)
- pCa PRECAMBRIAN PINAL SCHIST

FAULTS WITH UPTHROWN/DOWNTHROWN INDICATORS
PRE-MINE TOPOGRAPHY
5-YEAR TOPOGRAPHY (5 YEAR MINE PLAN)
JULY 2011 TOPOGRAPHY
2008 TOPOGRAPHY

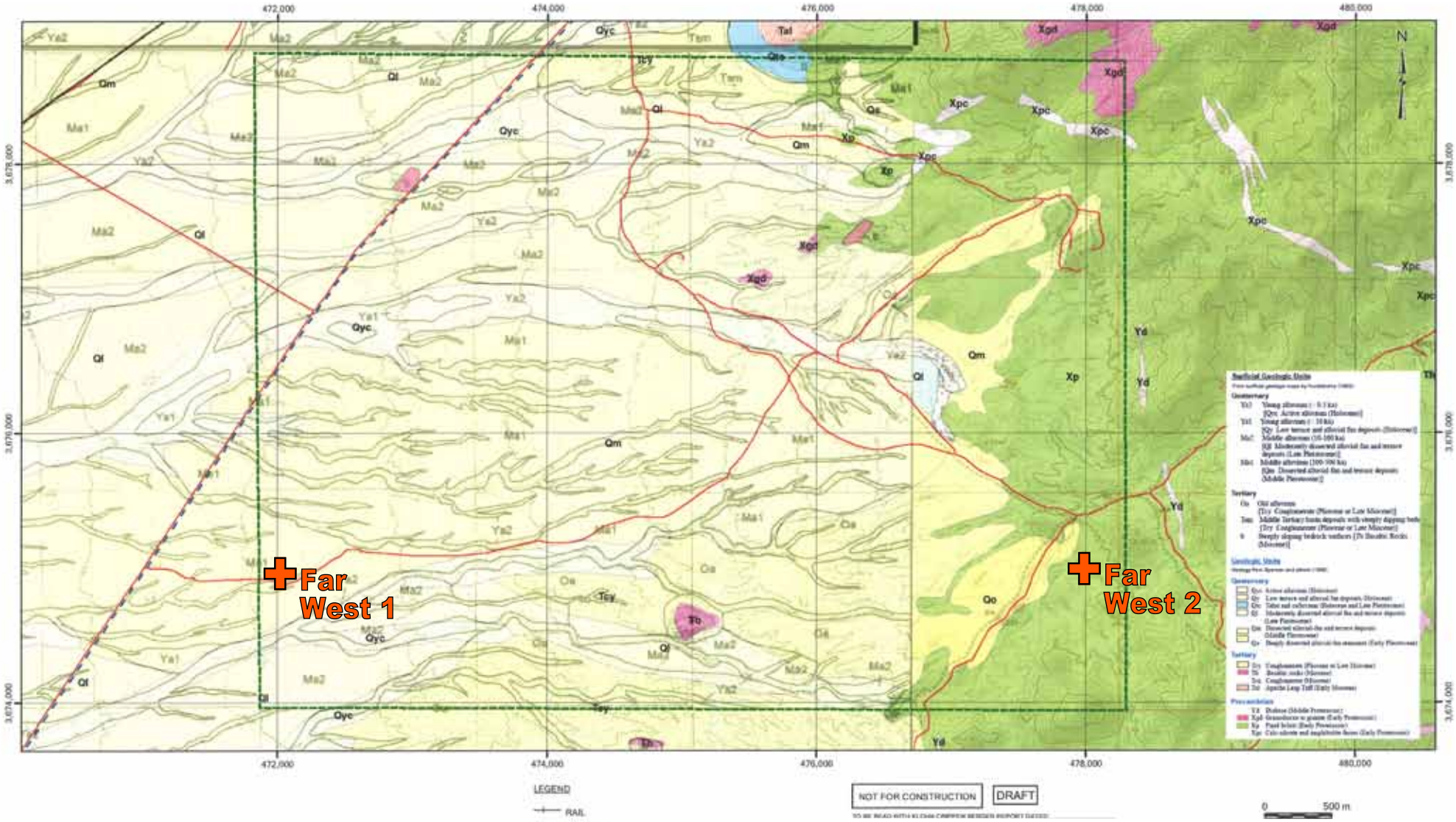
NOTE:

1. GEOLOGIC SECTION PROVIDED BY SRK, APR, 2009.

NOT FOR CONSTRUCTION

OCT, 2012

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | PVO GEOLOGIC CROSS SECTION | Figure 14 |




Notes:
1. NAD27 UTM12
2. Regional geological map based on Huckleberry (1993) and Spencer and others (1996). Provided by Montgomery and Associates.
3. Additional topographic data from USGS and National Geographic Society topographic maps, accessed via ESRI ArcGIS Online.

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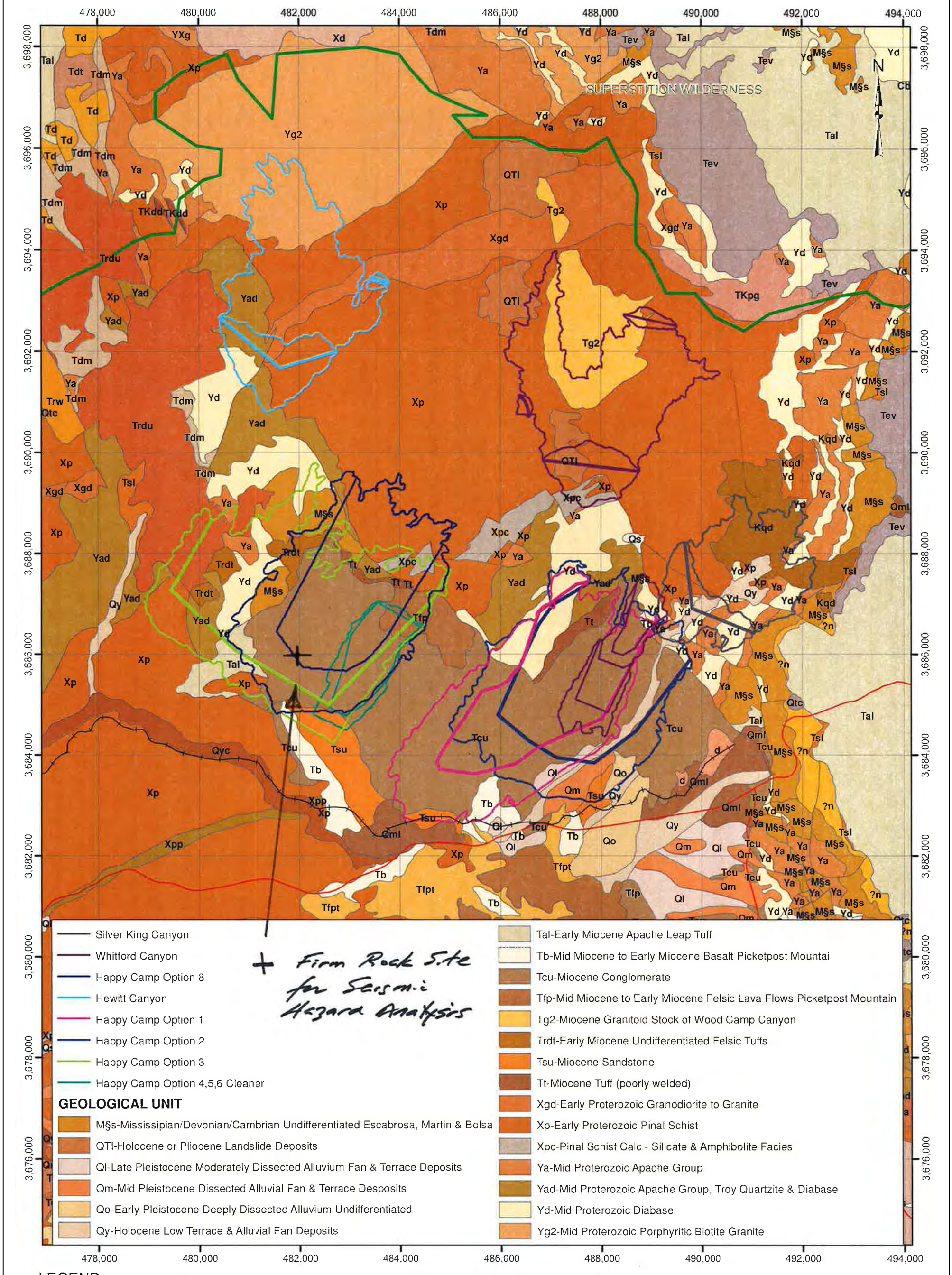
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | FAR WEST MAP OF SURFICIAL GEOLOGY | Figure 15 |




LEGEND:

RAILROAD  WILDERNESS AREA

HIGHWAY

NOTES:

1. PROJECTION AND DATUM: UTM12N NAD27
2. GEOLOGY DATA FROM SPENCE ET AL., 1998; FAULTS AND PETERSON, 1969 AND SPENCER AND RICHARDS, 1995.

NOT FOR CONSTRUCTION

TO BE READ WITH KLOHN CRIPPEN BERGER REPORT DATED _____

AS A MUTUAL PROTECTION TO OUR CLIENT, THE PUBLIC AND OURSELVES, ALL REPORTS AND DRAWINGS ARE SUBMITTED FOR THE CONFIDENTIAL INFORMATION OF OUR CLIENT FOR A SPECIFIC PROJECT AND AUTHORIZATION FOR USE AND/OR PUBLICATION OF DATA, STATEMENTS, CONCLUSIONS OR ABSTRACTS FROM OR REGARDING OUR REPORTS AND DRAWINGS IS RESERVED PENDING OUR WRITTEN APPROVAL

0  2,500 m

CLIENT: Resolution Copper Mining

PROJECT: RESOLUTION TAILINGS ALTERNATIVE ASSESSMENT

TITLE: SURFICIAL GEOLOGY

URS

Project No. 26818581

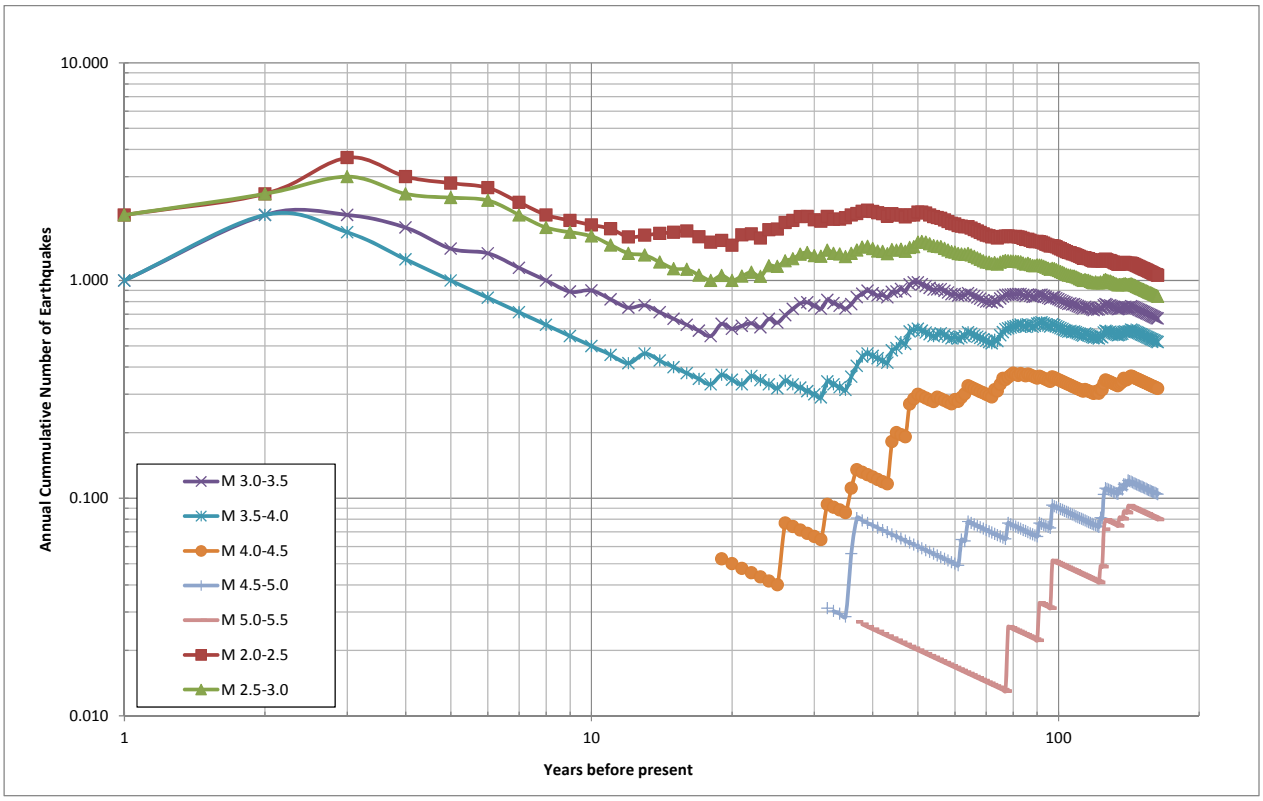
Resolution Copper Mining, Arizona

Klohn Crippen Berger

NEAR WEST MAP OF SURFICIAL GEOLOGY

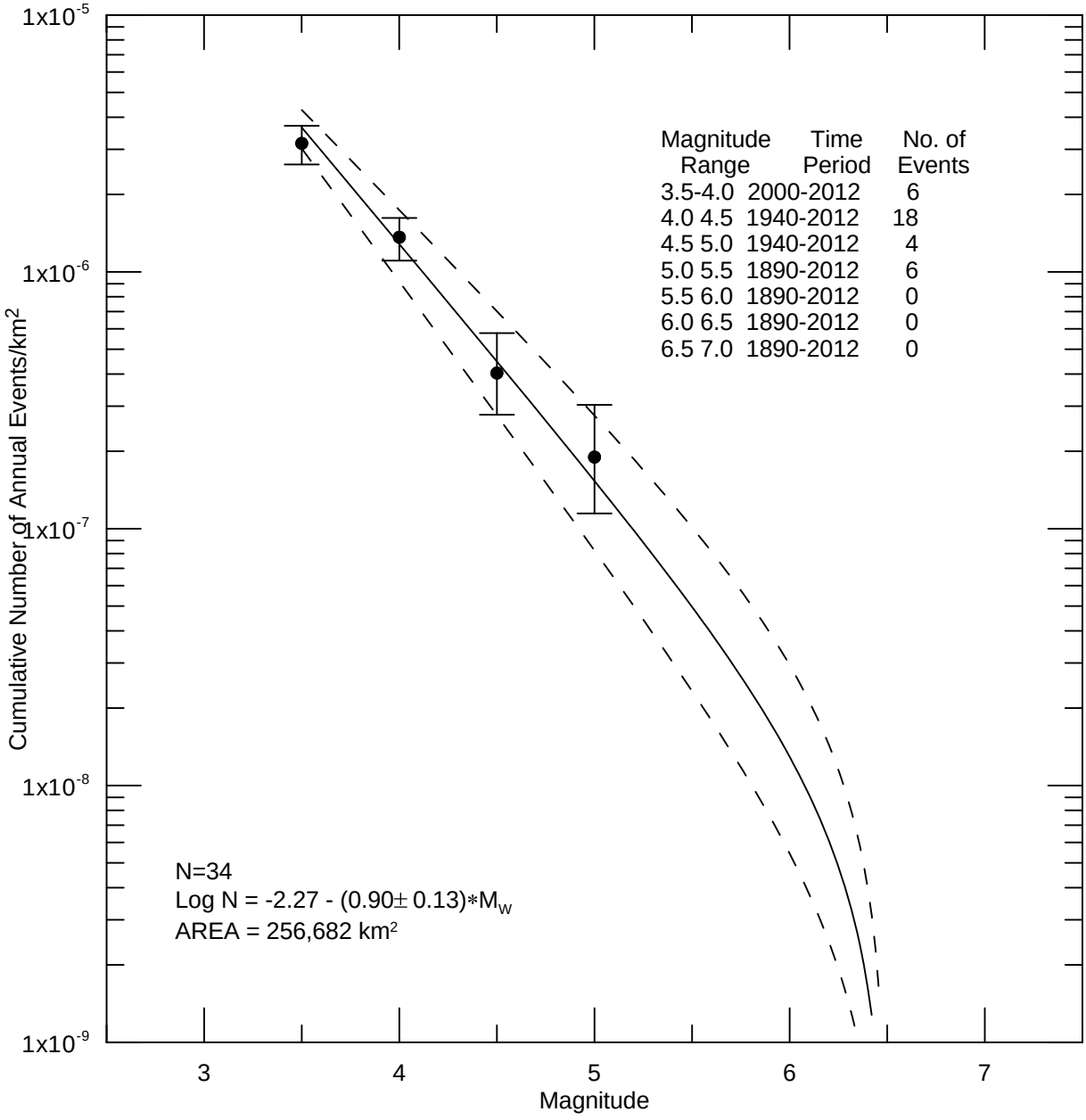
ADJ. No. M0944TA11  DWG No.

Figure 16




| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | STEPP PLOT FOR THE COMBINED<br>BASIN AND RANGE<br>AND TRANSTION ZONE PROVINCES | Figure<br>17 |

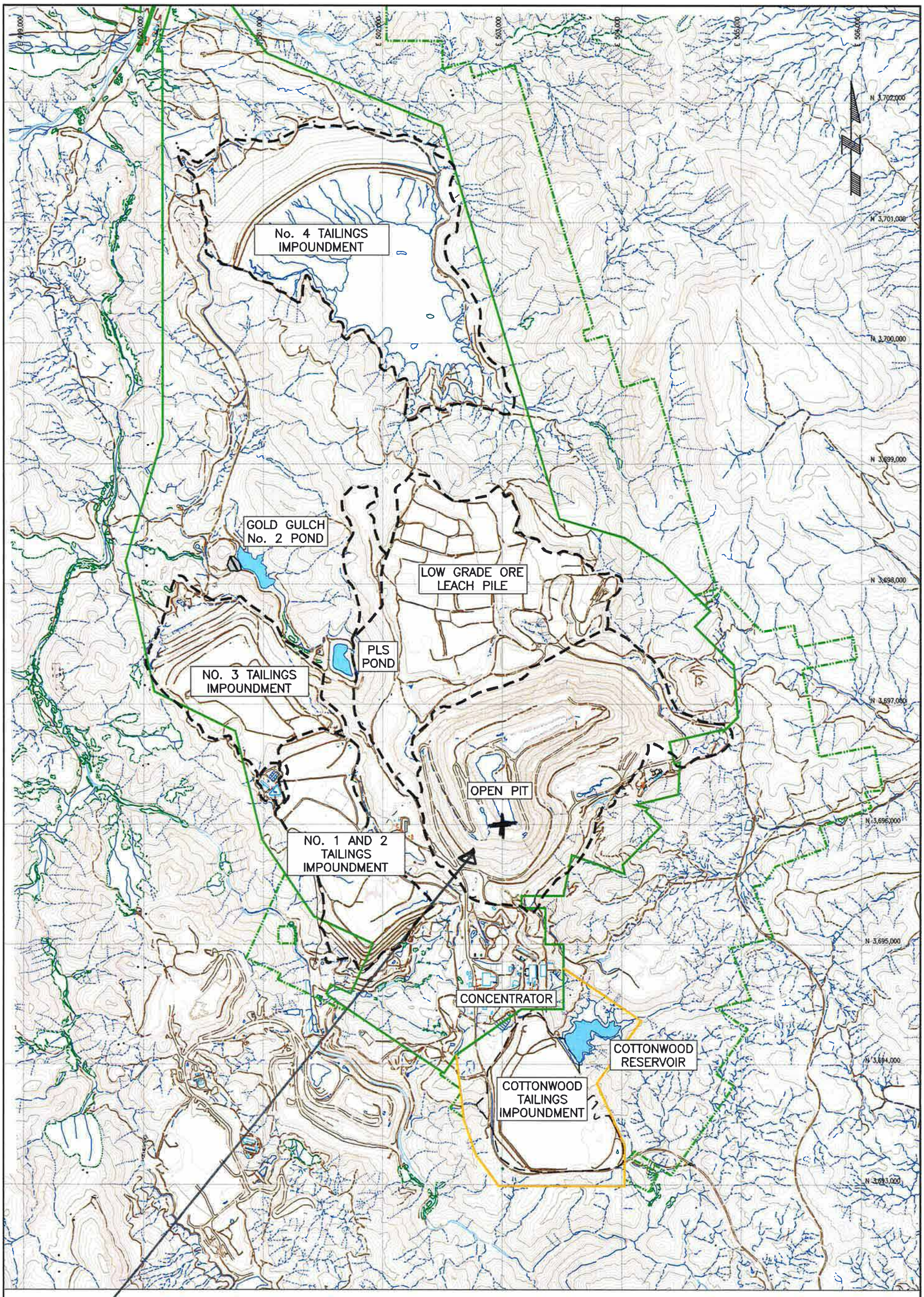
W:\x_wcfs\PROJECTS\Resolution Copper Mine\Seismicity\Stepp Plot Fig17.grf

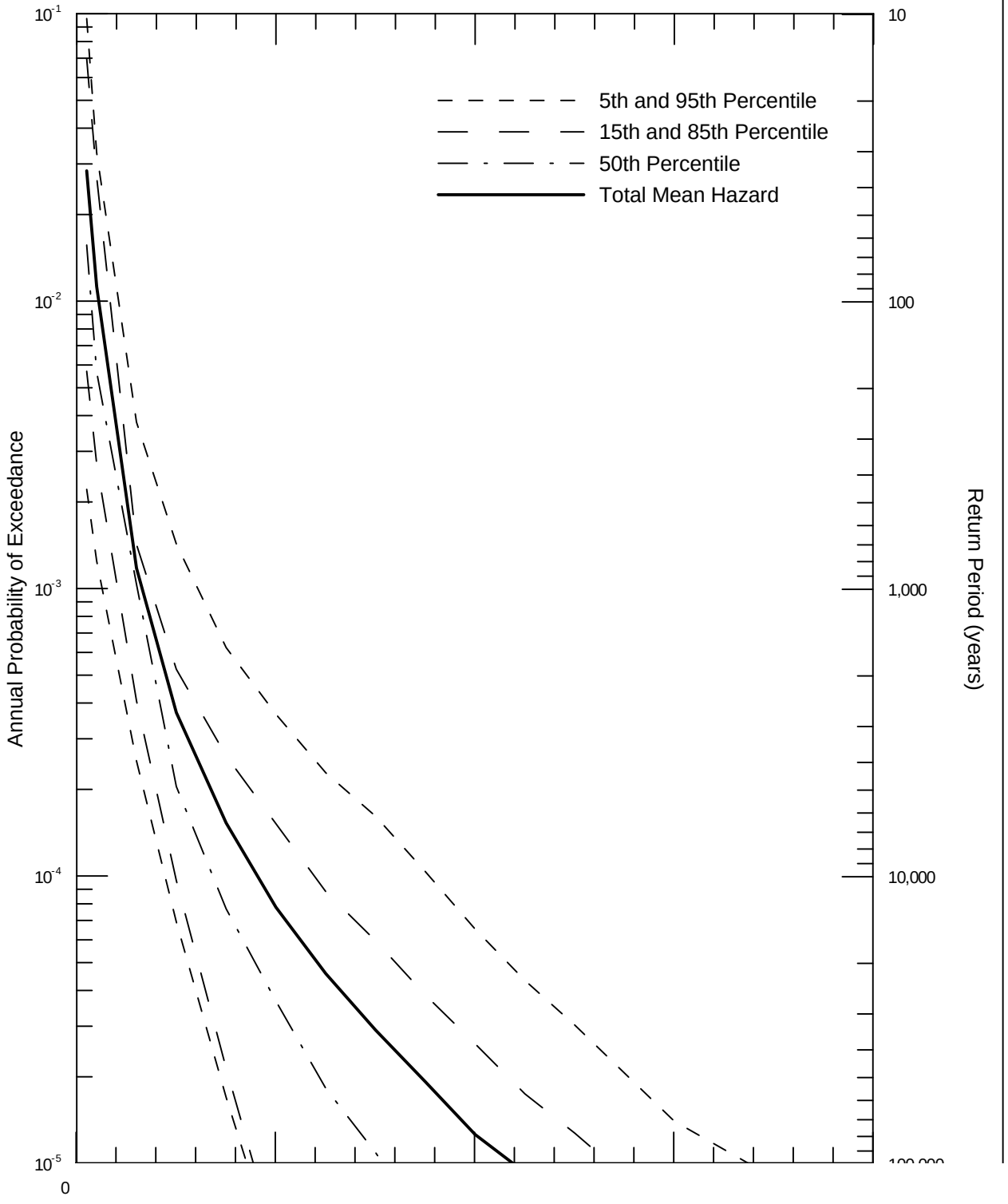



Return Periods
for zone
M5.0 24 yr
M6.0 195 yr
M6.5 554 yr

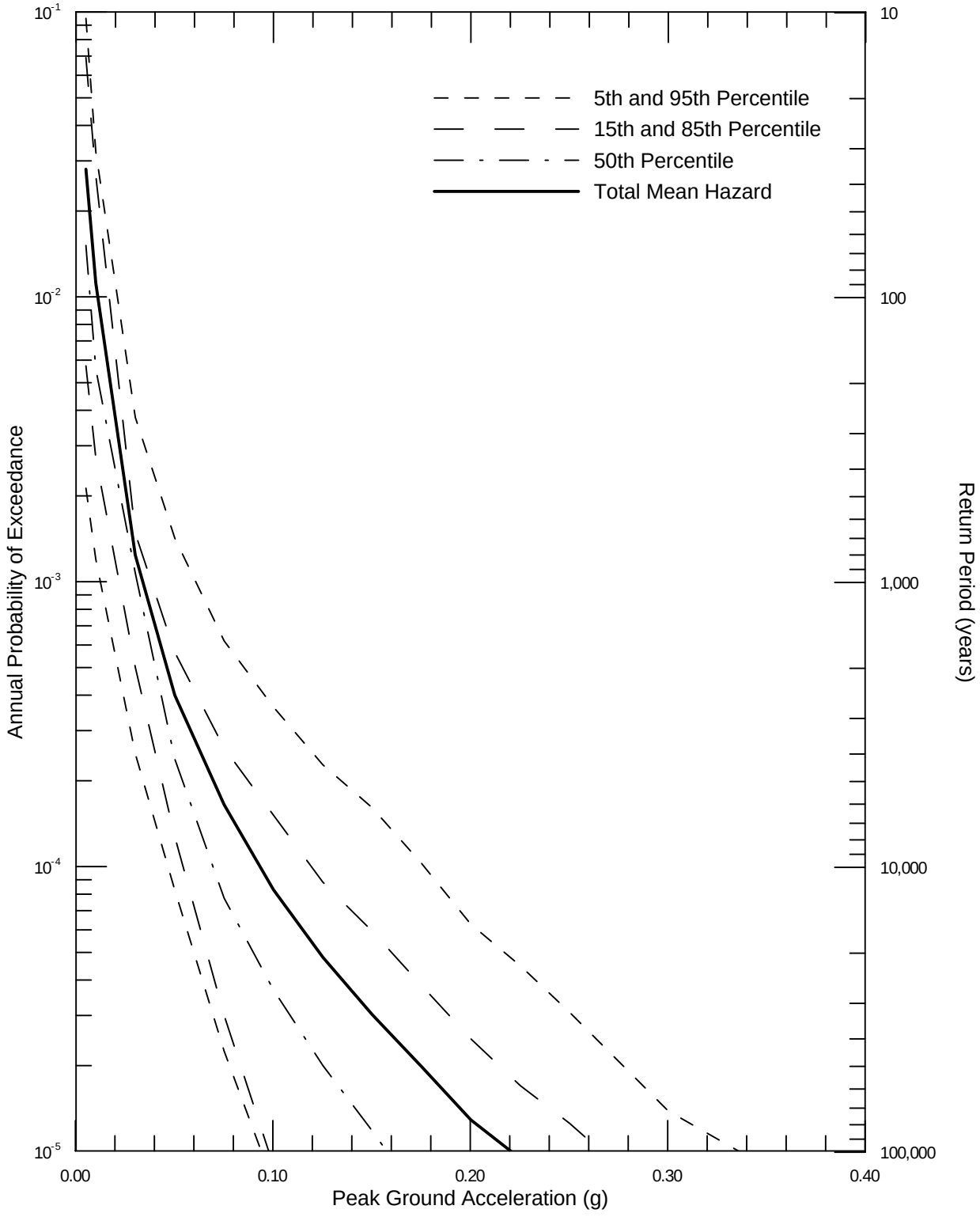
| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | EARTHQUAKE RECURRENCE FOR THE COMBINED SOUTHERN ARIZONA BASIN AND RANGE AND TRANSITION ZONE | Figure 18 |

W:\x_wcfs\PROJECTS\Resolution Copper Mine\Seismicity\recurrence\CombinedZones\rec-CB_6_Final_Figure.grf

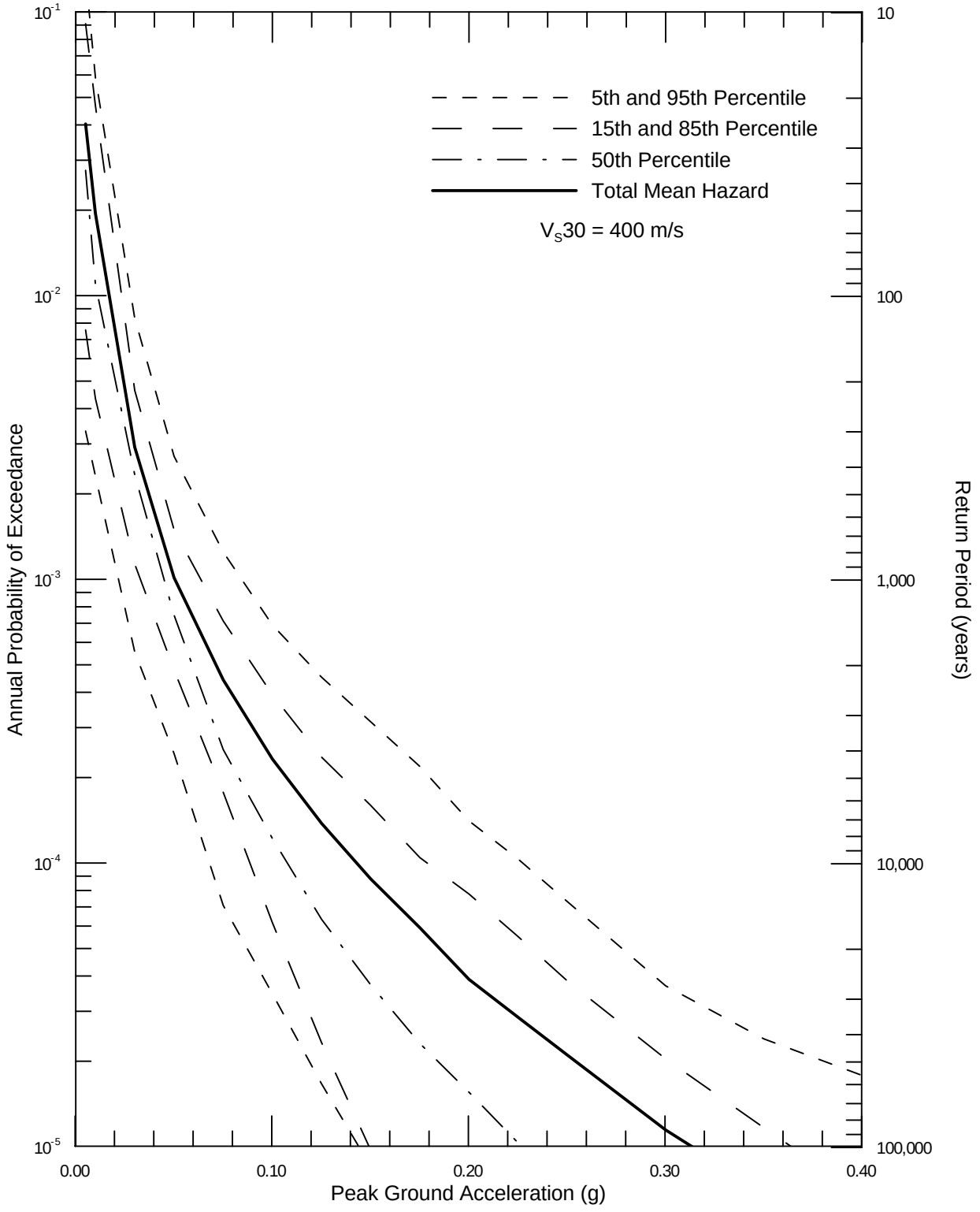

E 499,000
E 500,000
E 501,000
E 502,000
E 503,000
E 504,000
E 505,000
E 506,000
N 3,702,000
N 3,701,000
N 3,700,000
N 3,699,000
N 3,698,000
N 3,697,000
N 3,696,000
N 3,695,000
N 3,694,000
N 3,693,000
No. 4 TAILINGS IMPOUNDMENT
GOLD GULCH No. 2 POND
LOW GRADE ORE LEACH PILE
PLS POND
NO. 3 TAILINGS IMPOUNDMENT
OPEN PIT
NO. 1 AND 2 TAILINGS IMPOUNDMENT
CONCENTRATOR
COTTONWOOD RESERVOIR
COTTONWOOD TAILINGS IMPOUNDMENT
LEGEND
CREEK
PATENTED PROPERTY BOUNDARY
UNPATENTED PROPERTY BOUNDARY
PERMITTED BOUNDARY
+ Hard rock Site
NOTE:
1. DIGITAL TOPOGRAPHY PROVIDED BY RESOLUTION – JULY, 2011.
DATUM: UTM NAD27 ZONE 12
NOT FOR CONSTRUCTION
TO BE READ WITH KLOHN CRIPPEN BERGER REPORT DATED OCT. 2012
CLIENT
Resolution Copper Min
SCALE 0 750 m
RESOLUTION PROJECT
TAILINGS MANAGEMENT PRE-FEASIBILITY STUDY
TITLE
URS
Project No. 26818581
Resolution Copper Mining, Arizona
Klohn Crippen Berger
GENERAL SITE ARRANGEMENT
PVO GENERAL SITE ARRANGEMENT SHOWING SITE LOCATION
FIG No. M09441A09
SHEET No. 1 1
Figure 19


5th and 95th Percentile
15th and 85th Percentile
50th Percentile
Total Mean Hazard
Annual Probability of Exceedance
Return Period (years)
10-1
10-2
10-3
10-4
10-5
0
10
100
1,000
10,000
100,000

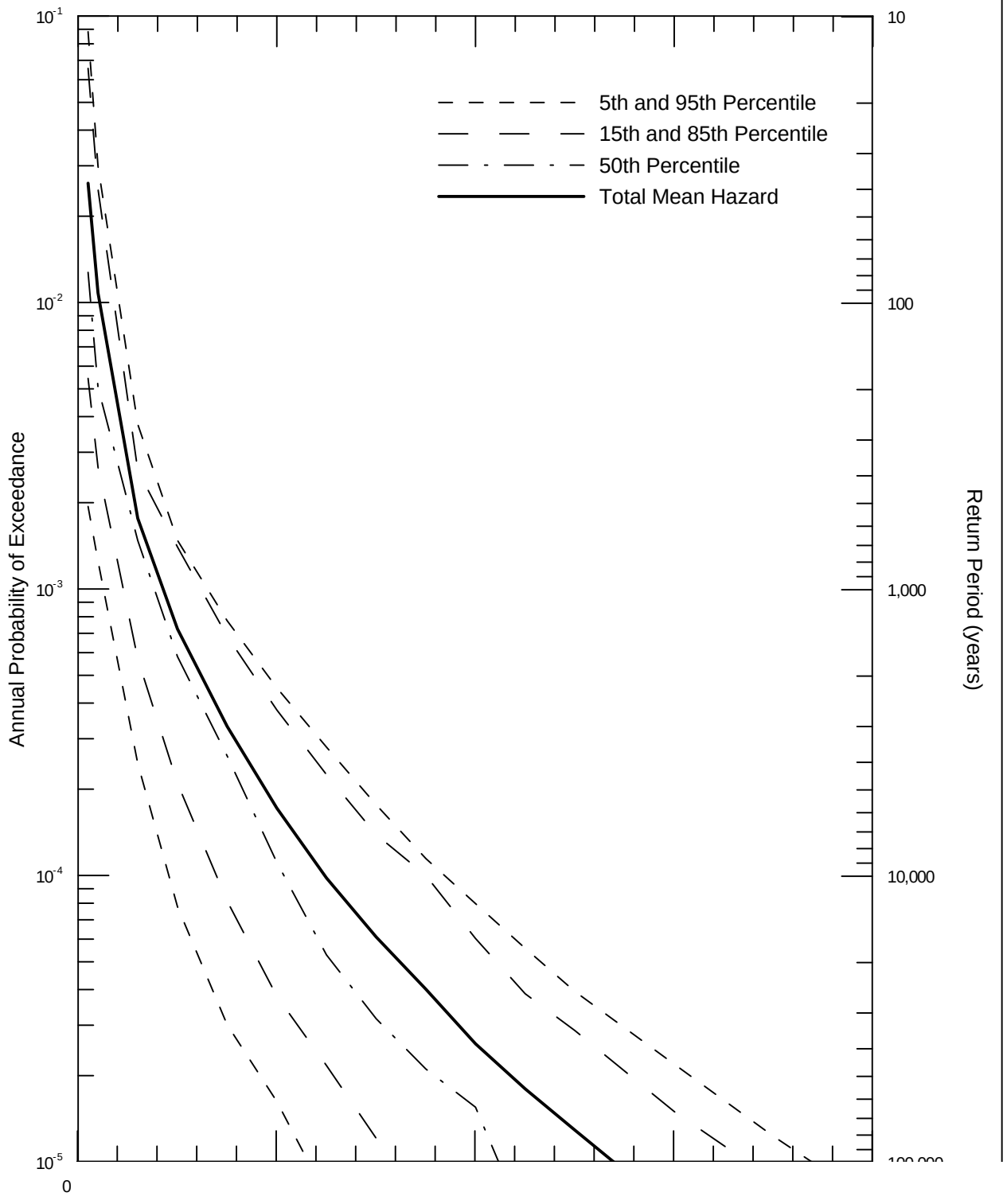
URS



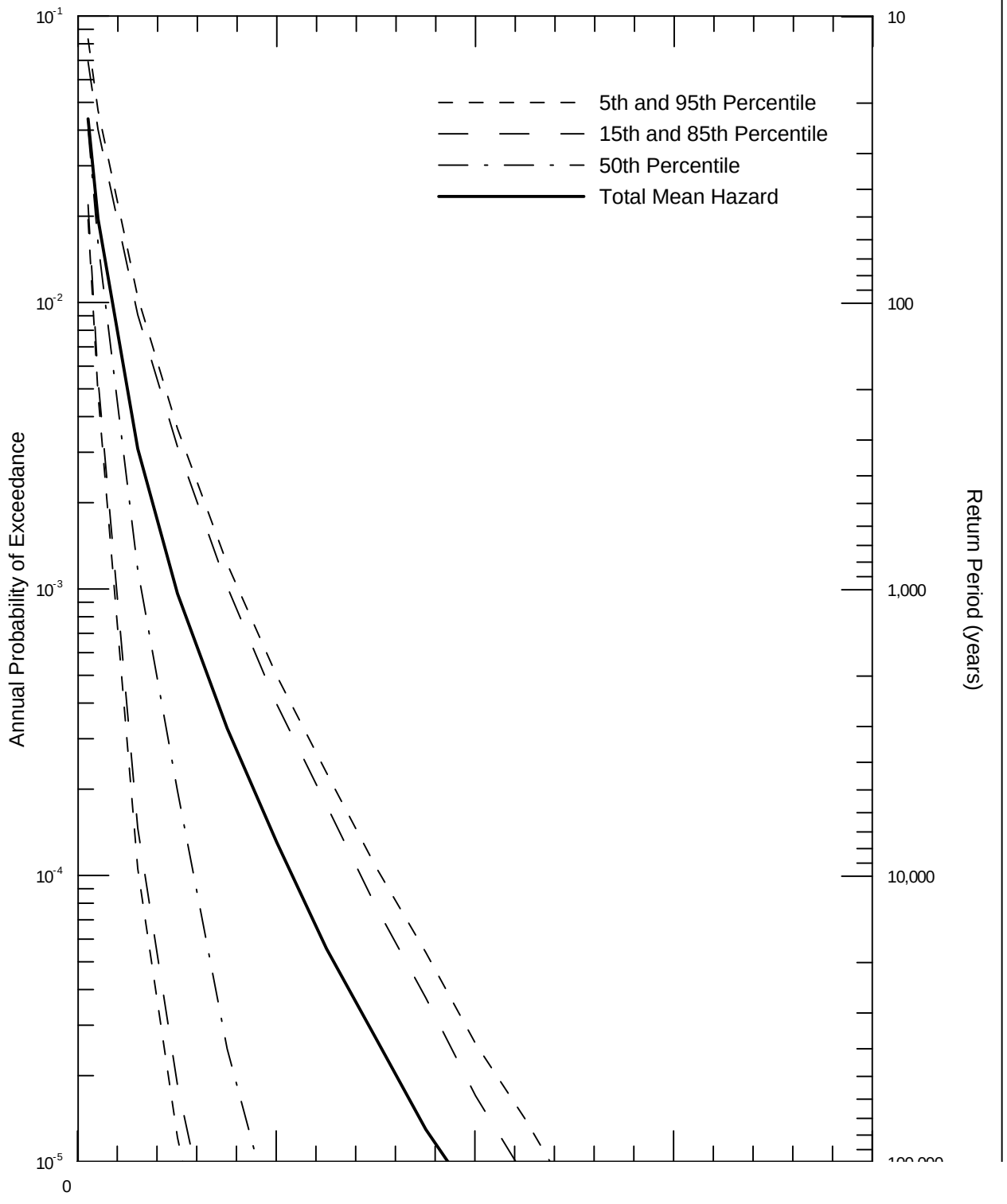

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SEISMIC HAZARD CURVES FOR<br>PEAK HORIZONTAL ACCELERATION<br>AT FAR WEST 2 SITE | Figure<br>21 |



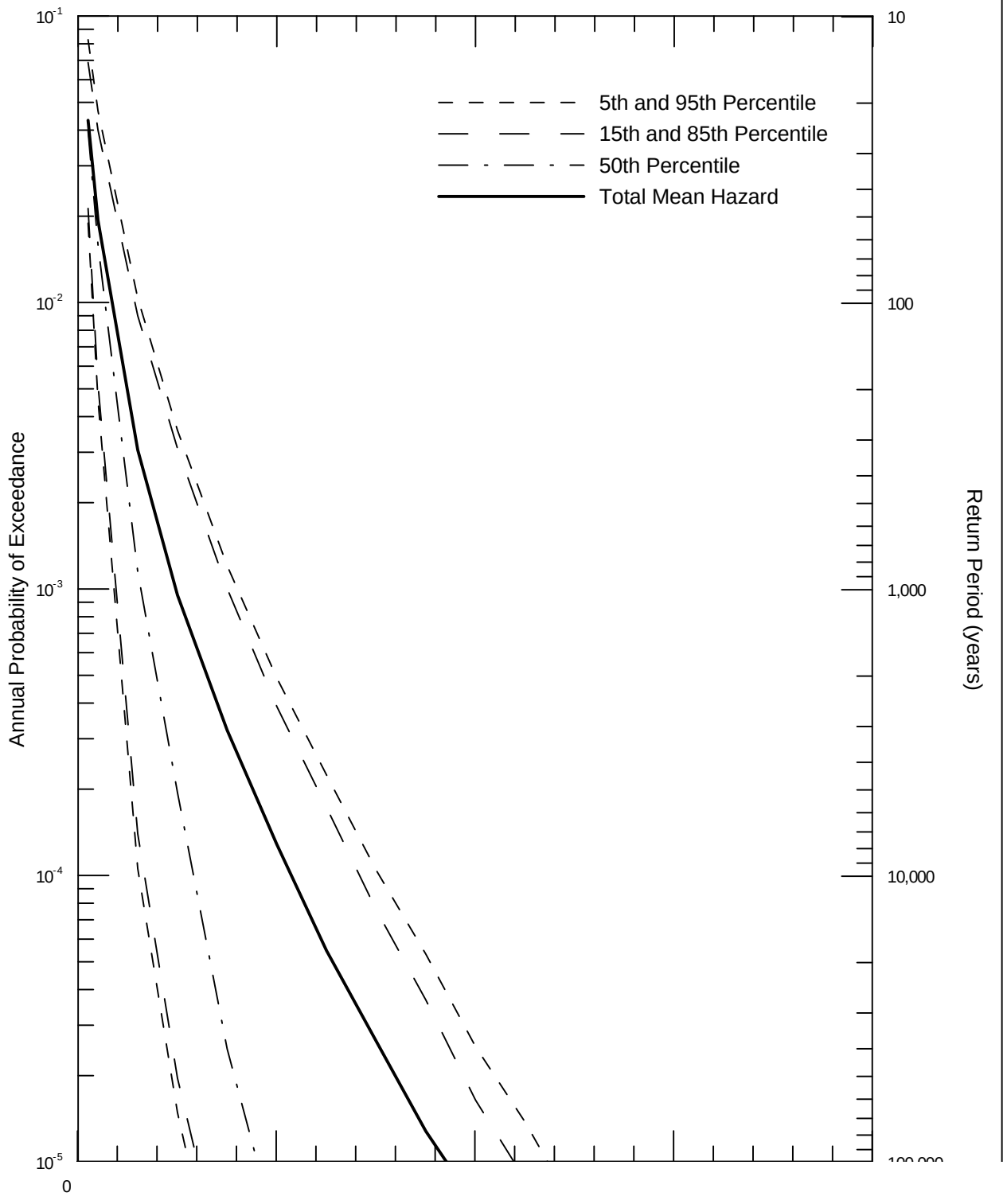

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SEISMIC HAZARD CURVES FOR<br>PEAK HORIZONTAL ACCELERATION<br>AT NEAR WEST SITE | Figure<br>22 |


5th and 95th Percentile
15th and 85th Percentile
50th Percentile
Total Mean Hazard
Annual Probability of Exceedance
Return Period (years)
10^-1
10^-2
10^-3
10^-4
10^-5
0
10
100
1,000
10,000
100,000

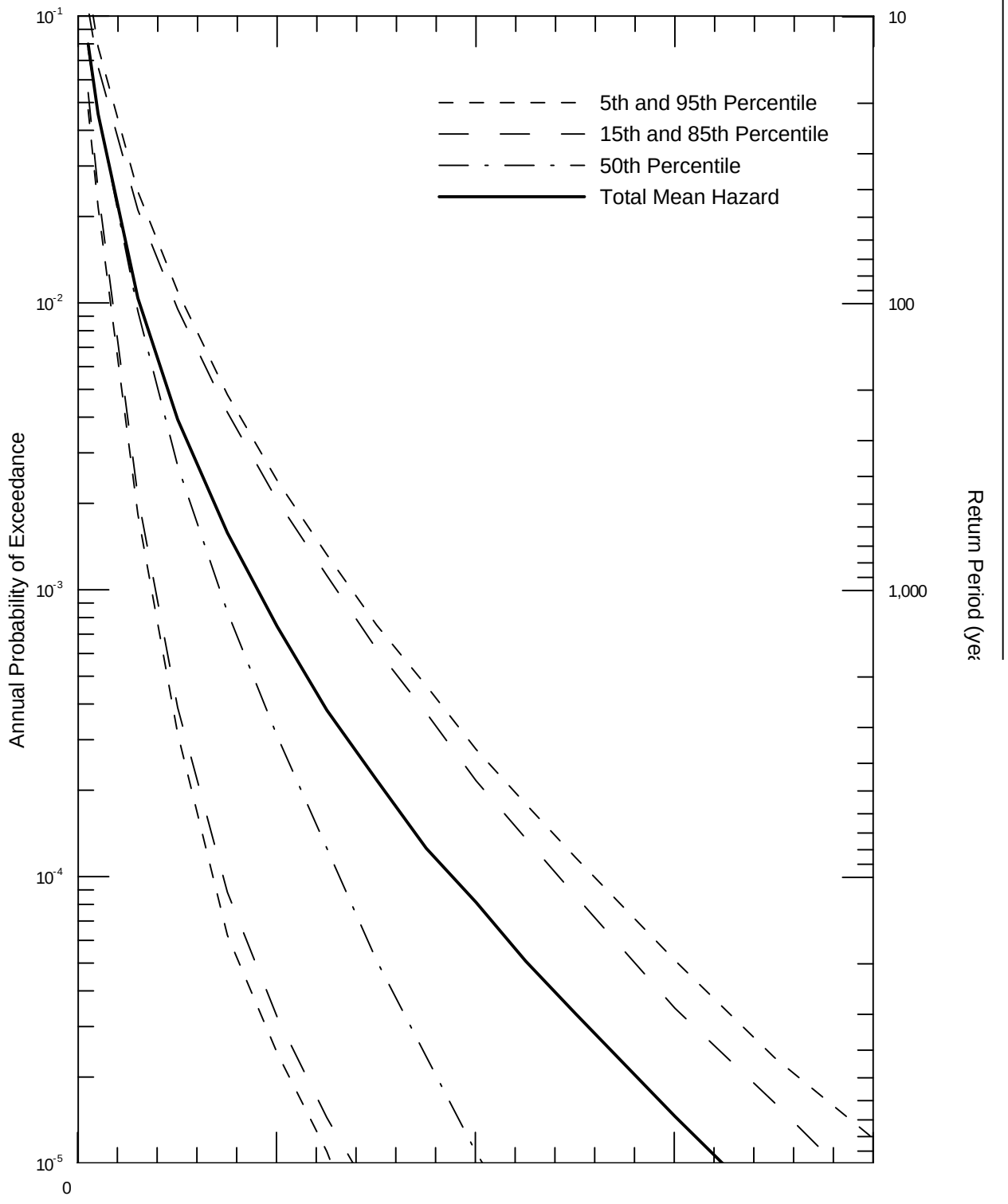
URS


5th and 95th Percentile
15th and 85th Percentile
50th Percentile
Total Mean Hazard
Annual Probability of Exceedance
Return Period (years)
10^-1
10^-2
10^-3
10^-4
10^-5
0
10
100
1,000
10,000
100,000

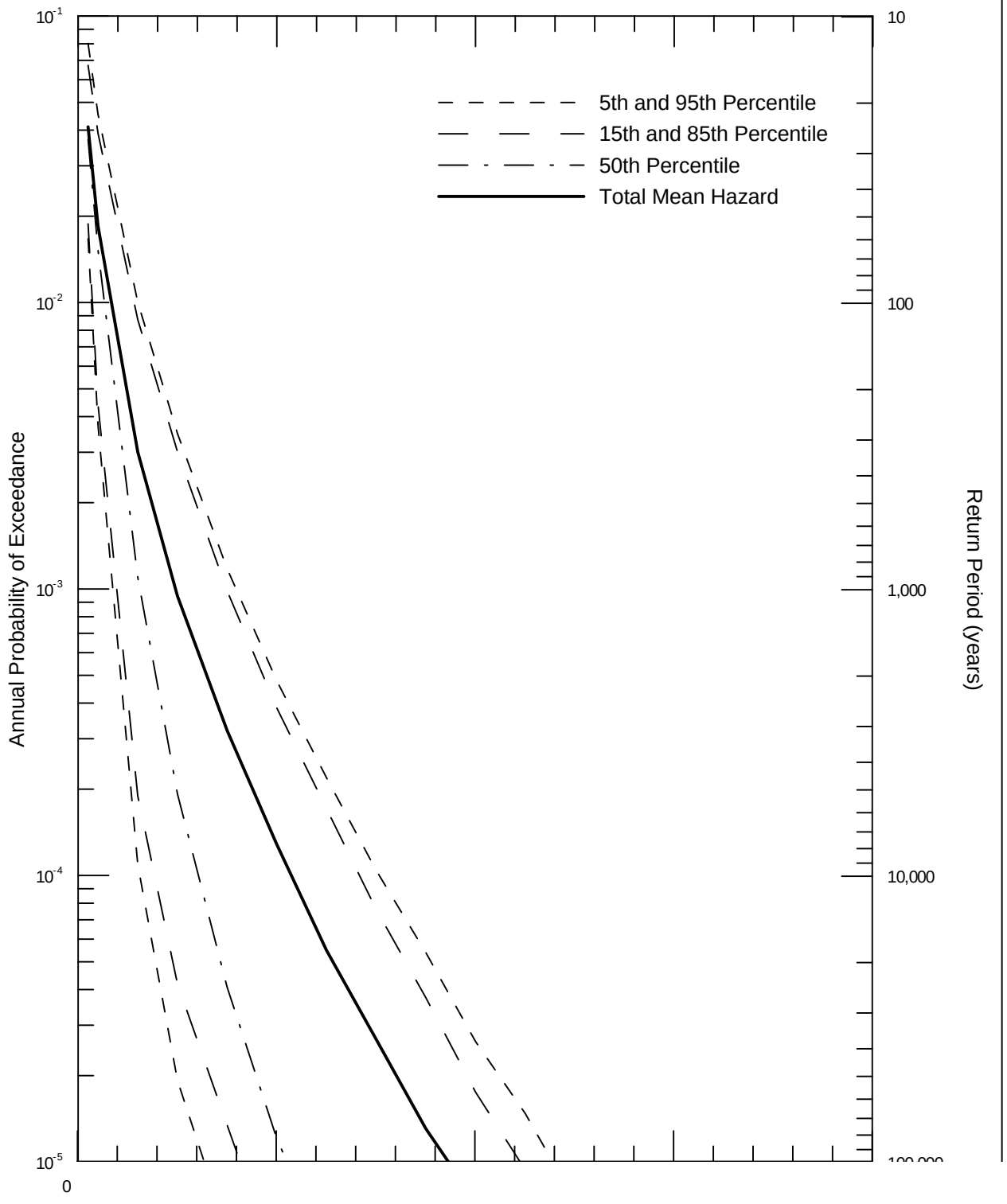
URS


5th and 95th Percentile
15th and 85th Percentile
50th Percentile
Total Mean Hazard
Annual Probability of Exceedance
Return Period (years)
10^-1
10^-2
10^-3
10^-4
10^-5
0
10
100
1,000
10,000

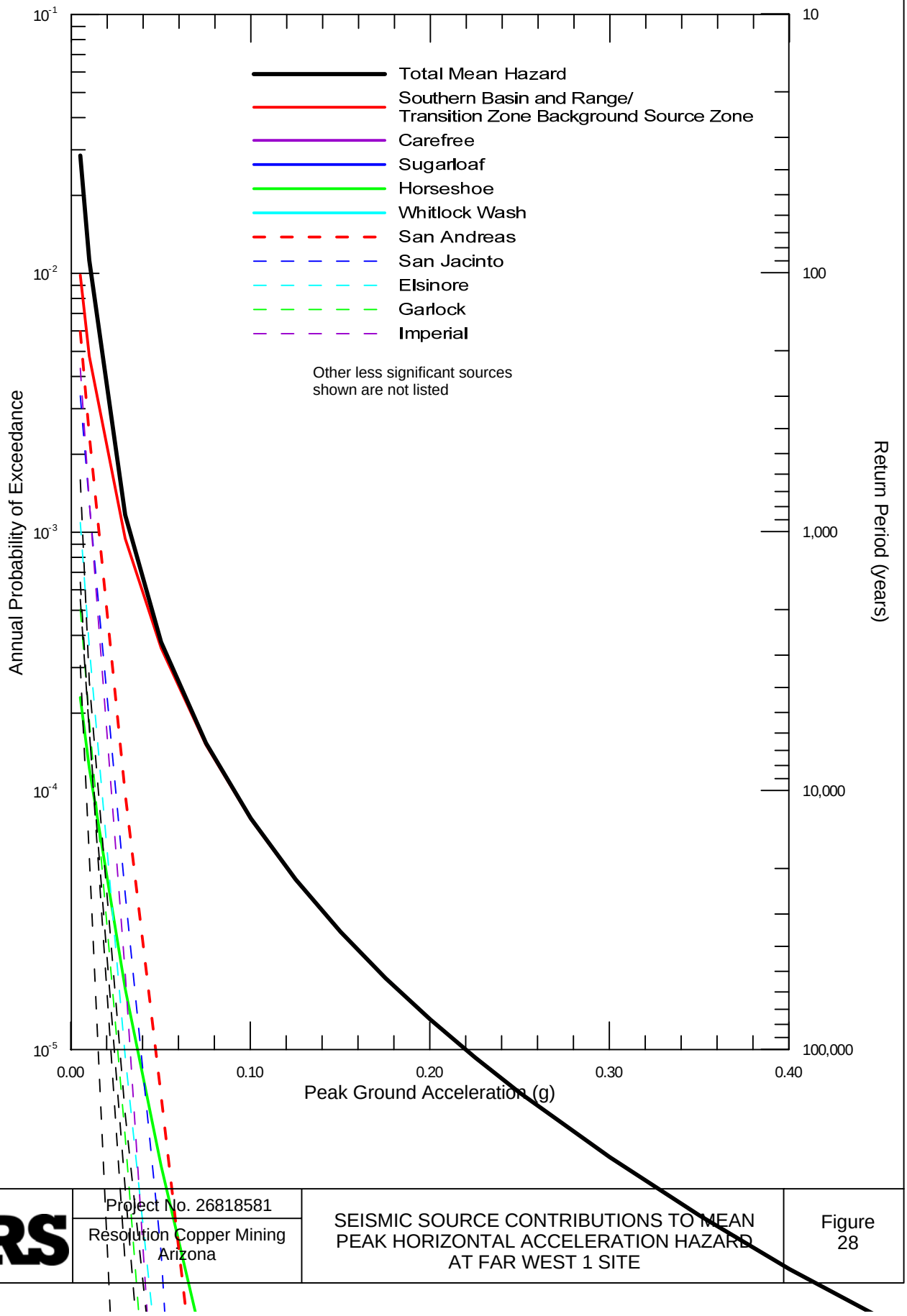
URS


5th and 95th Percentile
15th and 85th Percentile
50th Percentile
Total Mean Hazard
Annual Probability of Exceedance
Return Period (yea
10-1
10-2
10-3
10-4
10-5
0
10
100
1,000

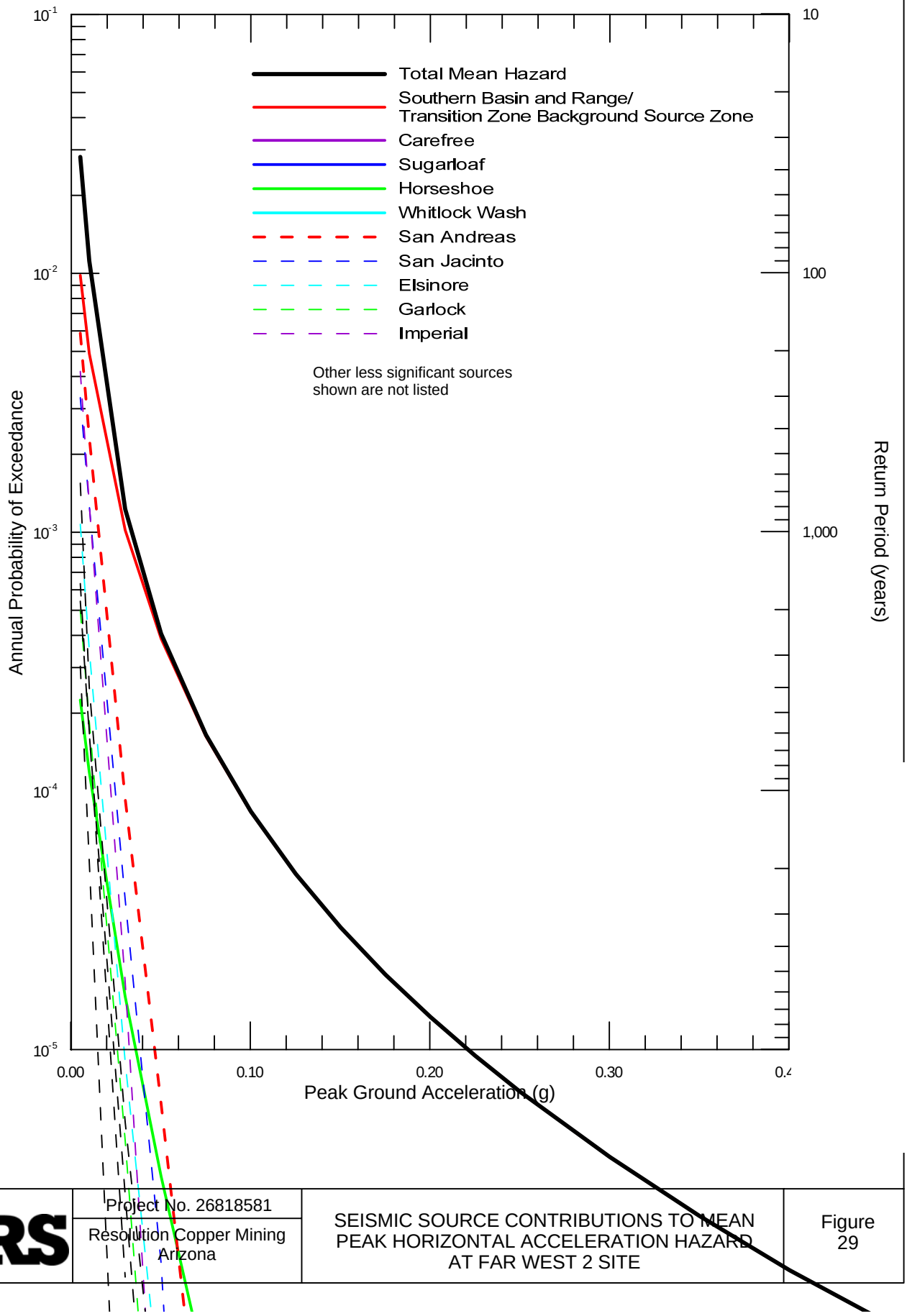
URS


5th and 95th Percentile
15th and 85th Percentile
50th Percentile
Total Mean Hazard
Annual Probability of Exceedance
Return Period (years)
10-1
10-2
10-3
10-4
10-5
0
10
100
1,000
10,000

URS




| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SEISMIC SOURCE CONTRIBUTIONS TO MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT FAR WEST 1 SITE | Figure 28 |

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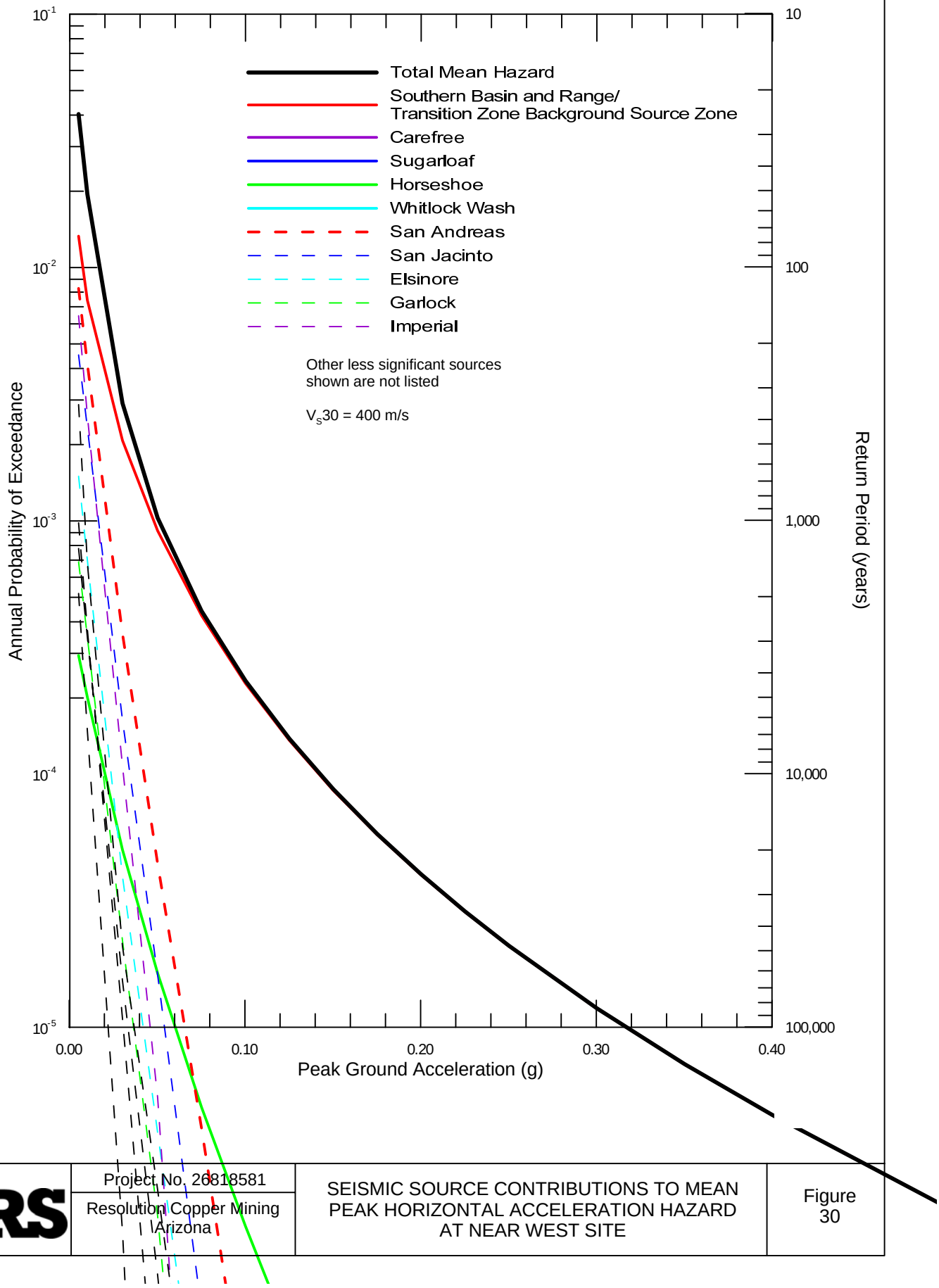
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SEISMIC SOURCE CONTRIBUTIONS TO MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT FAR WEST 2 SITE | Figure 29 |

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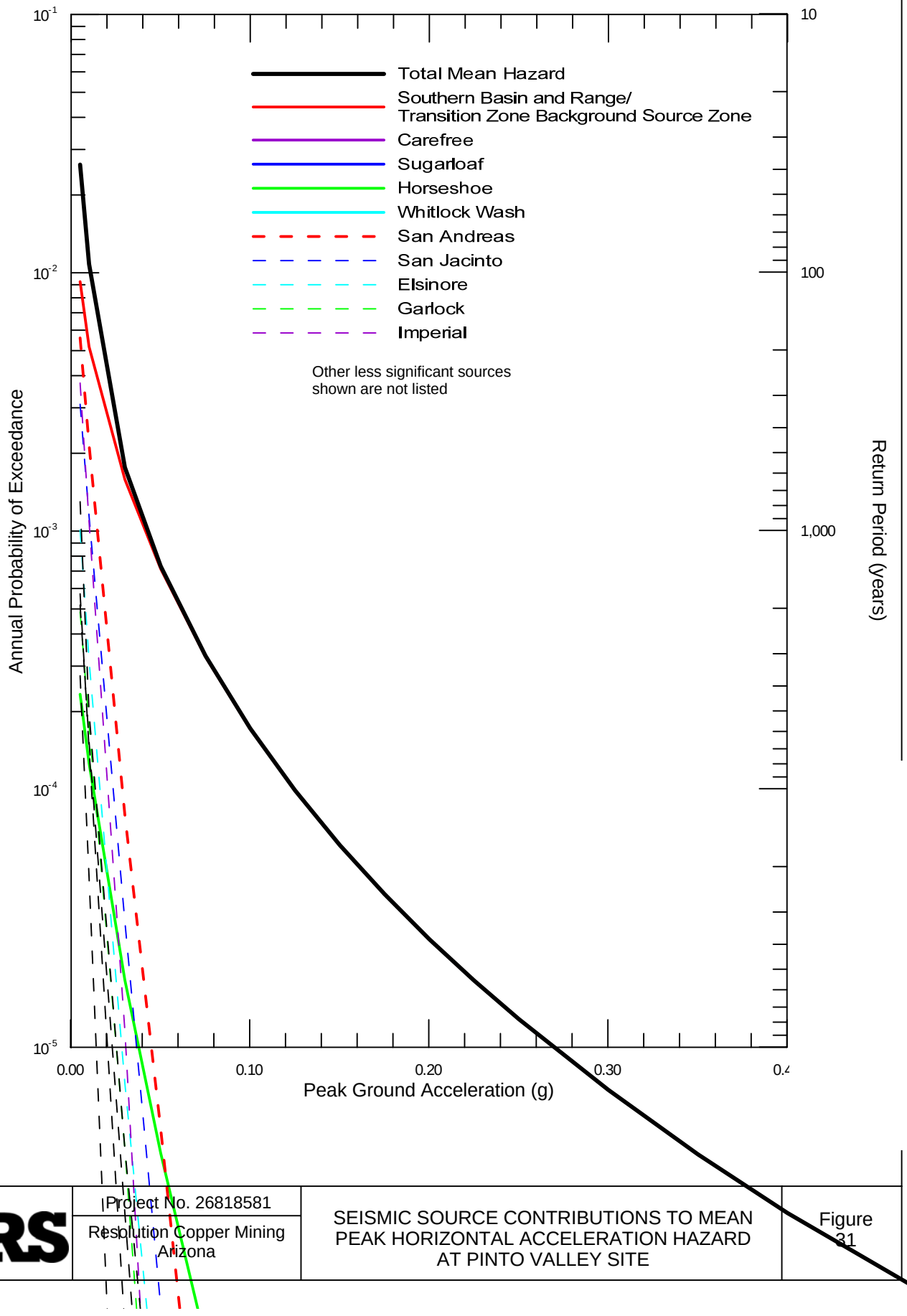
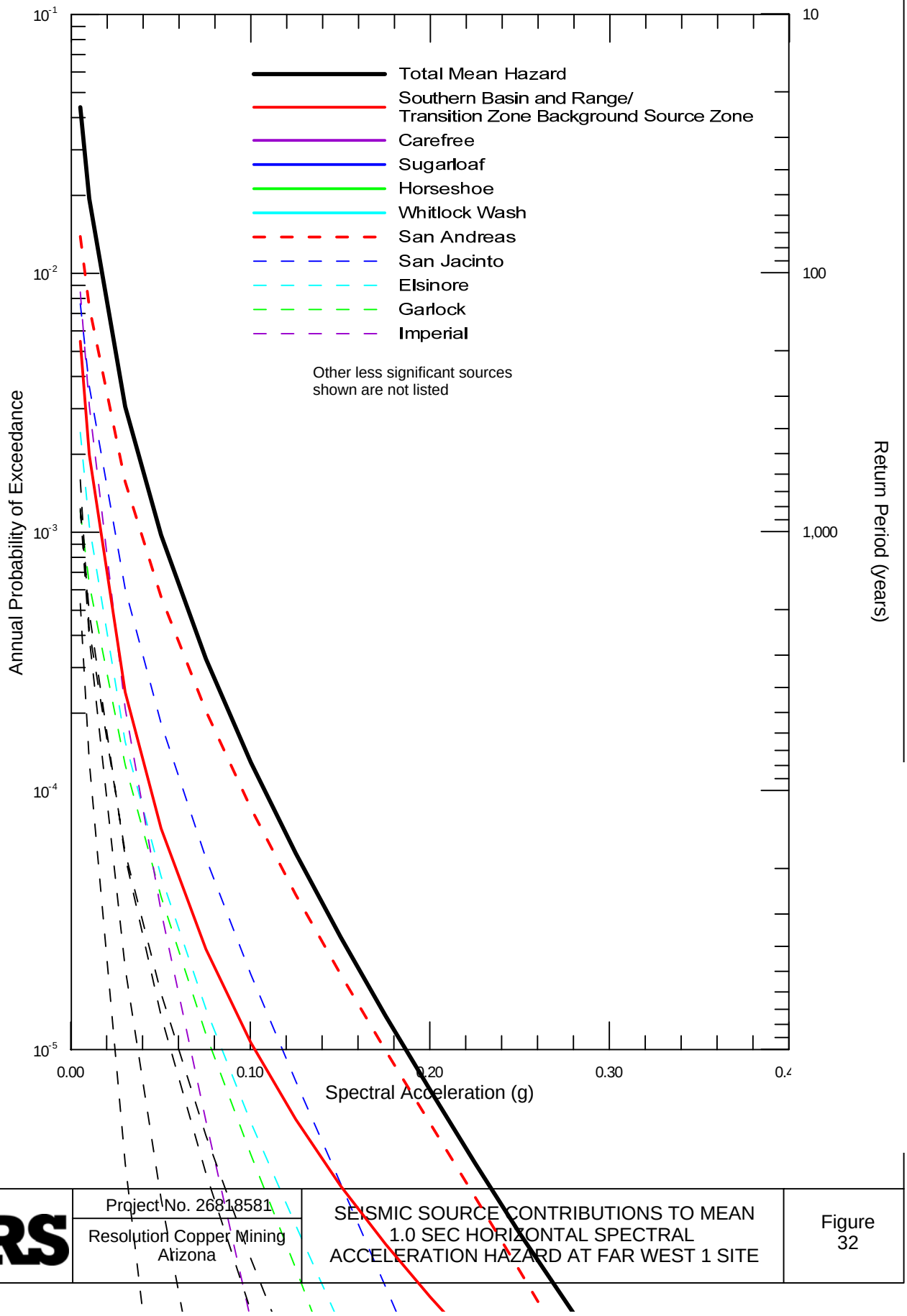
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SEISMIC SOURCE CONTRIBUTIONS TO MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT NEAR WEST SITE | Figure 30 |




| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SEISMIC SOURCE CONTRIBUTIONS TO MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT PINTO VALLEY SITE | Figure 31 |




| | | | |
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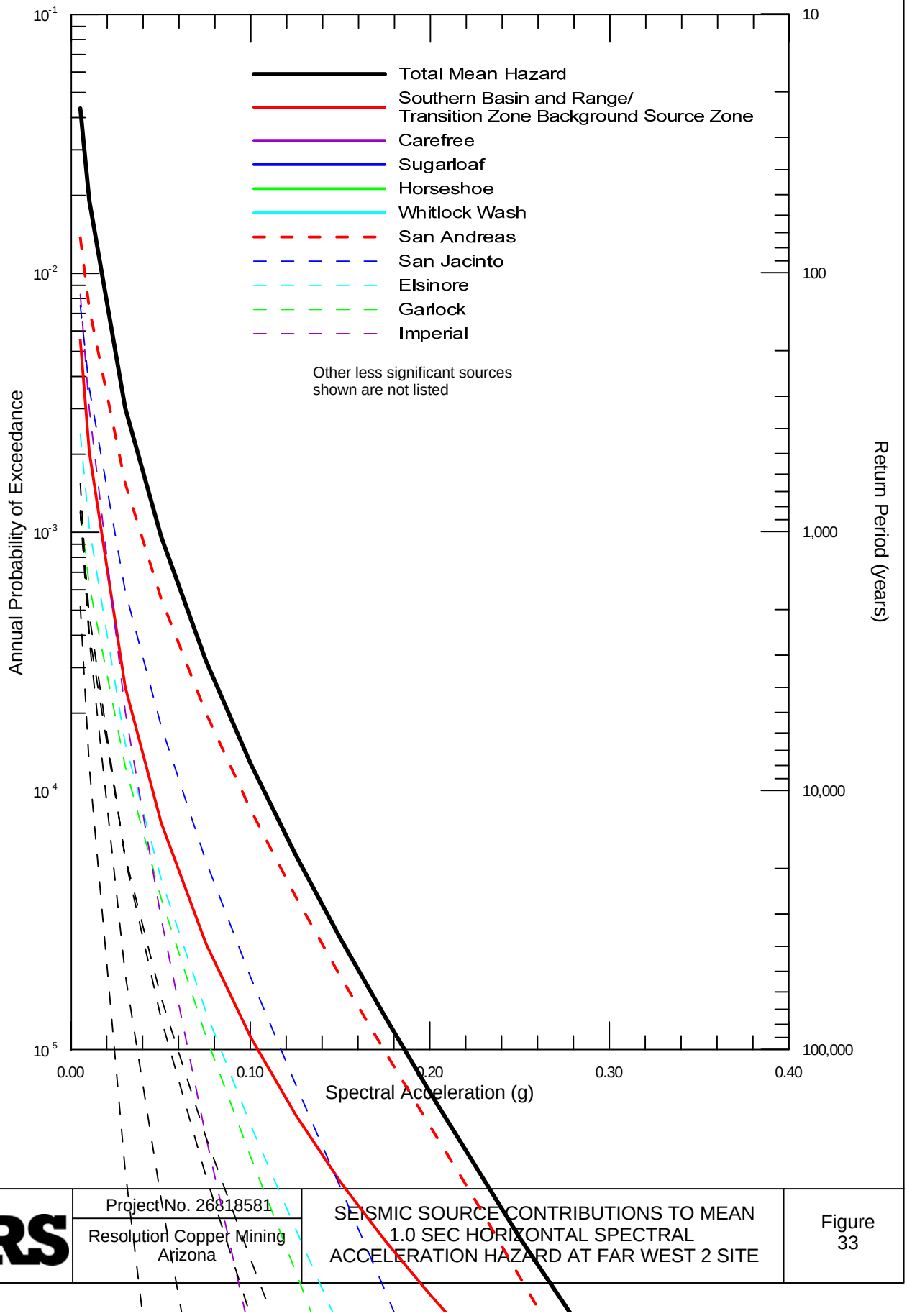
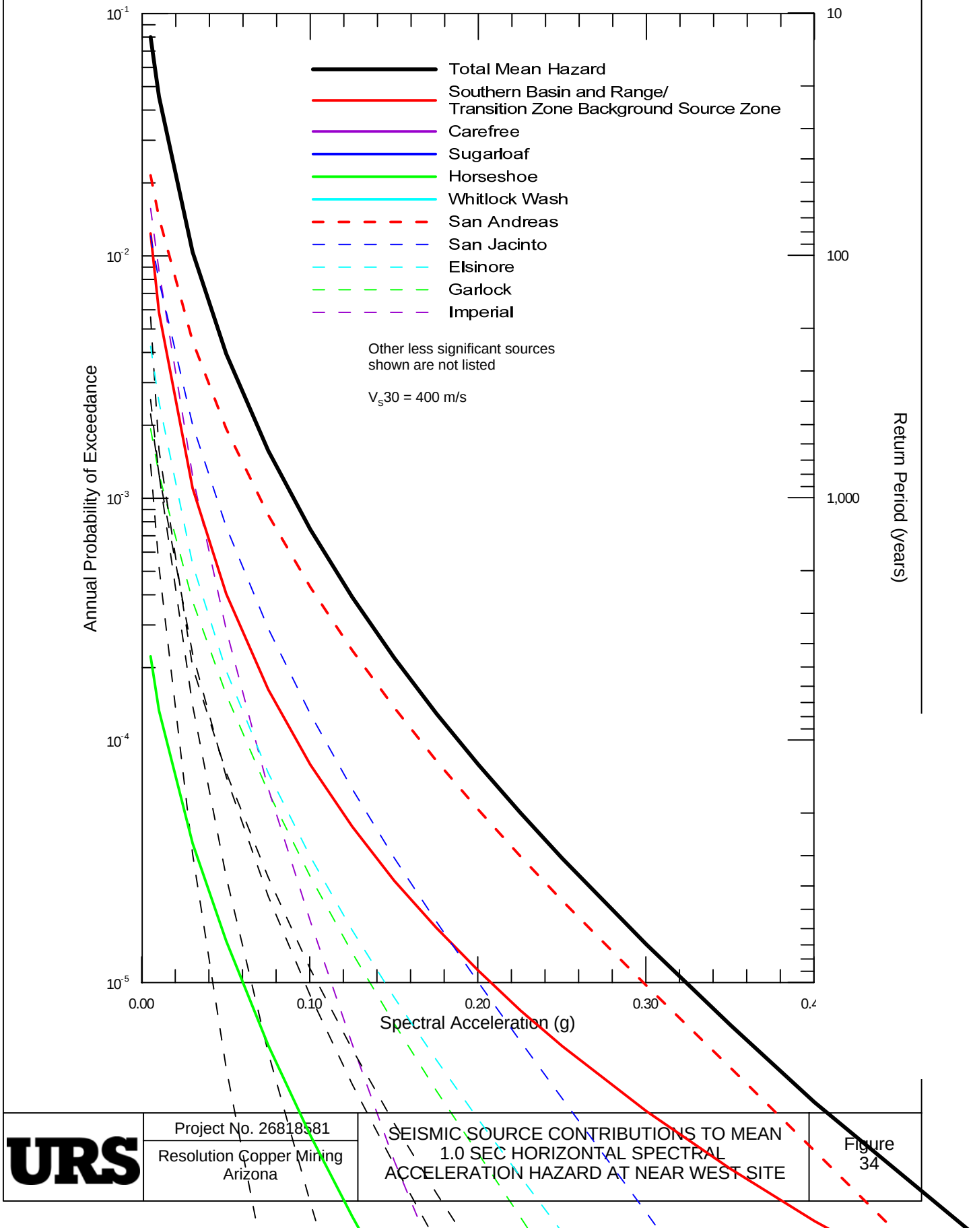
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SEISMIC SOURCE CONTRIBUTIONS TO MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT FAR WEST 1 SITE | Figure 32 |




| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SEISMIC SOURCE CONTRIBUTIONS TO MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT FAR WEST 2 SITE | Figure 33 |

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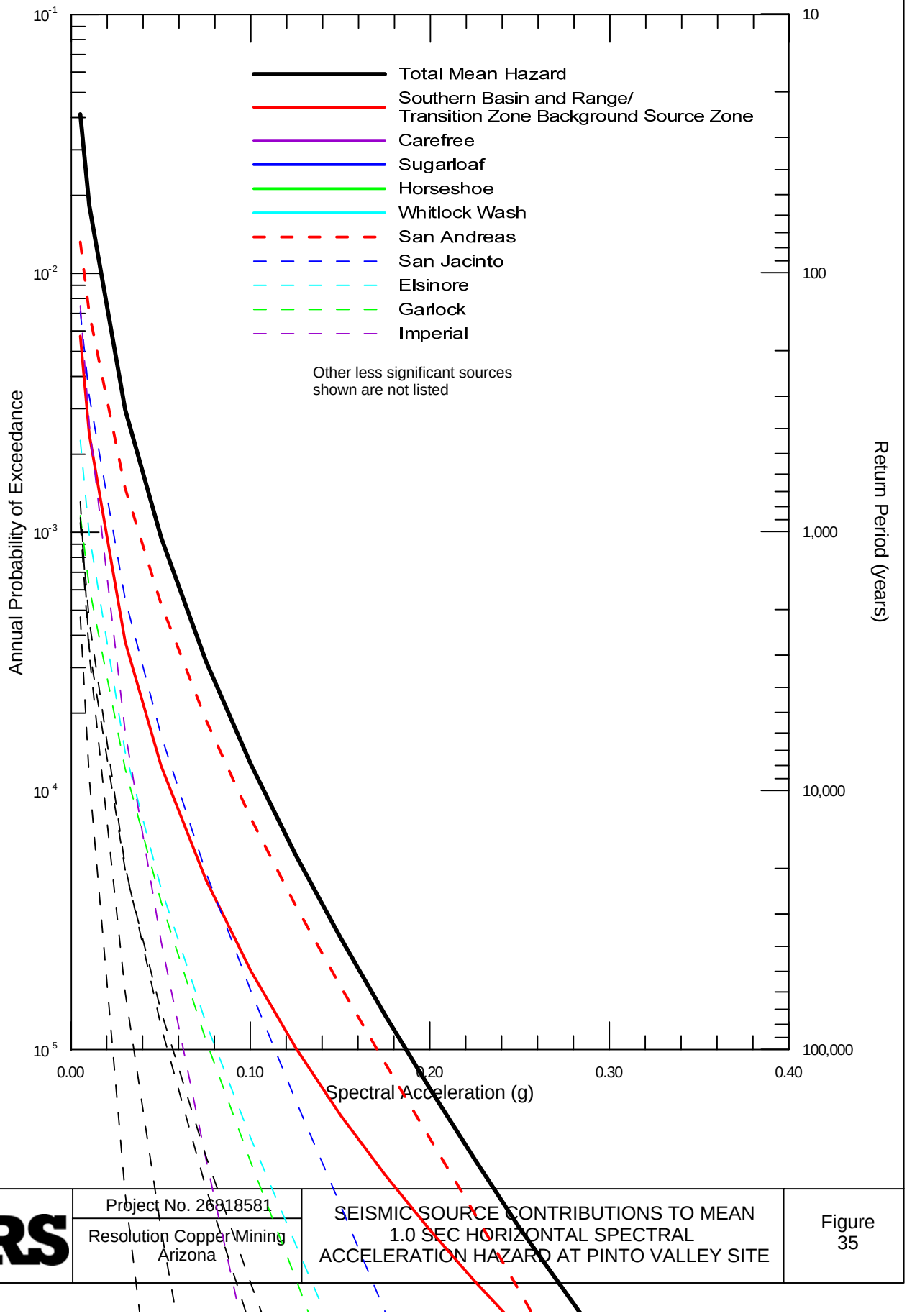
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SEISMIC SOURCE CONTRIBUTIONS TO MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT NEAR WEST SITE | Figure 34 |

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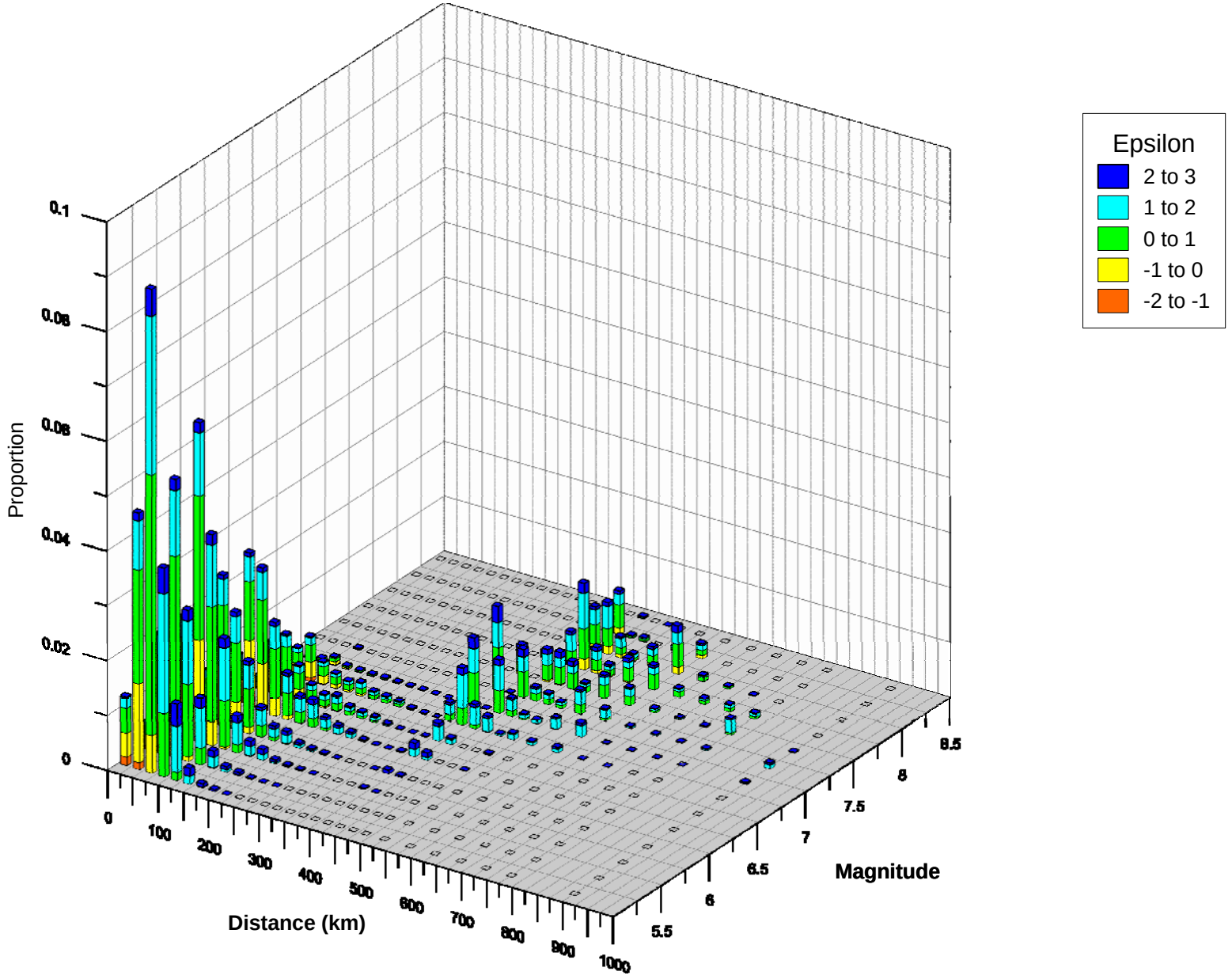
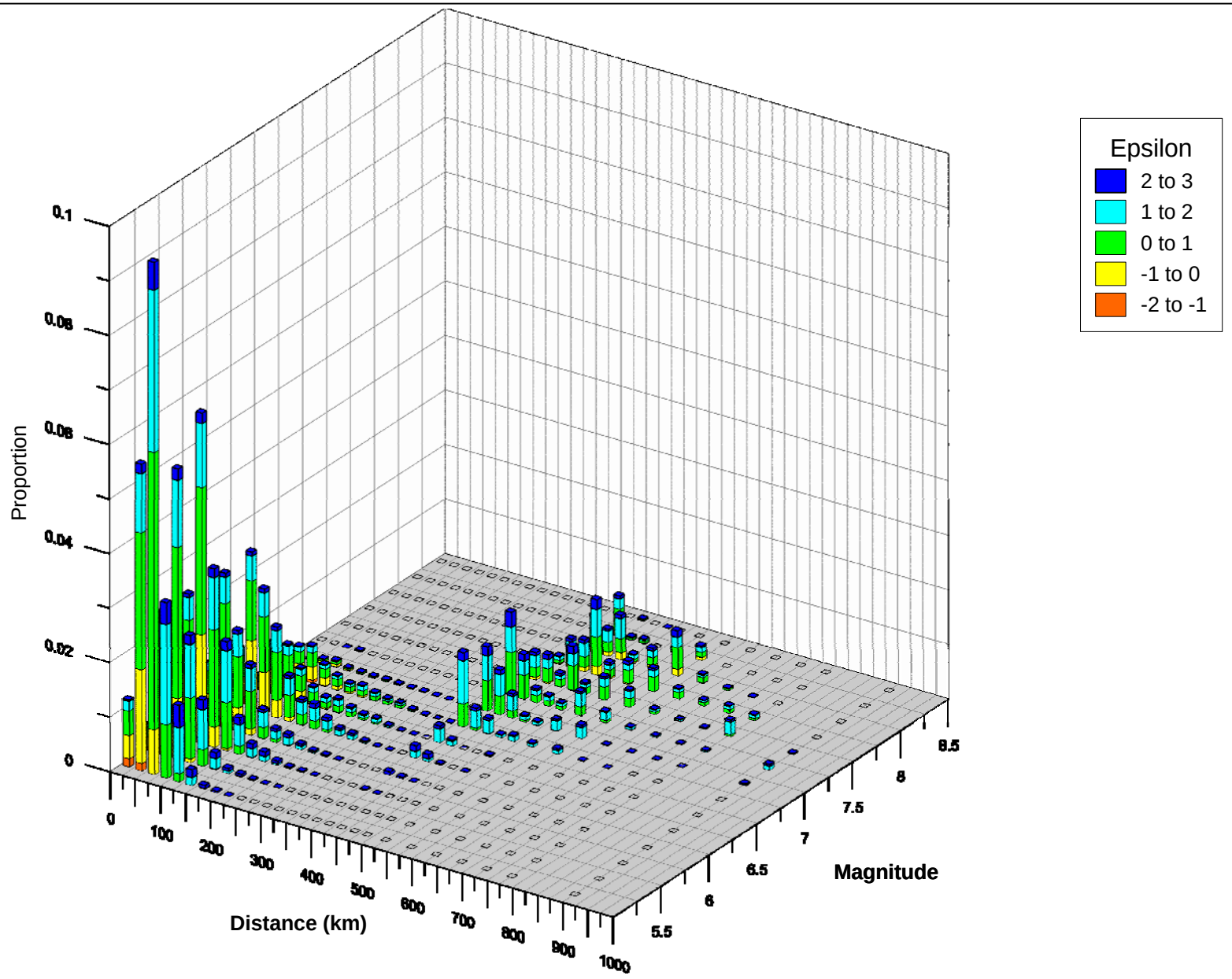
|---|---|---|---|
| URS | Project No. 26918581<br>Resolution Copper Mining<br>Arizona | SEISMIC SOURCE CONTRIBUTIONS TO MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT PINTO VALLEY SITE | Figure 35 |




| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT 100-YEAR RETURN PERIOD AT FAR WEST 1 SITE | Figure<br>36 |

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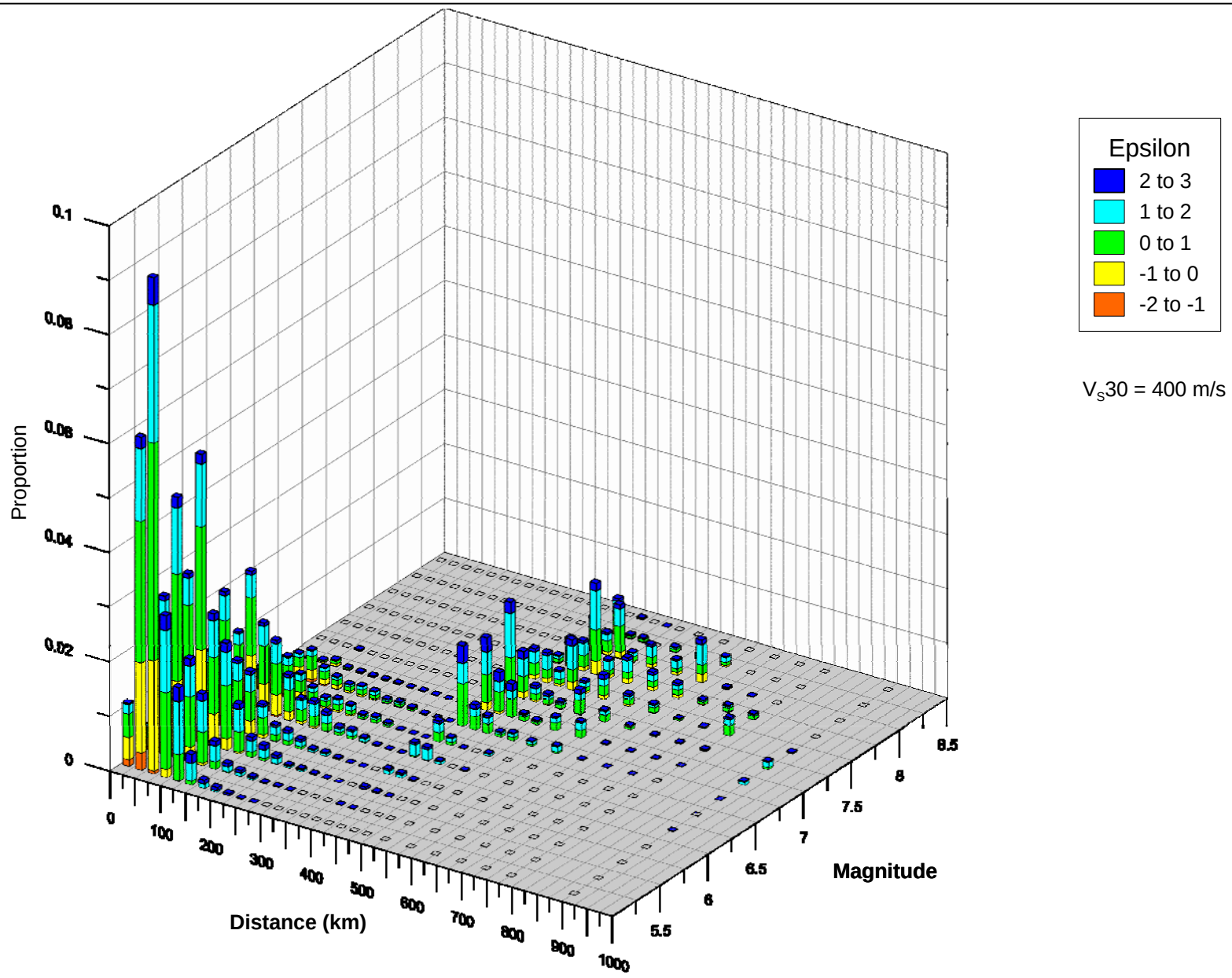
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT 100-YEAR RETURN PERIOD AT FAR WEST 2 SITE | Figure 37 |

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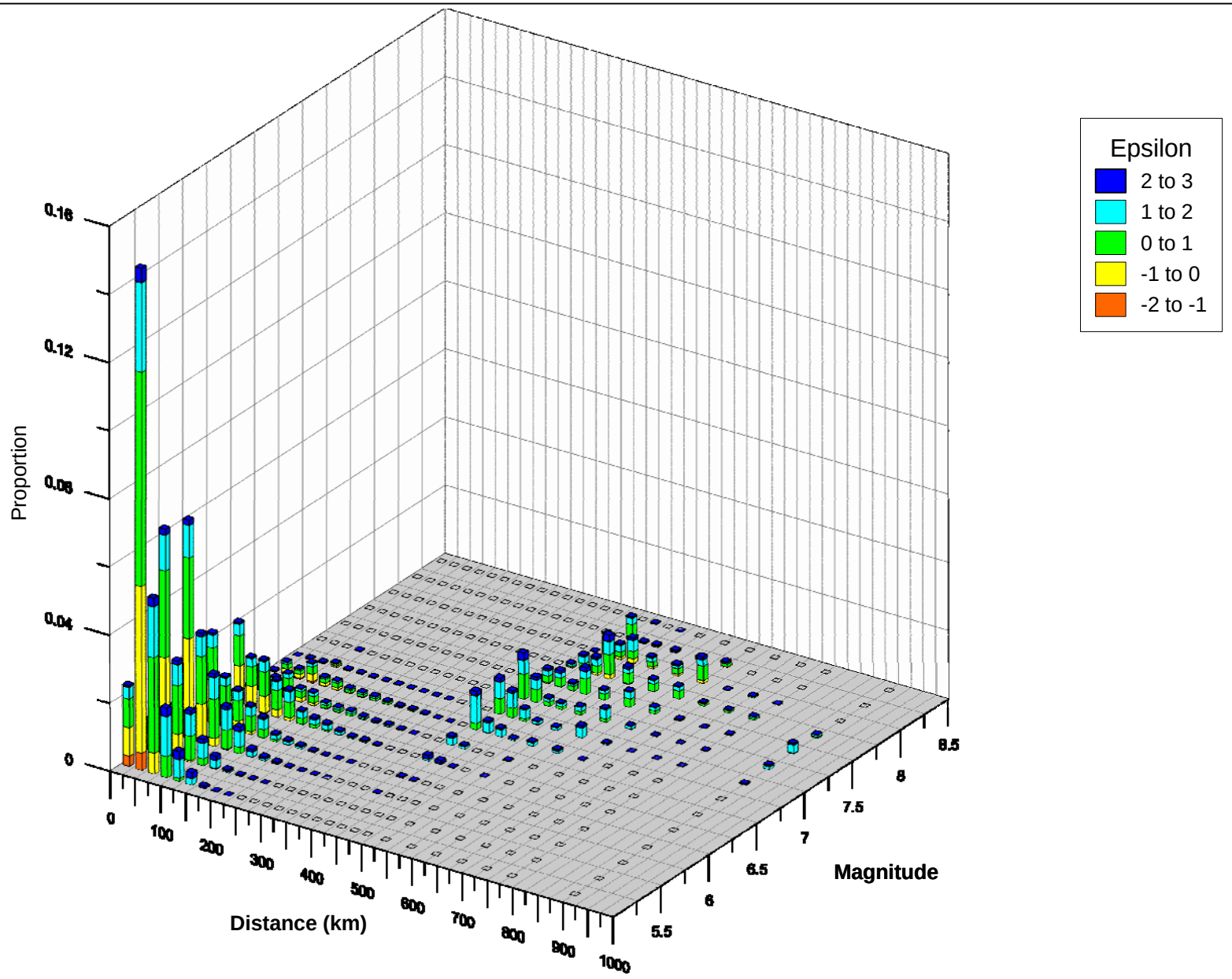
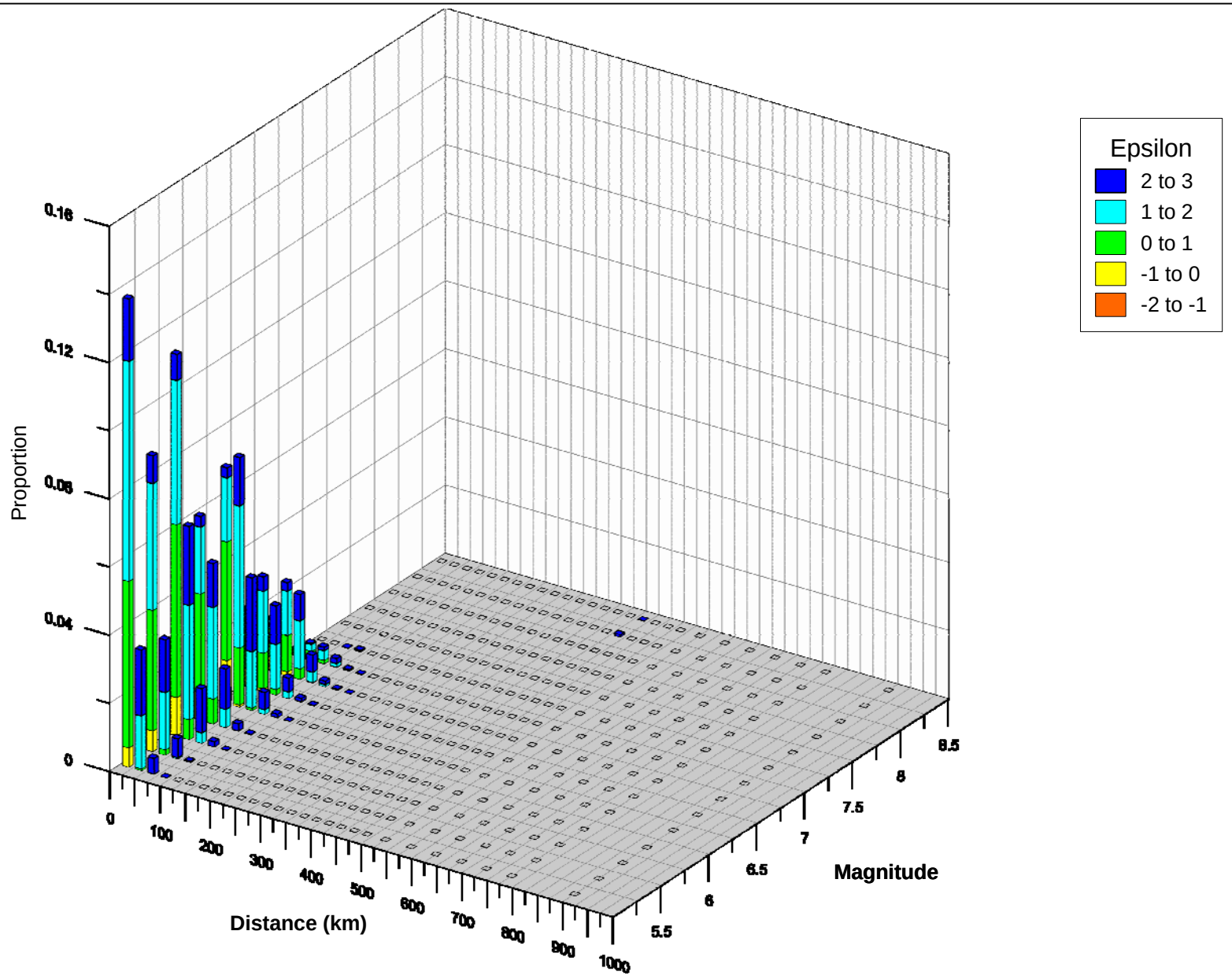
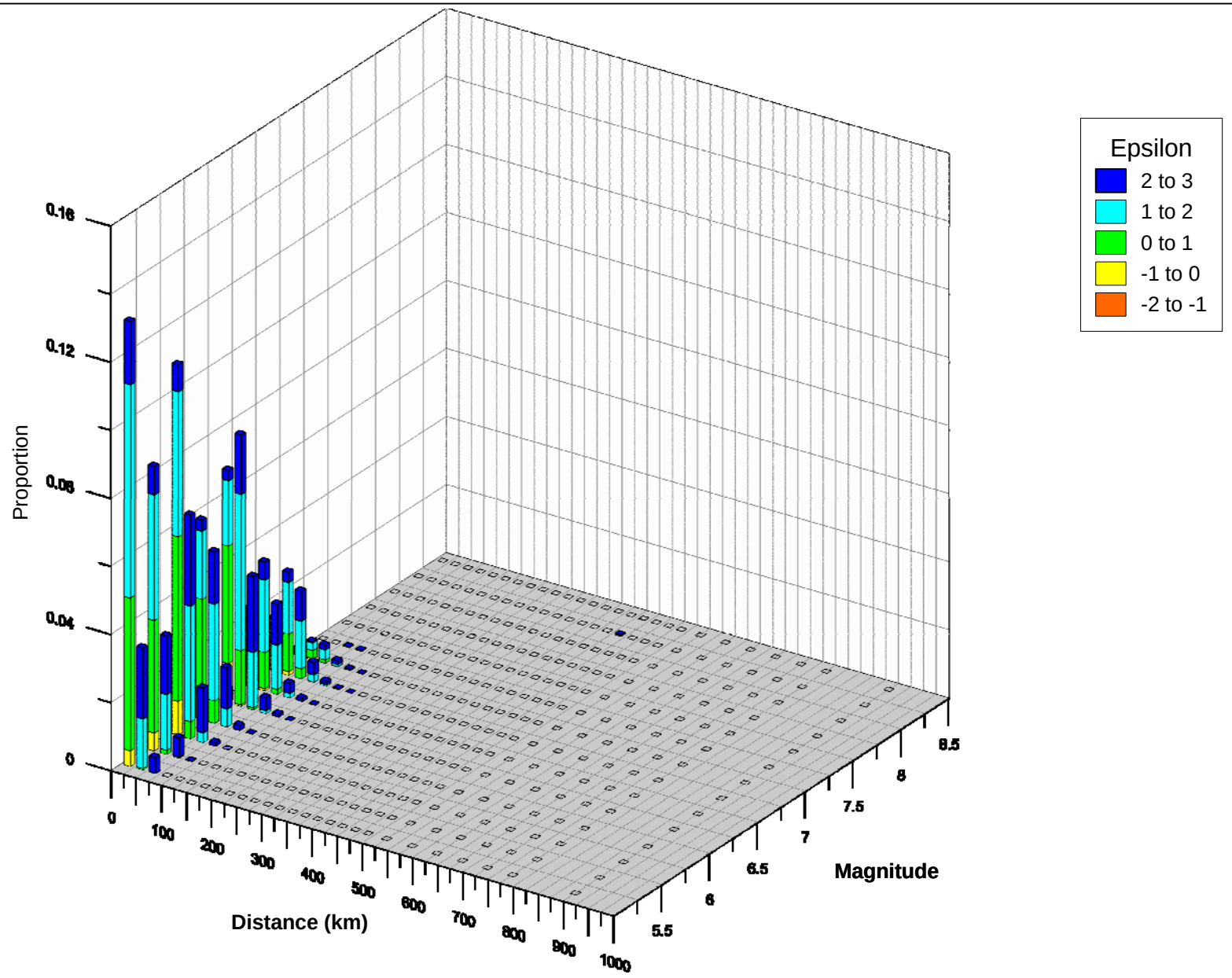
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT 100-YEAR RETURN PERIOD AT NEAR WEST SITE | Figure 38 |




| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT 100-YEAR RETURN PERIOD AT PINTO VALLEY SITE | Figure<br>39 |




| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT 10,000-YEAR RETURN PERIOD AT FAR WEST 1 SITE | Figure<br>40 |

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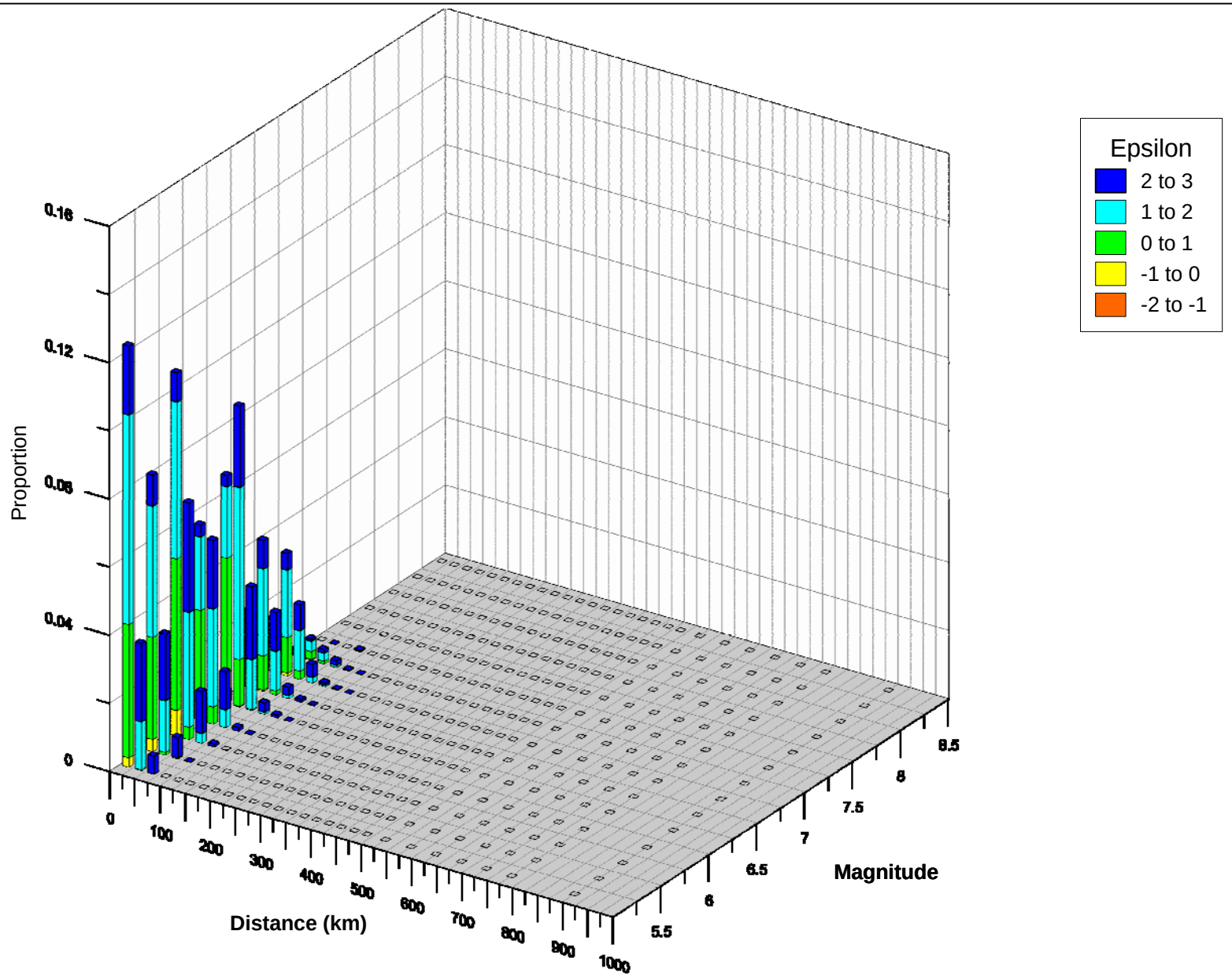
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT 10,000-YEAR RETURN PERIOD AT FAR WEST 2 SITE | Figure<br>41 |

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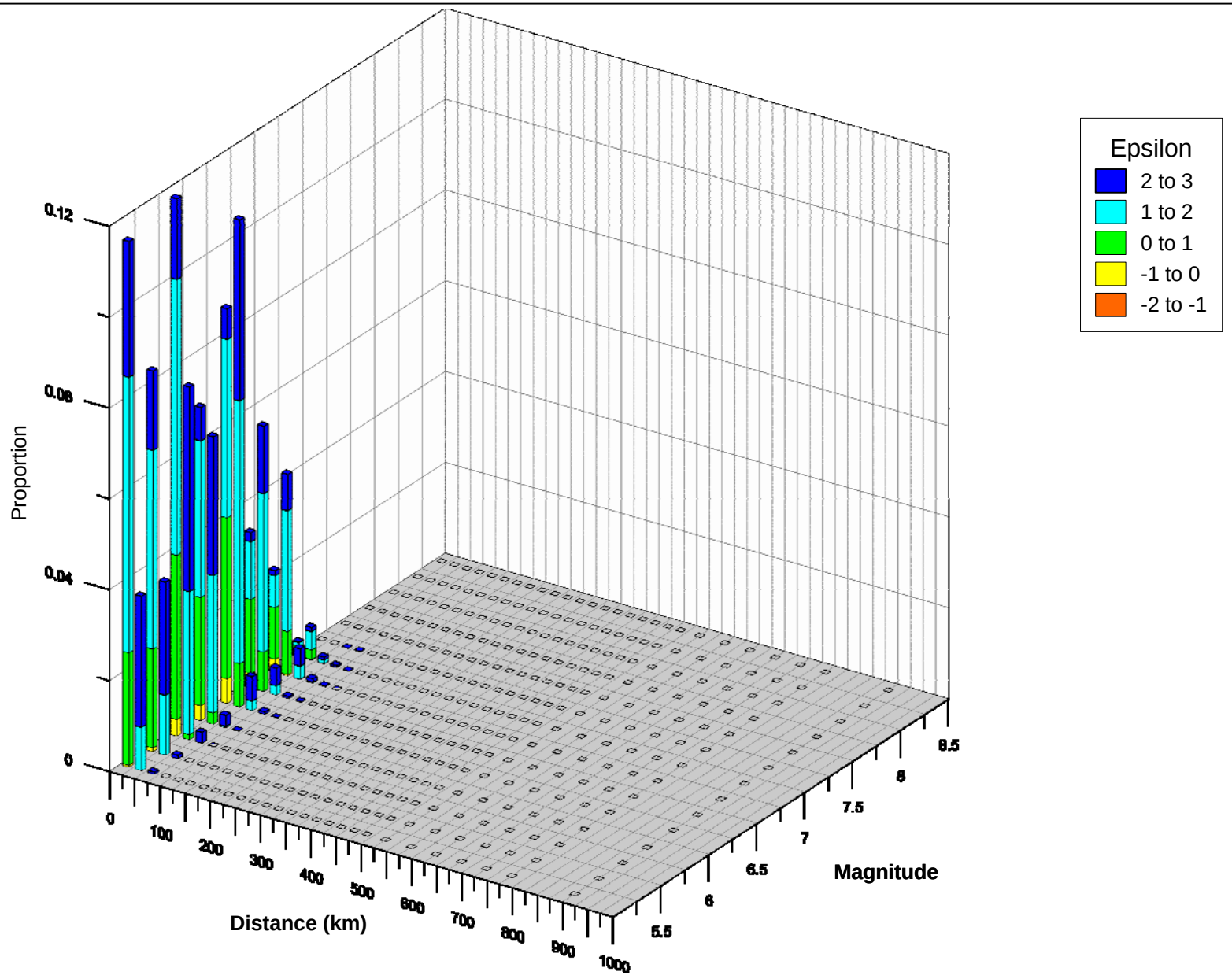
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT 10,000-YEAR RETURN PERIOD AT NEAR WEST SITE | Figure 42 |

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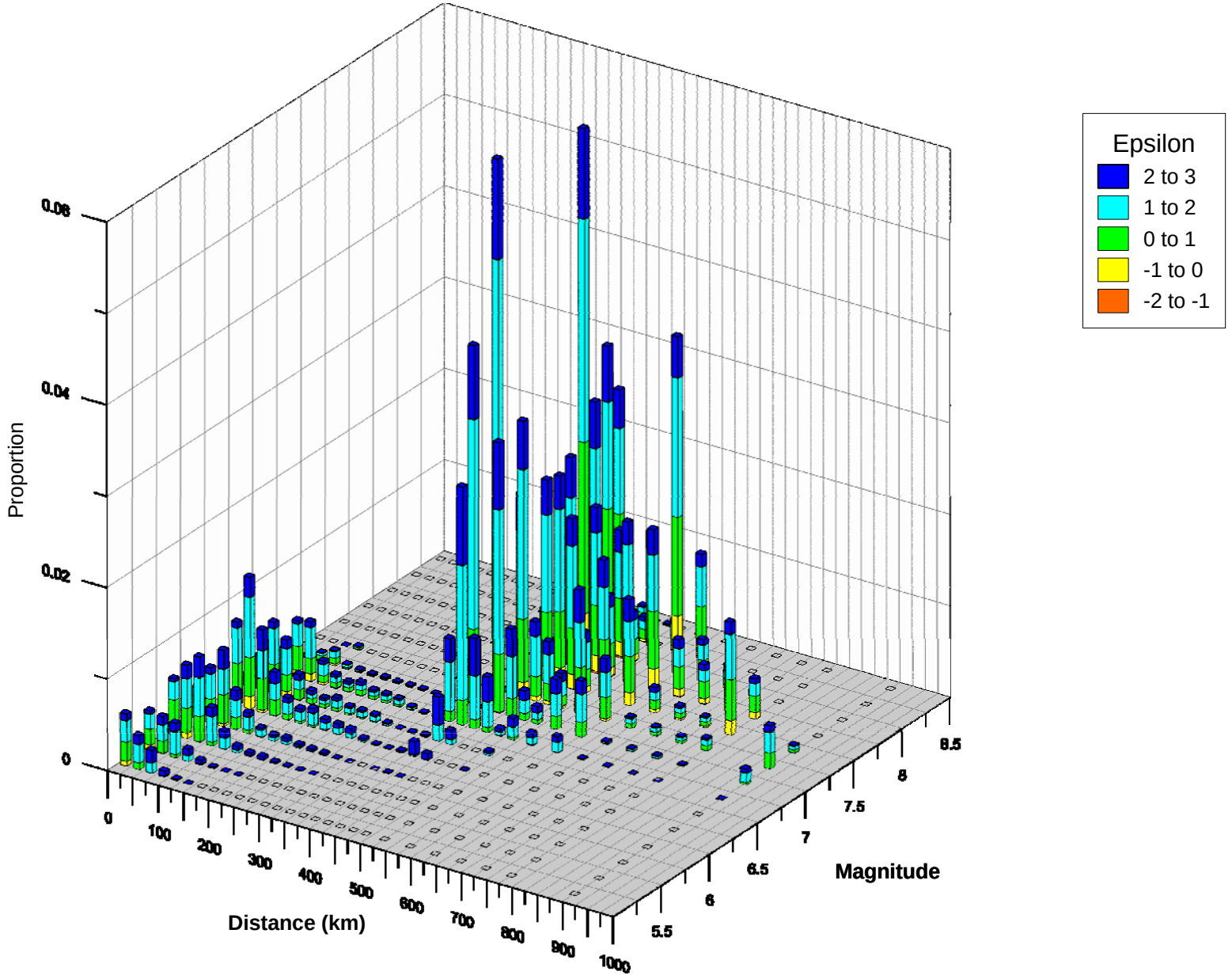
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN PEAK HORIZONTAL ACCELERATION HAZARD AT 10,000-YEAR RETURN PERIOD AT PINTO VALLEY SITE | Figure<br>43 |

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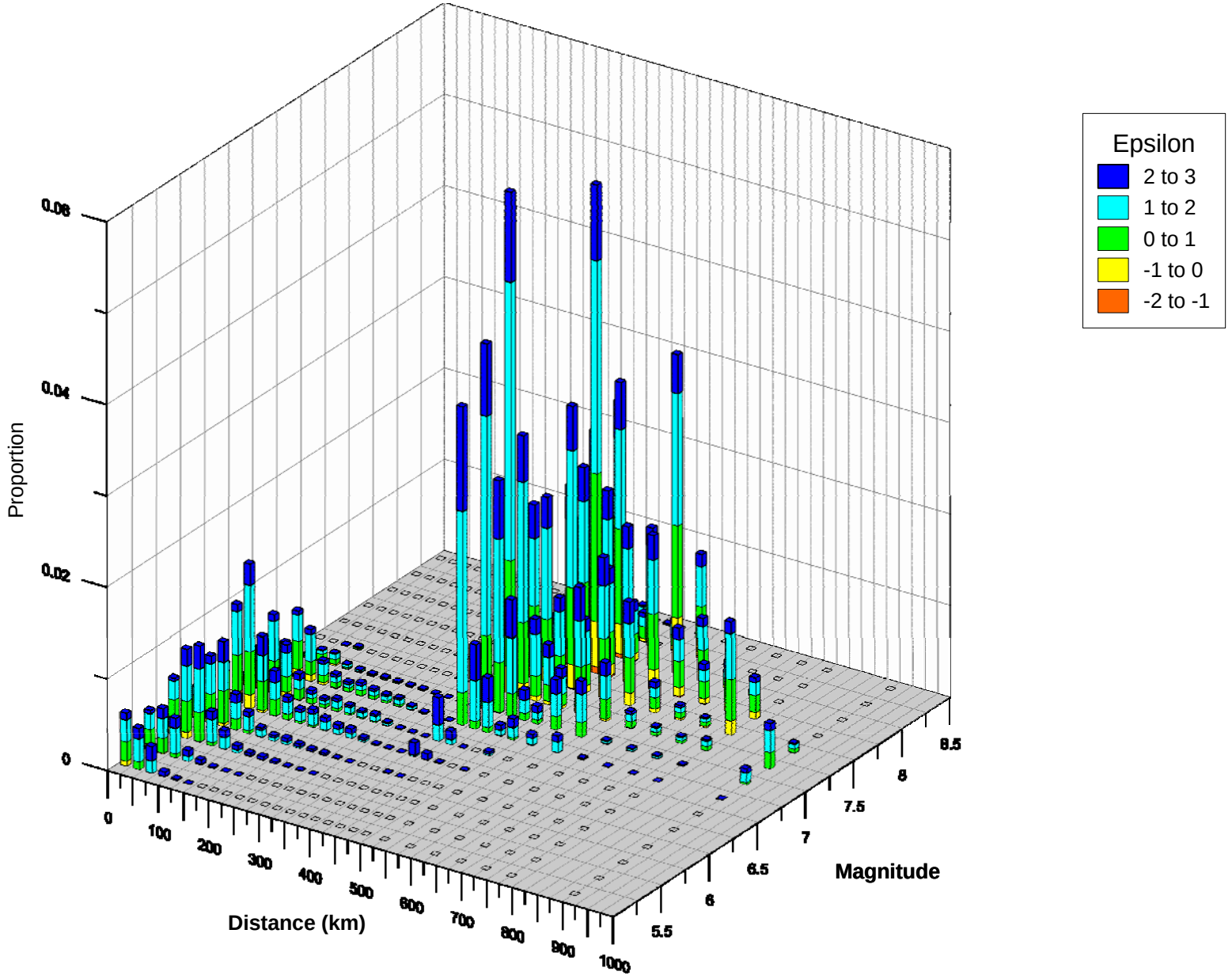
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT 100-YEAR RETURN PERIOD AT FAR WEST 1 SITE | Figure<br>44 |

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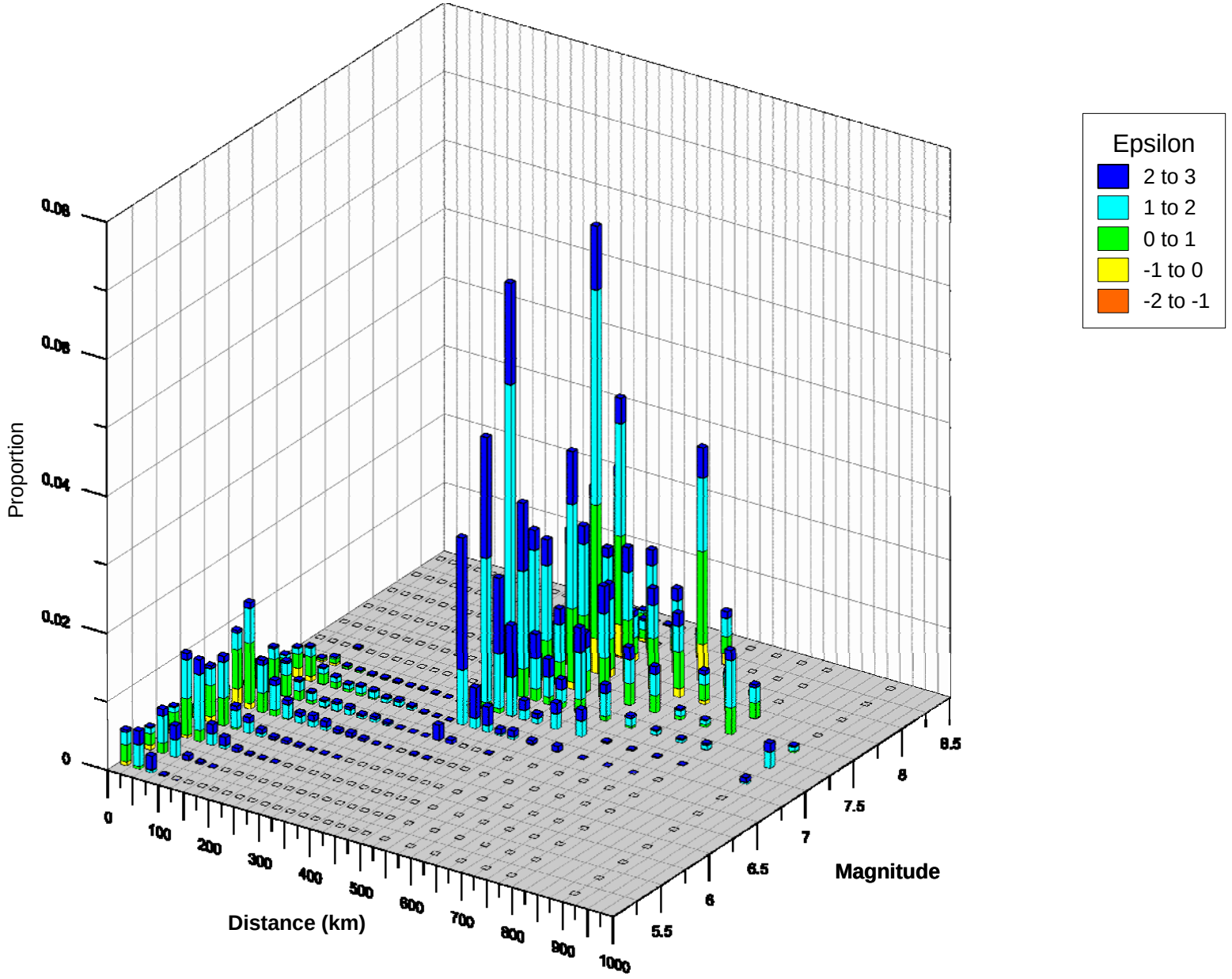
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT 100-YEAR RETURN PERIOD AT FAR WEST 2 SITE | Figure<br>45 |

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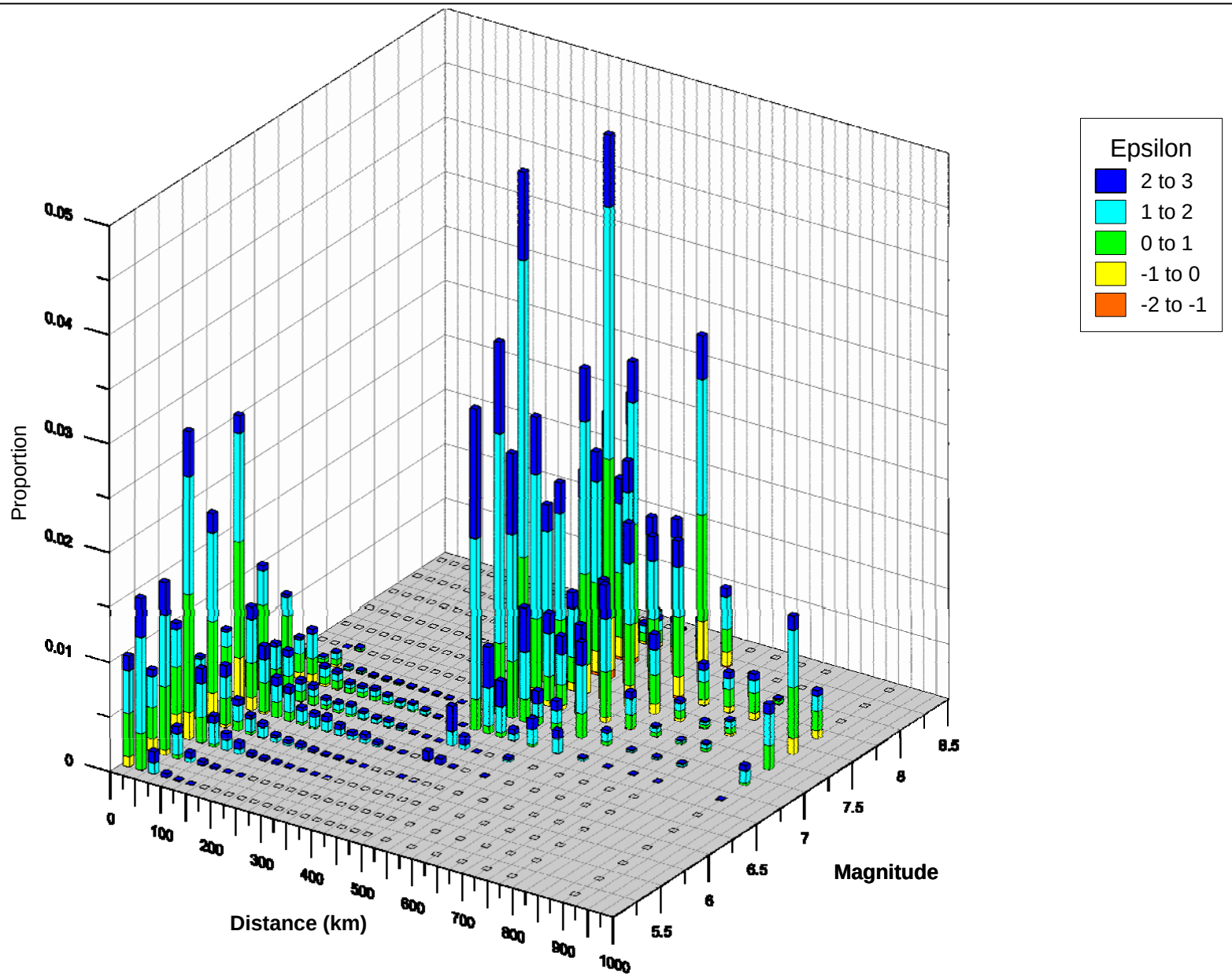
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT 100-YEAR RETURN PERIOD AT NEAR WEST SITE | Figure 46 |

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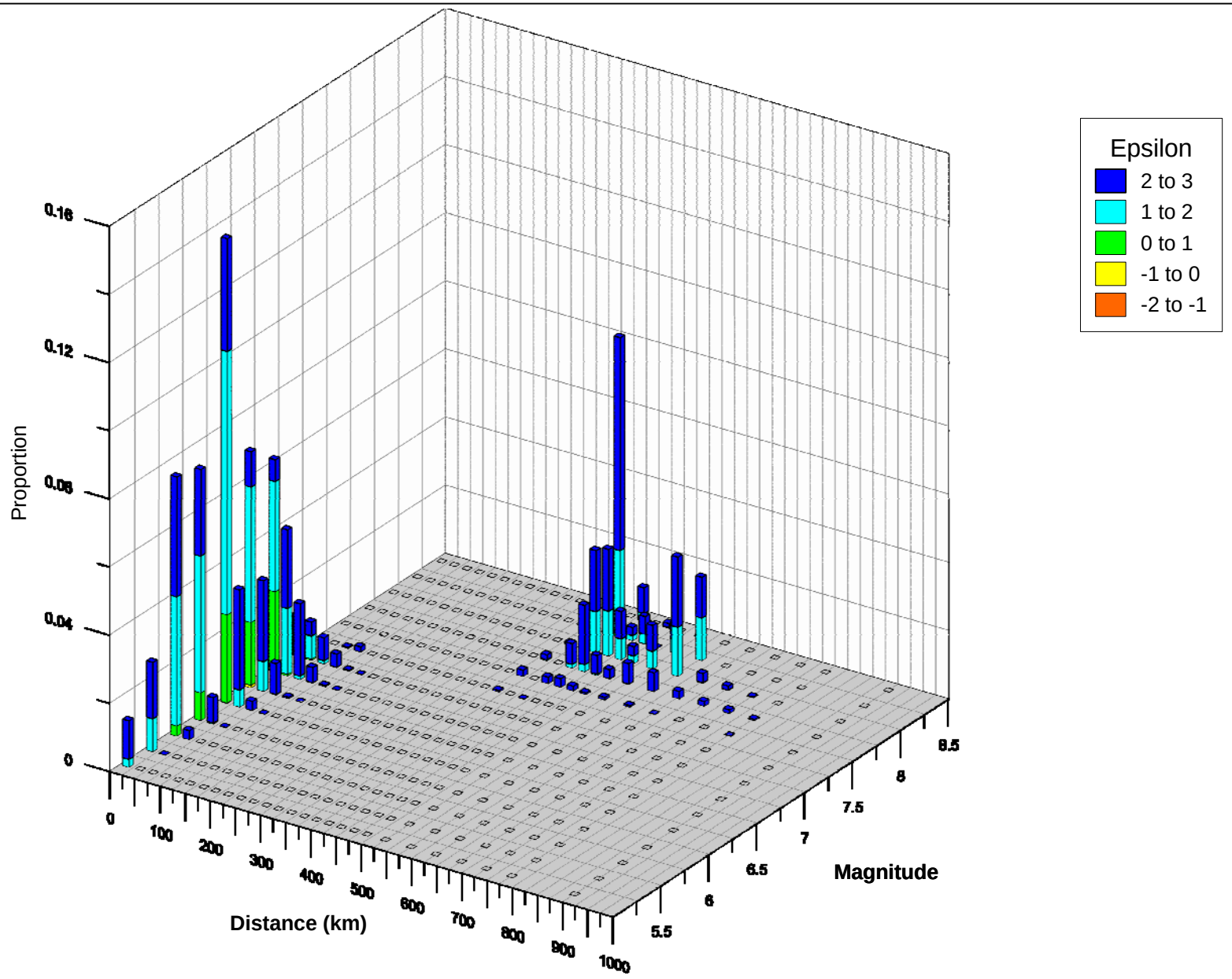
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT 100-YEAR RETURN PERIOD AT PINTO VALLEY SITE |

Figure 47

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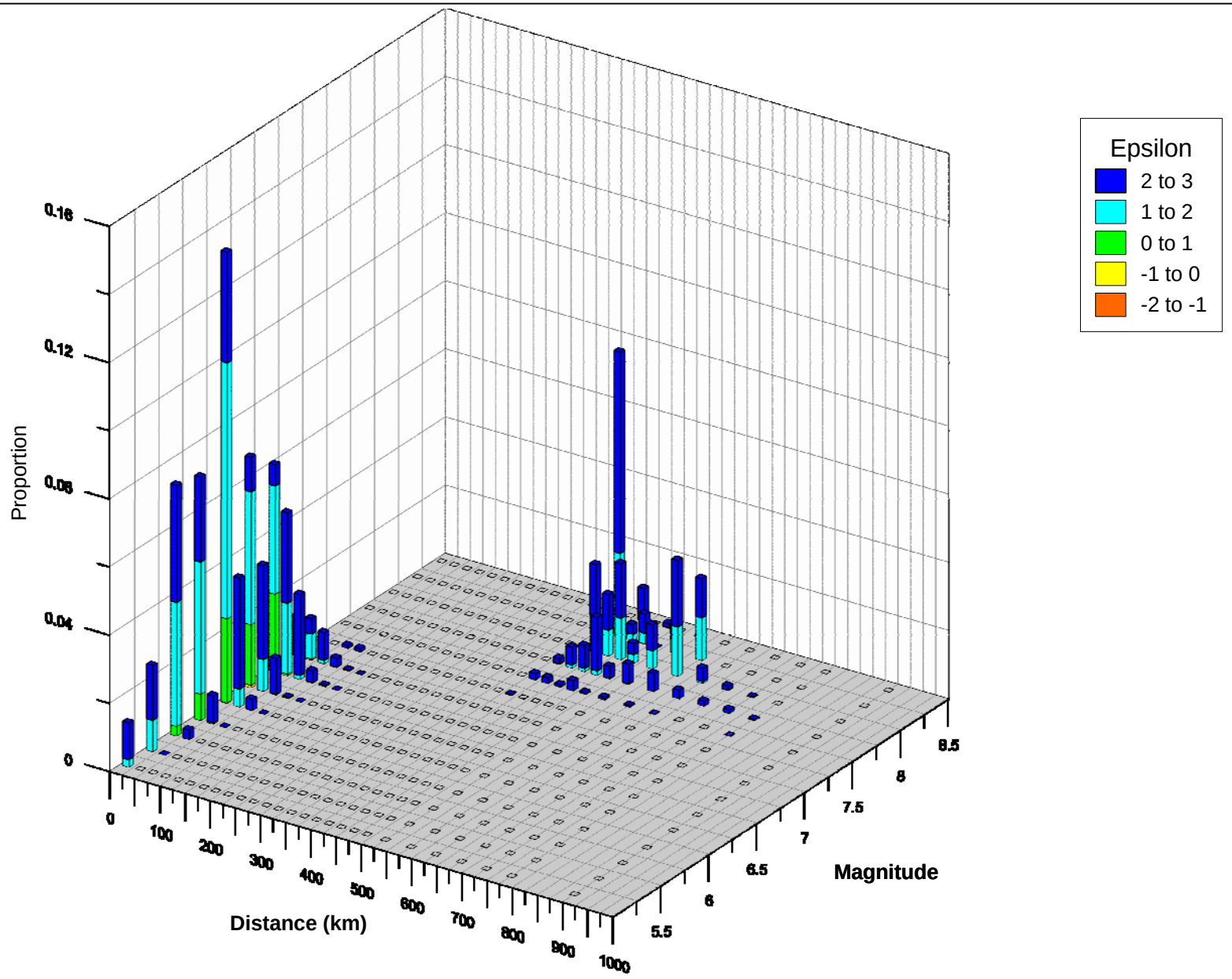
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT 10,000-YEAR RETURN PERIOD AT FAR WEST 1 SITE | Figure<br>48 |

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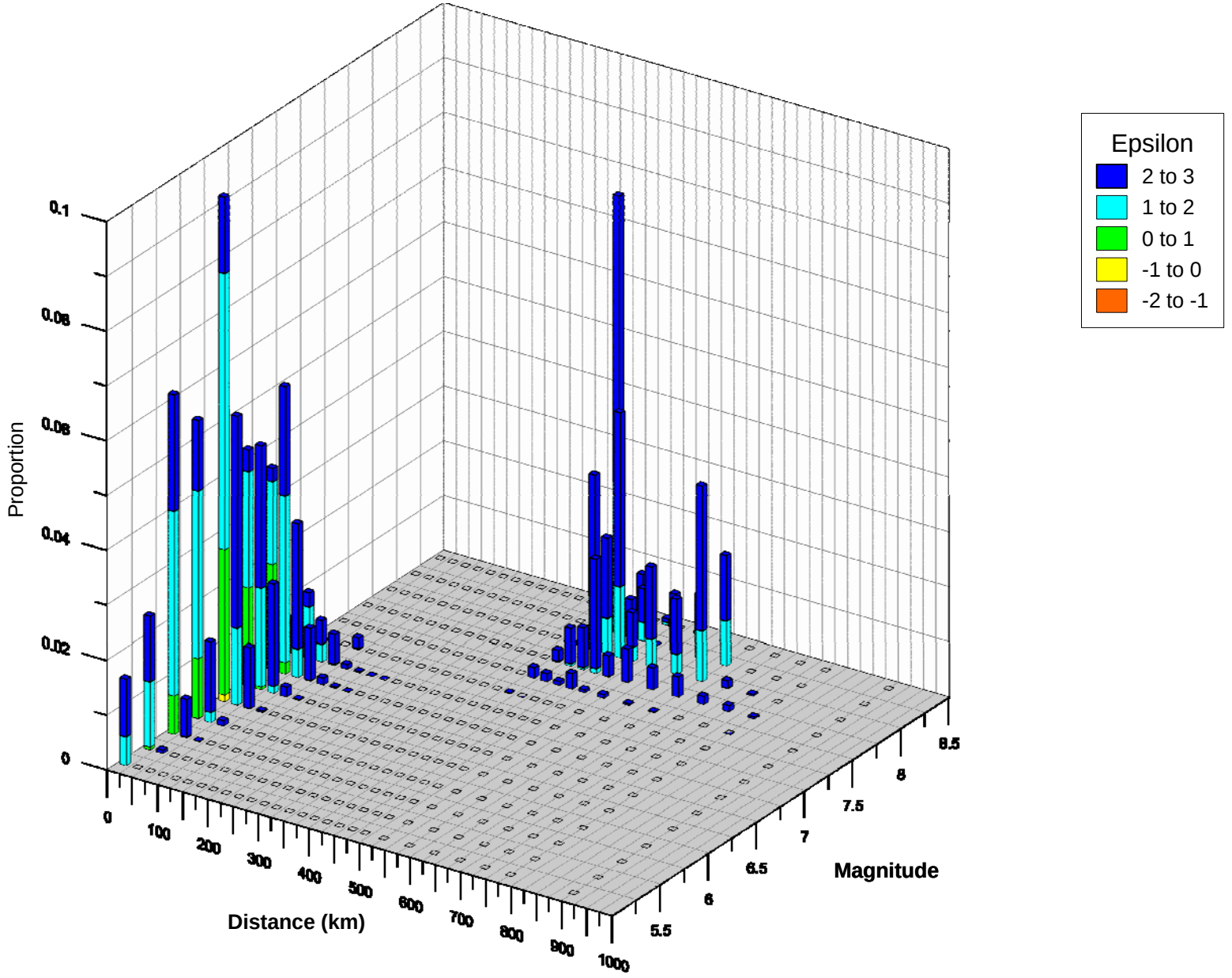
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT 10,000-YEAR RETURN PERIOD AT FAR WEST 2 SITE | Figure<br>49 |

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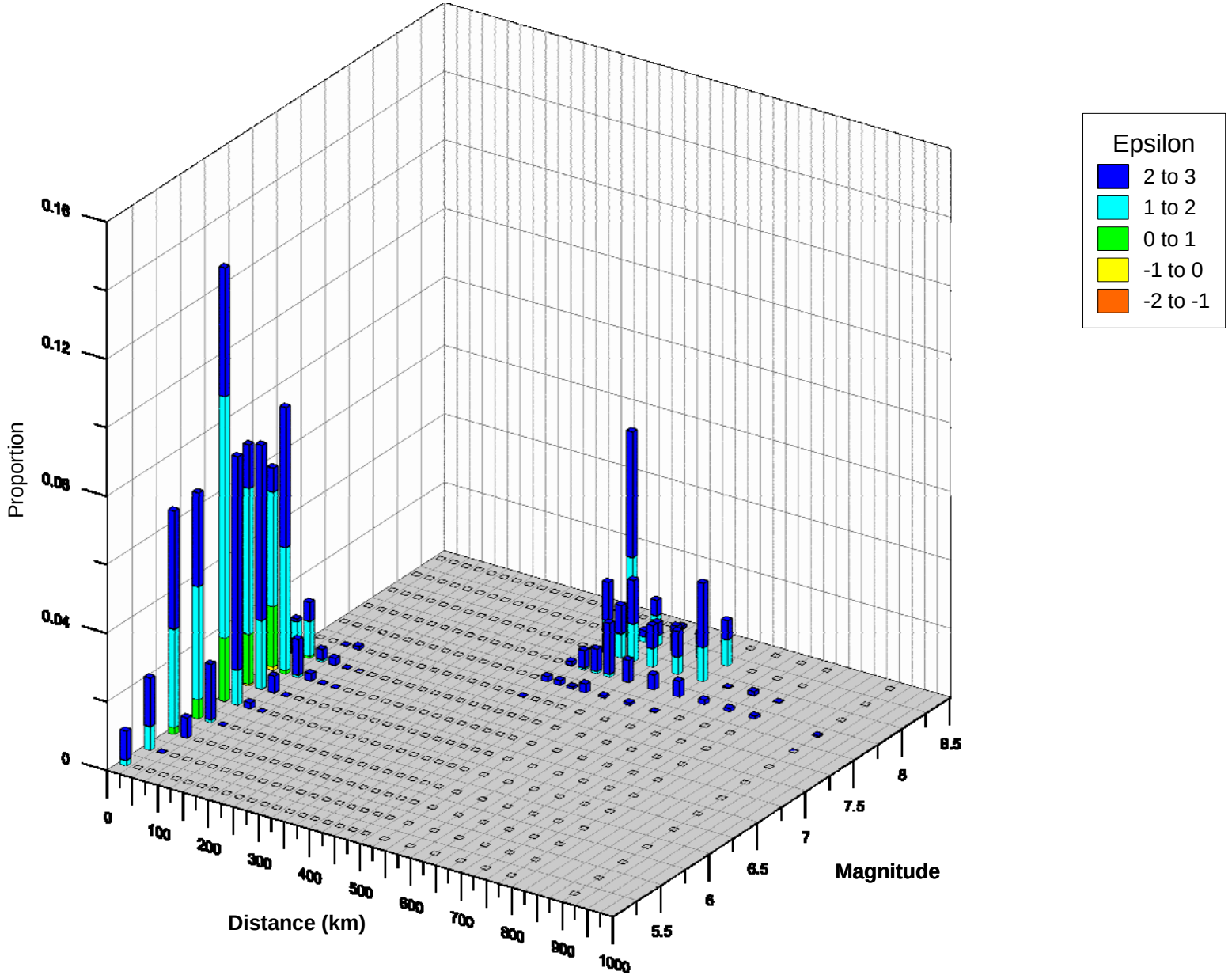
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT 10,000-YEAR RETURN PERIOD AT NEAR WEST SITE | Figure 50 |

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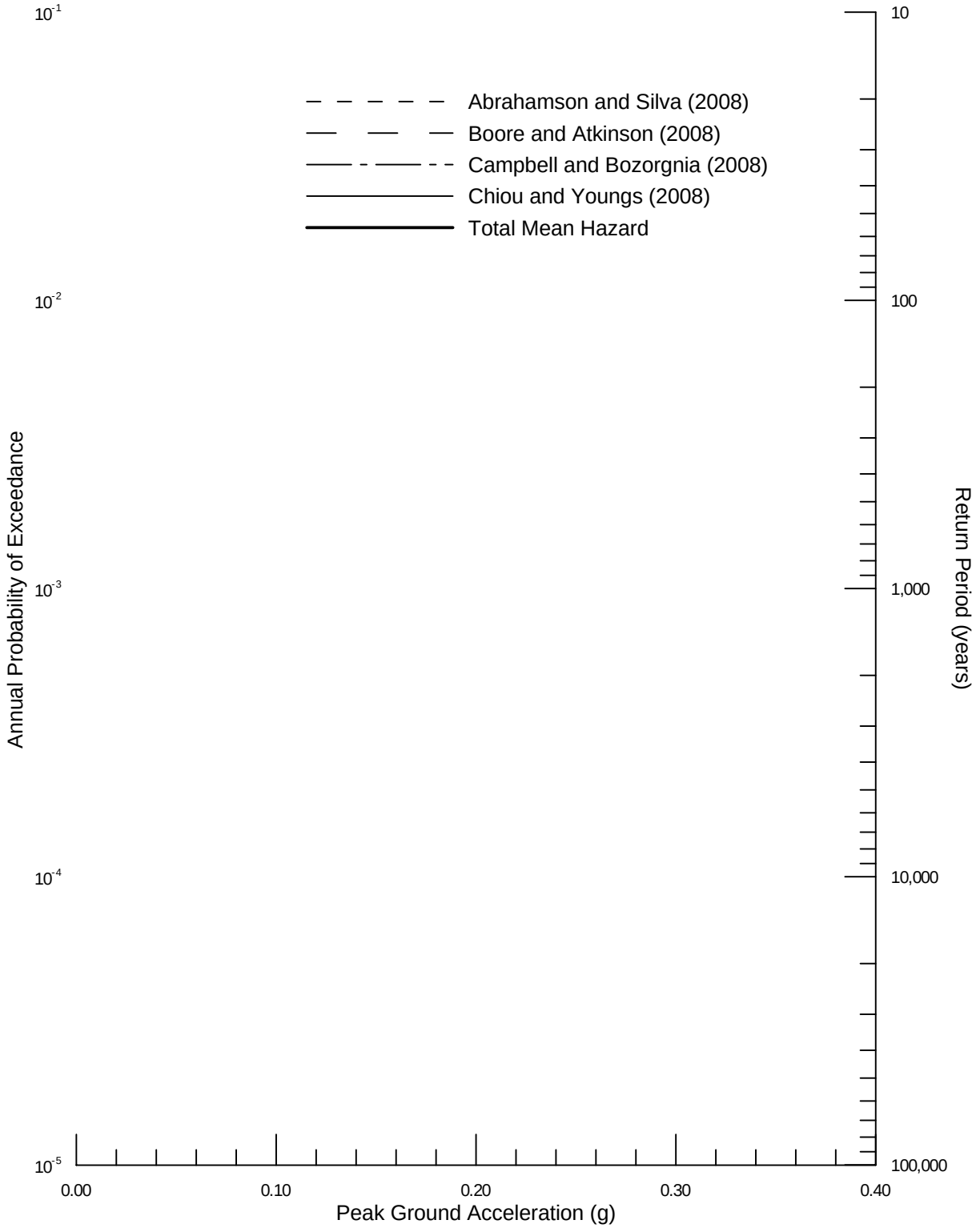
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MAGNITUDE AND DISTANCE CONTRIBUTIONS TO THE MEAN 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD AT 10,000-YEAR RETURN PERIOD AT PINTO VALLEY SITE | Figure<br>51 |

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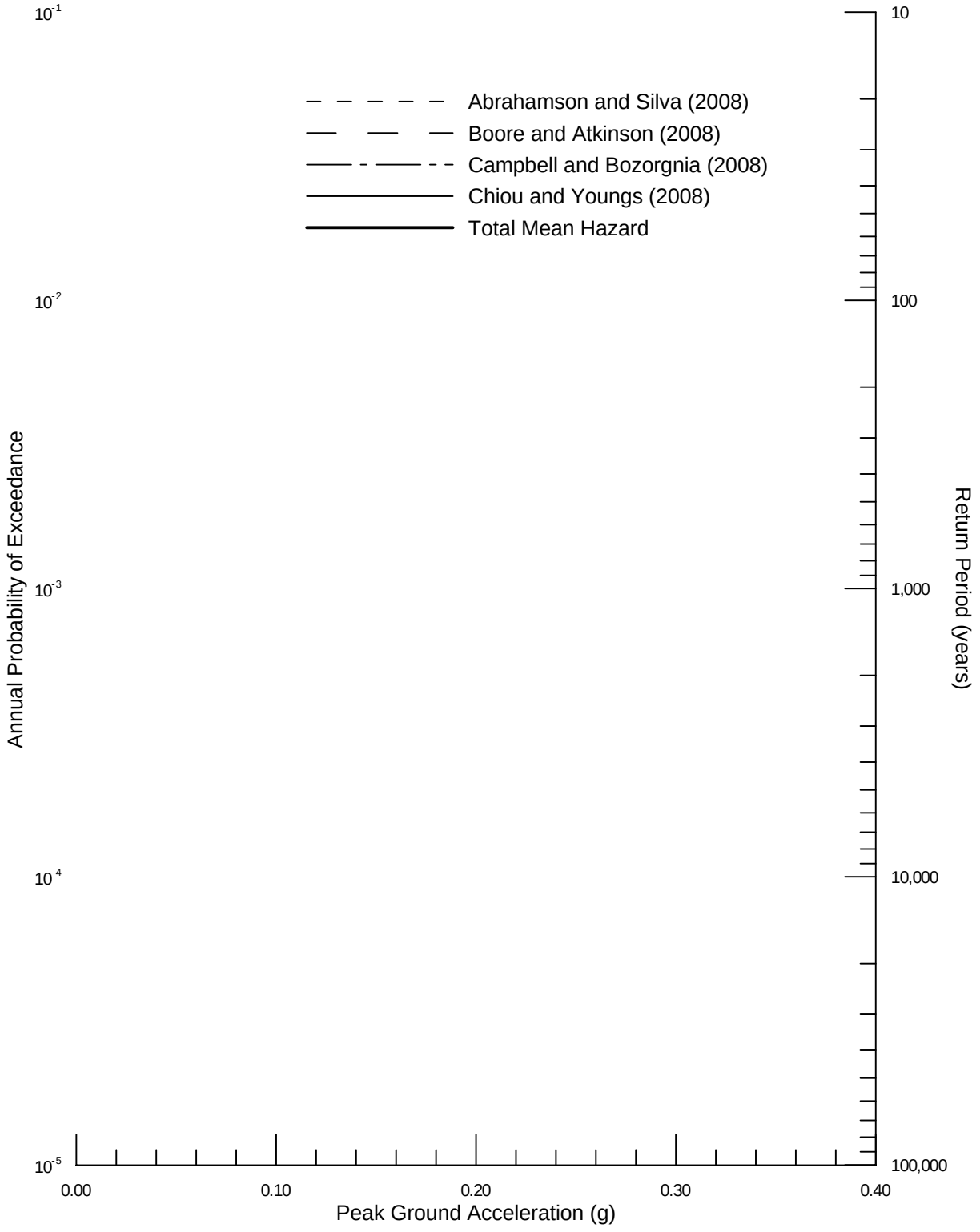
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SENSITIVITY OF THE PEAK HORIZONTAL ACCELERATION HAZARD TO THE SELECTION OF GROUND MOTION PREDICTION MODELS AT FAR WEST 1 SITE | Figure 52 |

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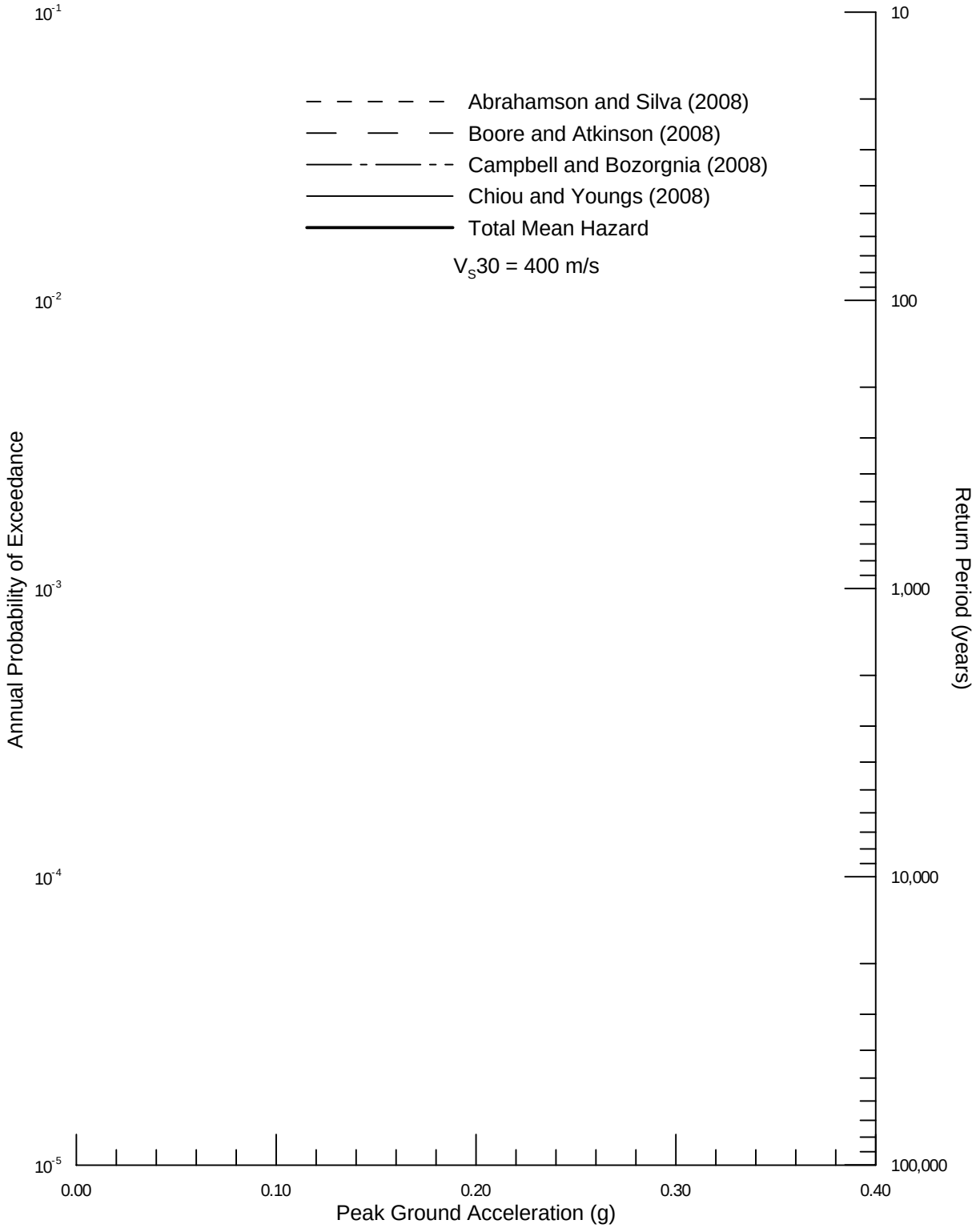
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SENSITIVITY OF THE PEAK HORIZONTAL ACCELERATION HAZARD TO THE SELECTION OF GROUND MOTION PREDICTION MODELS AT FAR WEST 2 SITE | Figure 53 |

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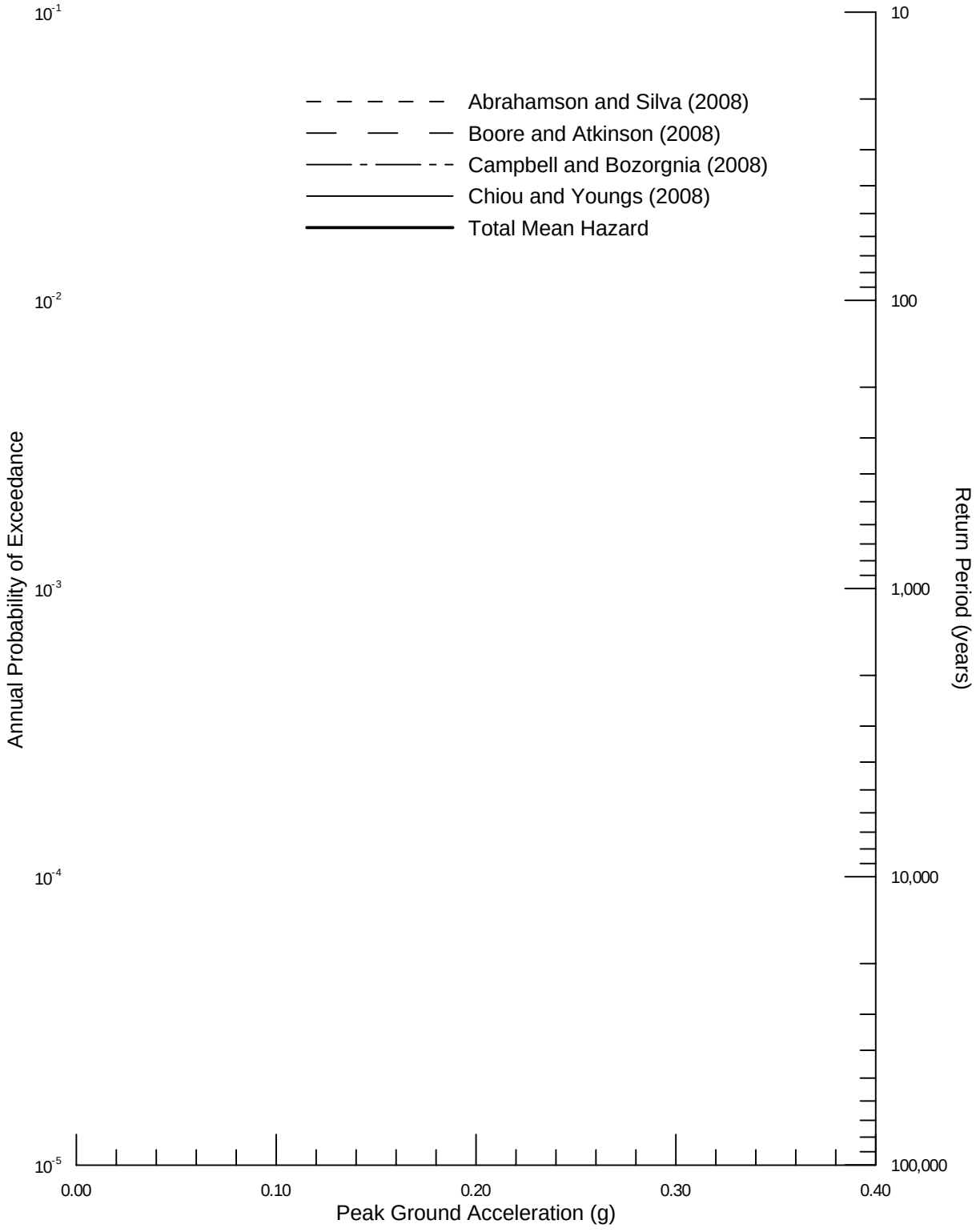
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SENSITIVITY OF THE PEAK HORIZONTAL ACCELERATION HAZARD TO THE SELECTION OF GROUND MOTION PREDICTION MODELS AT NEAR WEST SITE | Figure 54 |

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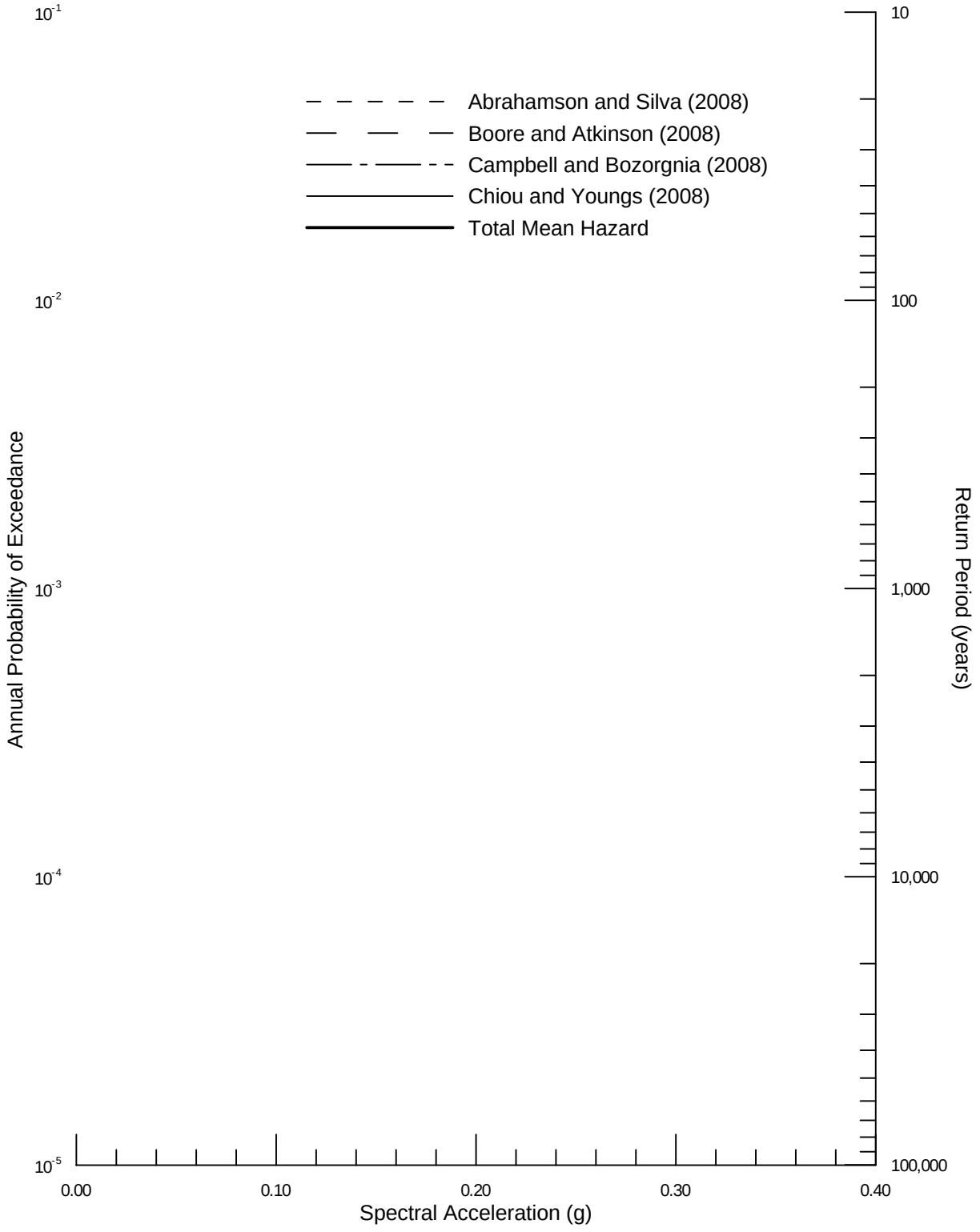
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SENSITIVITY OF THE PEAK HORIZONTAL ACCELERATION HAZARD TO THE SELECTION OF GROUND MOTION PREDICTION MODELS AT PINTO VALLEY SITE | Figure 55 |

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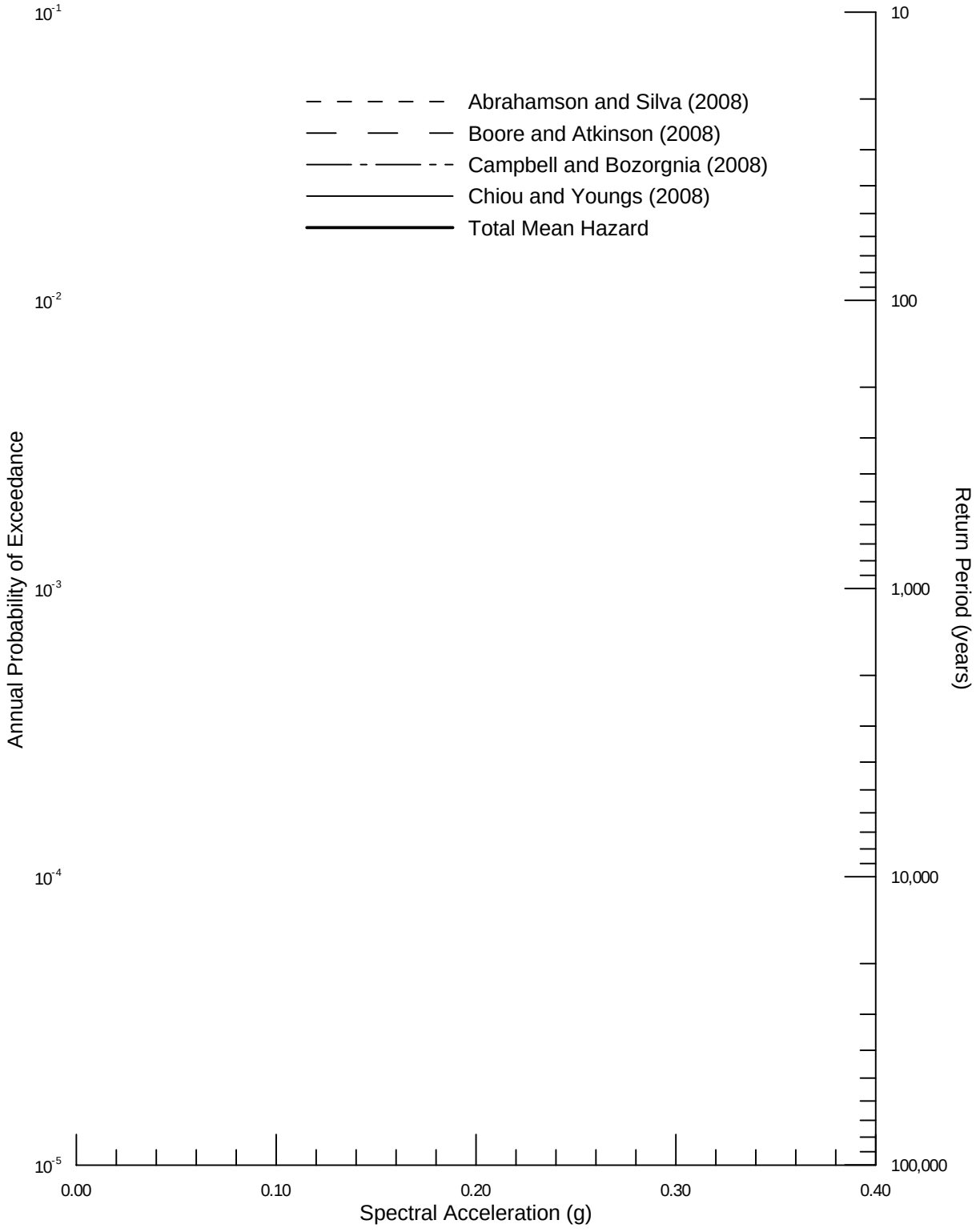
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SENSITIVITY OF THE 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD TO THE SELECTION OF GROUND MOTION PREDICTION MODELS AT FAR WEST 1 SITE | Figure 56 |

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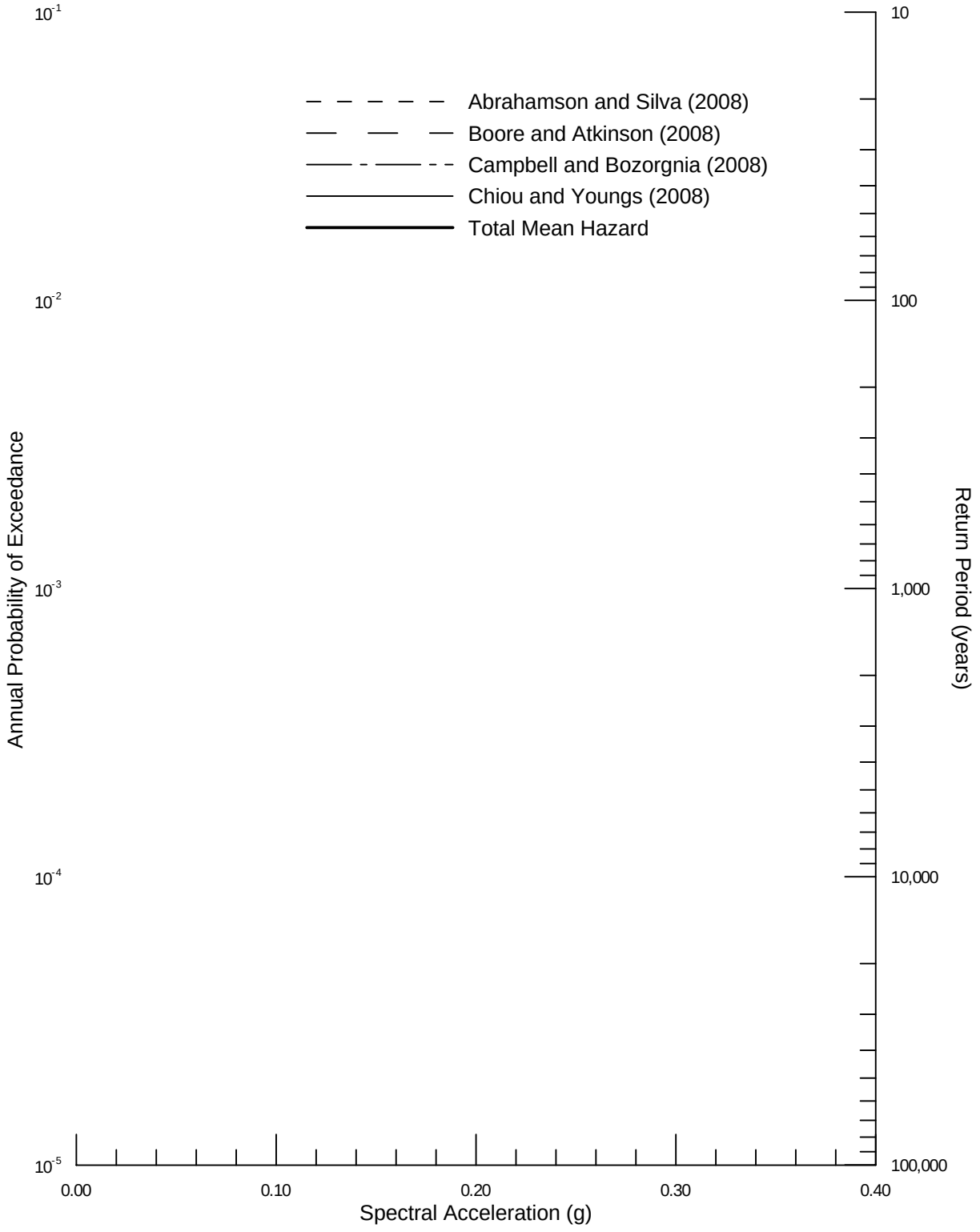
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SENSITIVITY OF THE 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD TO THE SELECTION OF GROUND MOTION PREDICTION MODELS AT FAR WEST 2 SITE | Figure 57 |

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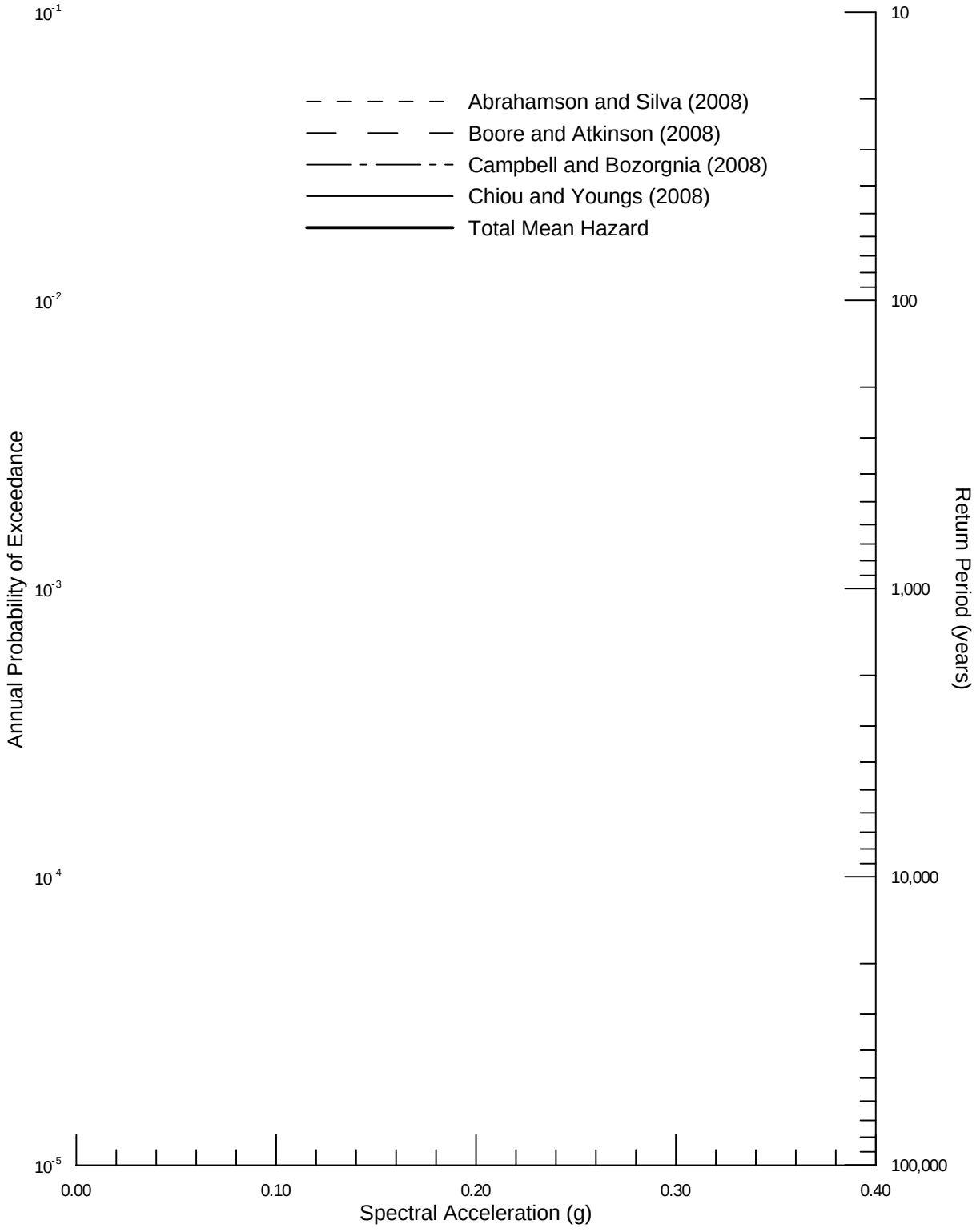
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SENSITIVITY OF THE 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD TO THE SELECTION OF GROUND MOTION PREDICTION MODELS AT NEAR WEST SITE | Figure 58 |

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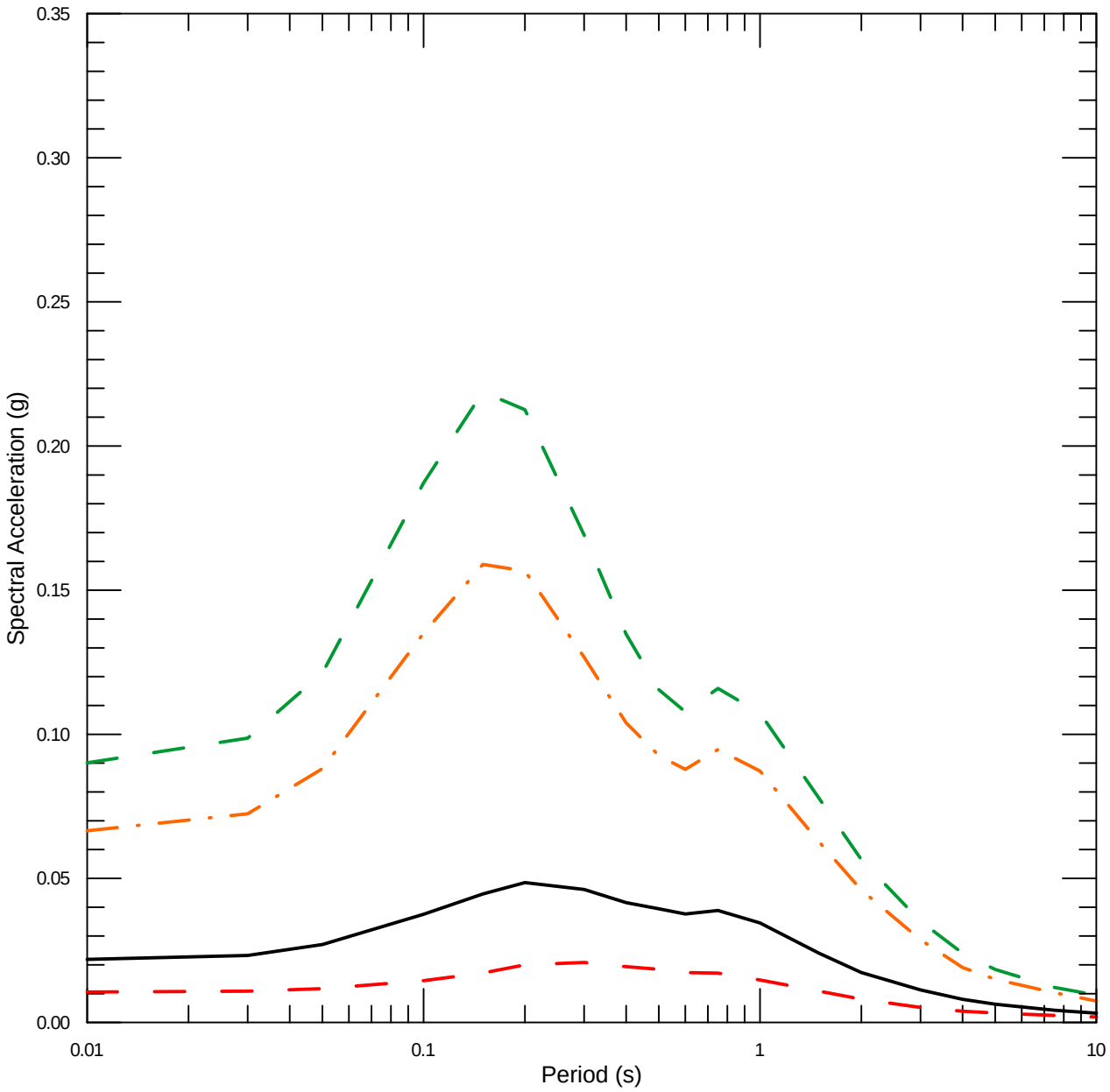
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | SENSITIVITY OF THE 1.0 SEC HORIZONTAL SPECTRAL ACCELERATION HAZARD TO THE SELECTION OF GROUND MOTION PREDICTION MODELS AT PINTO VALLEY SITE | Figure 59 |

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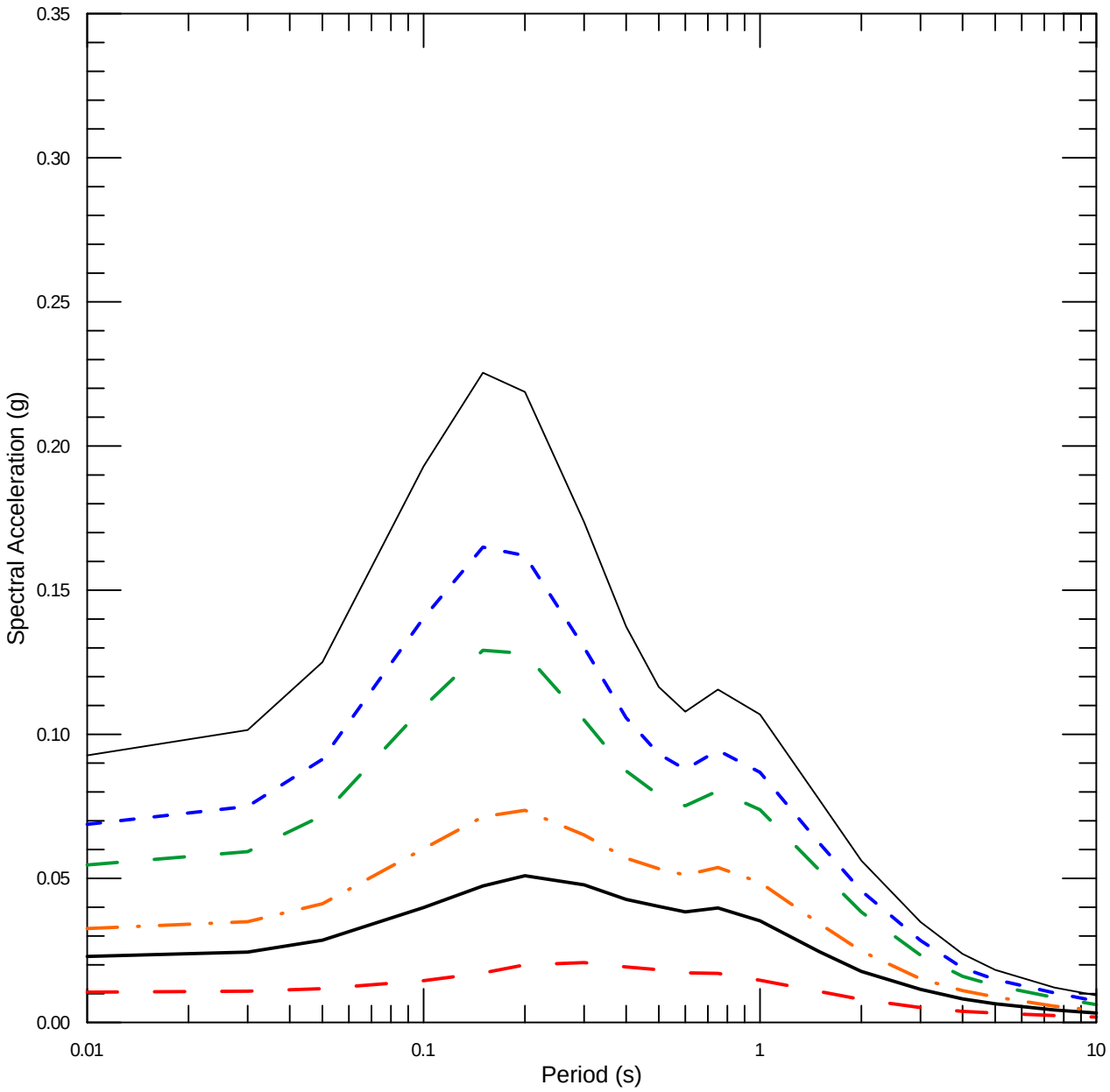
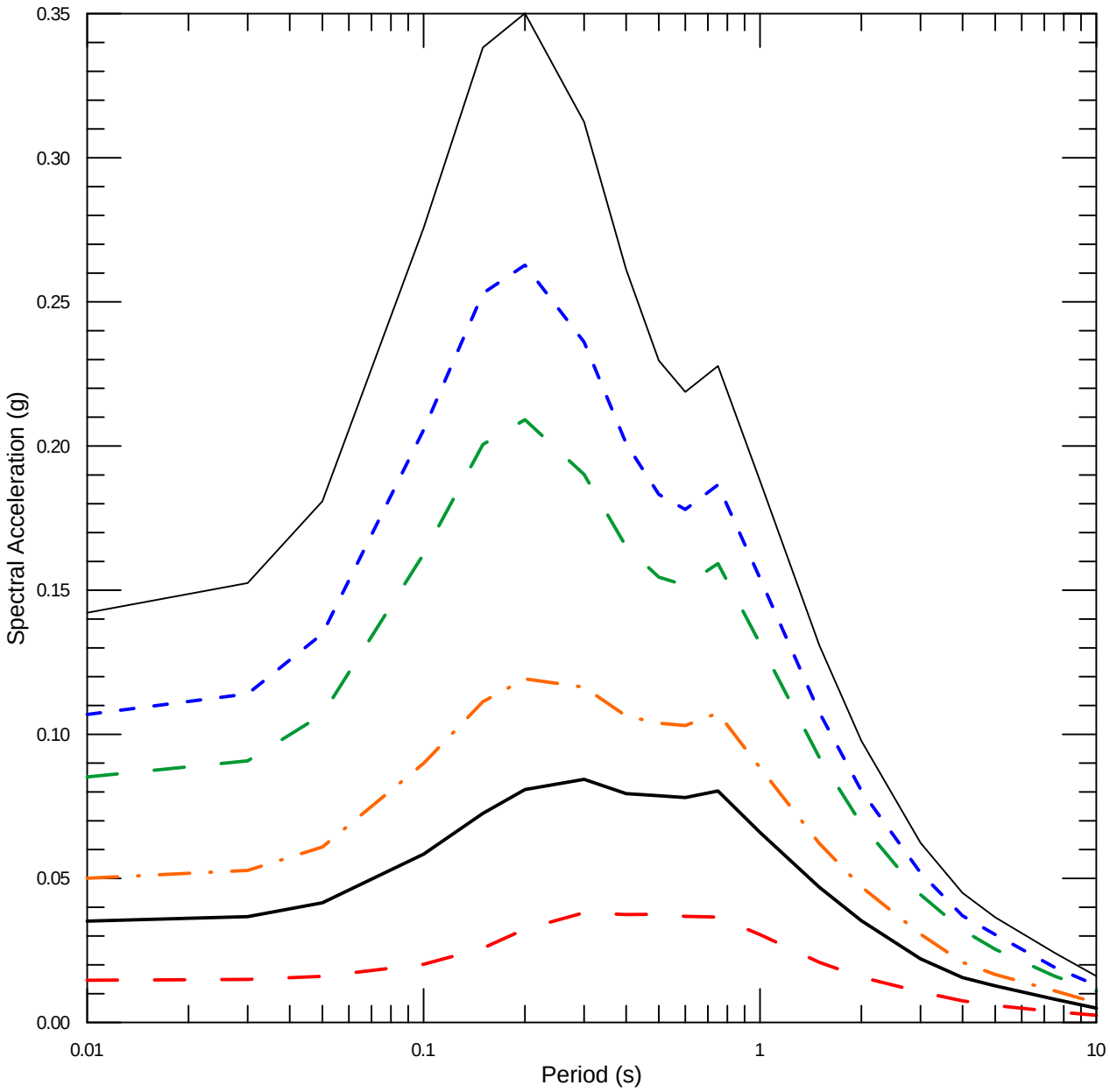
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5%-DAMPED UNIFORM HAZARD SPECTRA<br>AT FAR WEST 1 SITE ON ROCK | Figure<br>60 |




UNIFORM HAZARD SPECTRA

- 100-Year Return Period
- 475-Year Return Period
- 975-Year Return Period
- 3,000-Year Return Period
- 5,000-Year Return Period
- 10,000-Year Return Period

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5%-DAMPED UNIFORM HAZARD SPECTRA<br>AT FAR WEST 2 SITE | Figure<br>61 |




UNIFORM HAZARD SPECTRA

- 100-Year Return Period
- 475-Year Return Period
- 975-Year Return Period
- 3,000-Year Return Period
- 5,000-Year Return Period
- 10,000-Year Return Period

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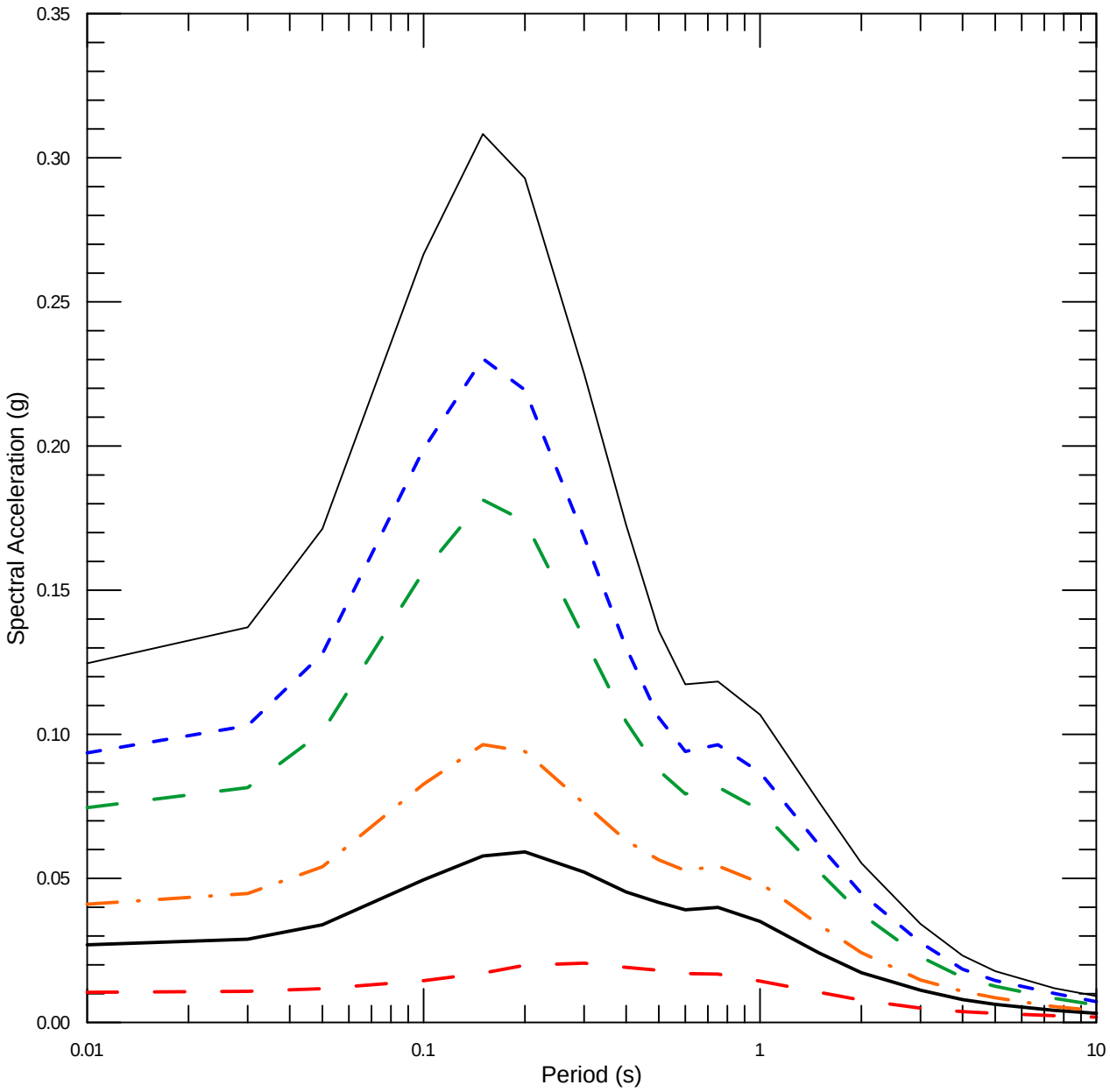
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5%-DAMPED UNIFORM HAZARD SPECTRA<br>AT NEAR WEST SITE | Figure<br>62 |




UNIFORM HAZARD SPECTRA

- 100-Year Return Period
- 475-Year Return Period
- 975-Year Return Period
- 3,000-Year Return Period
- 5,000-Year Return Period
- 10,000-Year Return Period

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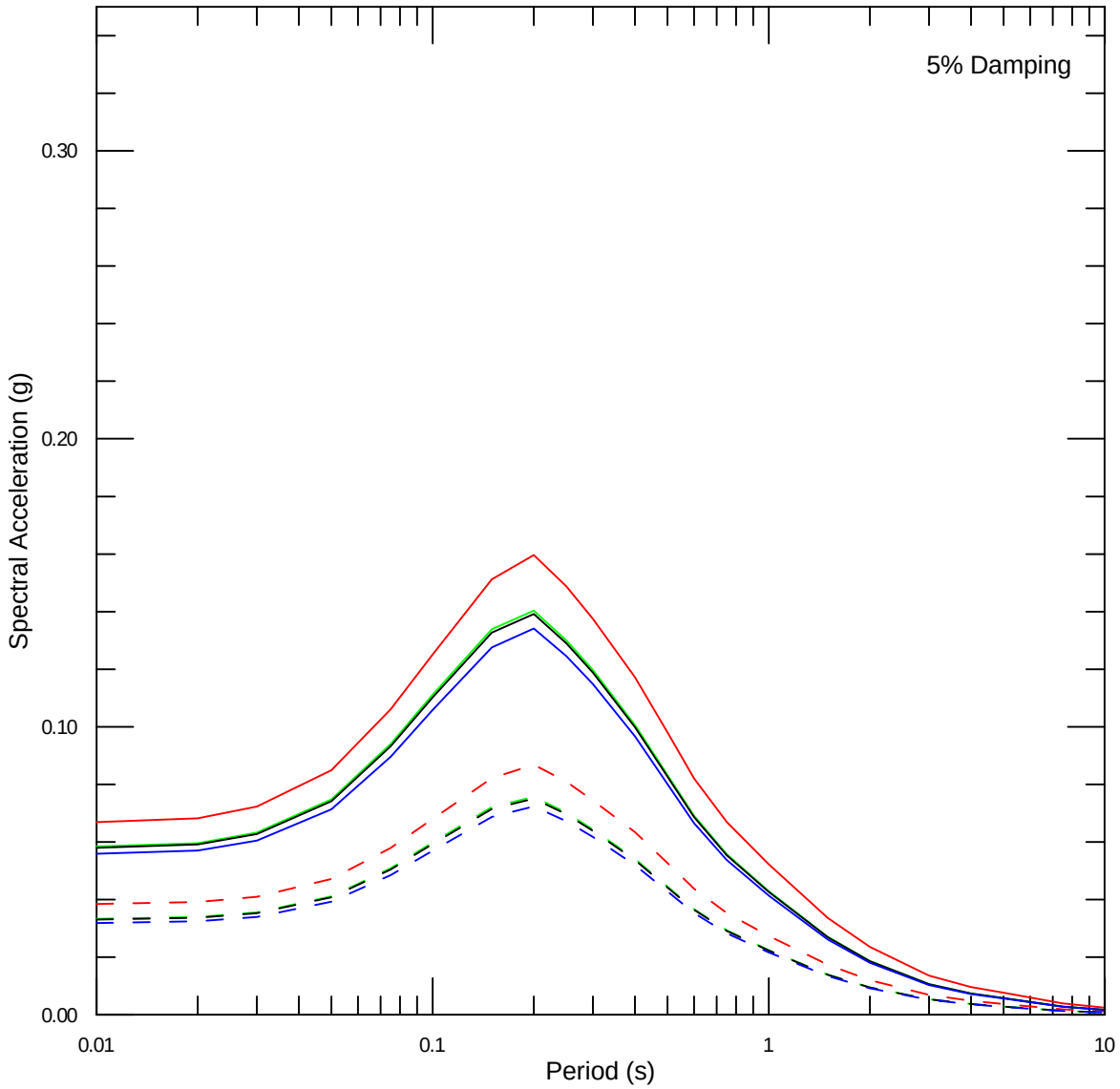
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5%-DAMPED UNIFORM HAZARD SPECTRA<br>AT PINTO VALLEY SITE | Figure<br>63 |




Pinto Valley - Median
Pinto Valley - 84th Percentile
Near West - Median
Near West - 84th Percentile
Far West 1 - Median
Far West 1 - 84th Percentile
Far West 2 - Median
Far West 2 - 84th Percentile

Sugarloaf fault
**M**6.6
Dip = 50°
Normal Fault

Far West 1: $R_{RUP}$ = 54.6 km
Far West 2: $R_{RUP}$ = 56.5 km
Near West: $R_{RUP}$ = 48.6 km
Pinto Valley: $R_{RUP}$ = 54.8 km

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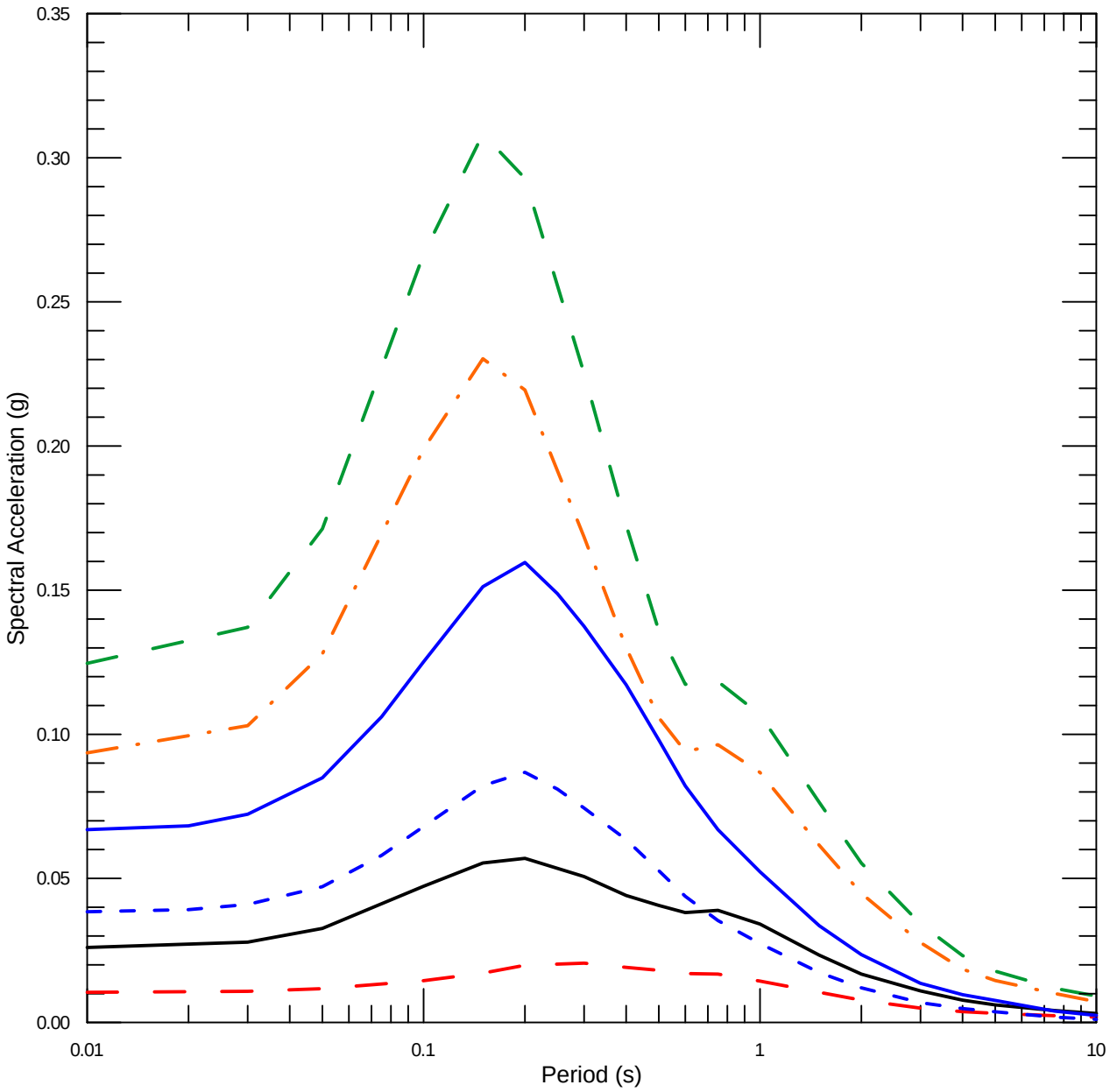
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | MEDIAN AND 84th-PERCENTILE SUGARLOAF FAULT **M**6.6 MCE HORIZONTAL ACCELERATION RESPONSE SPECTRA | Figure 64 |

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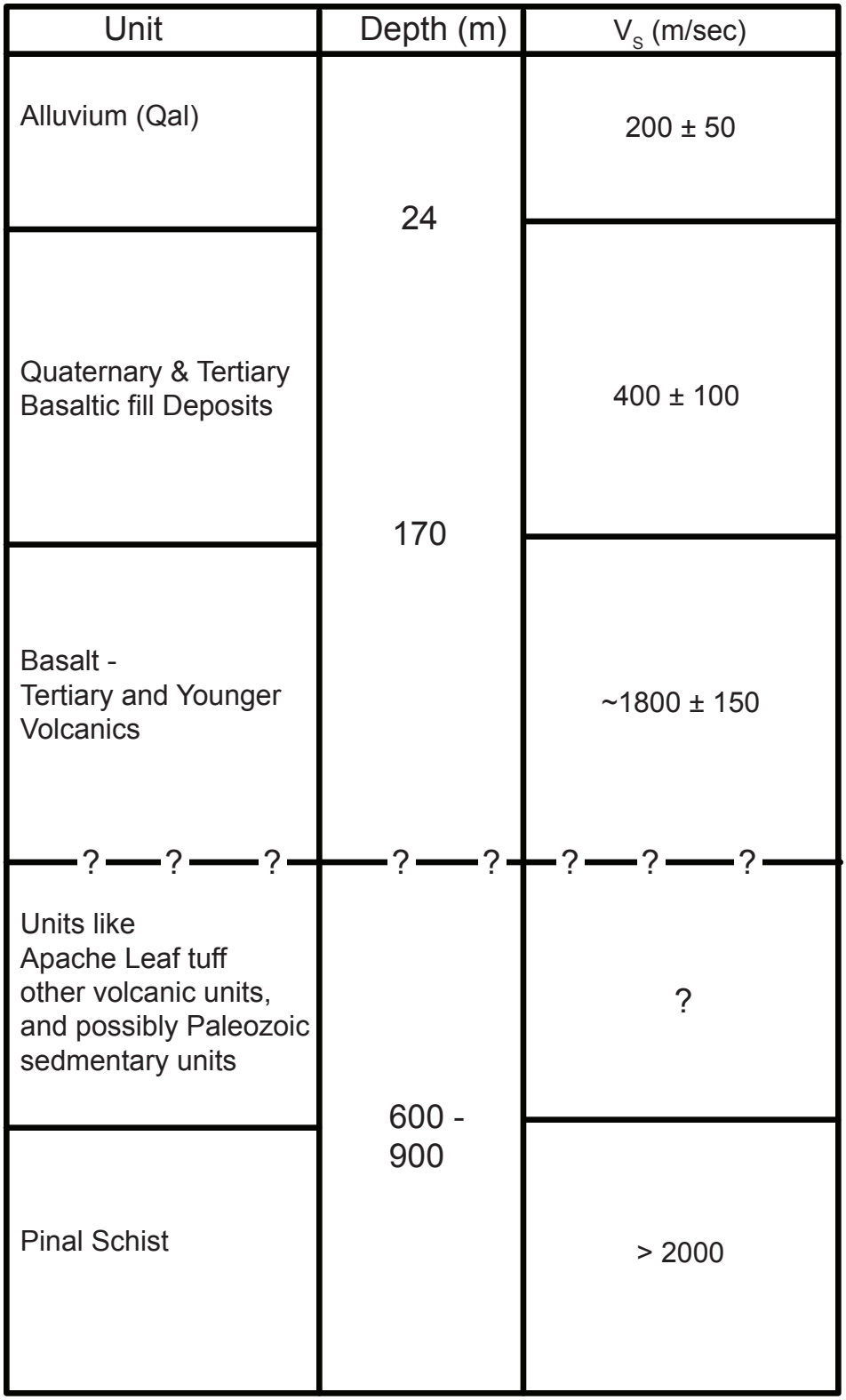
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5%-DAMPED UNIFORM HAZARD SPECTRA<br>AND DETERMINISTIC SPECTRA<br>AT PINTO VALLEY SITE | Figure<br>65 |

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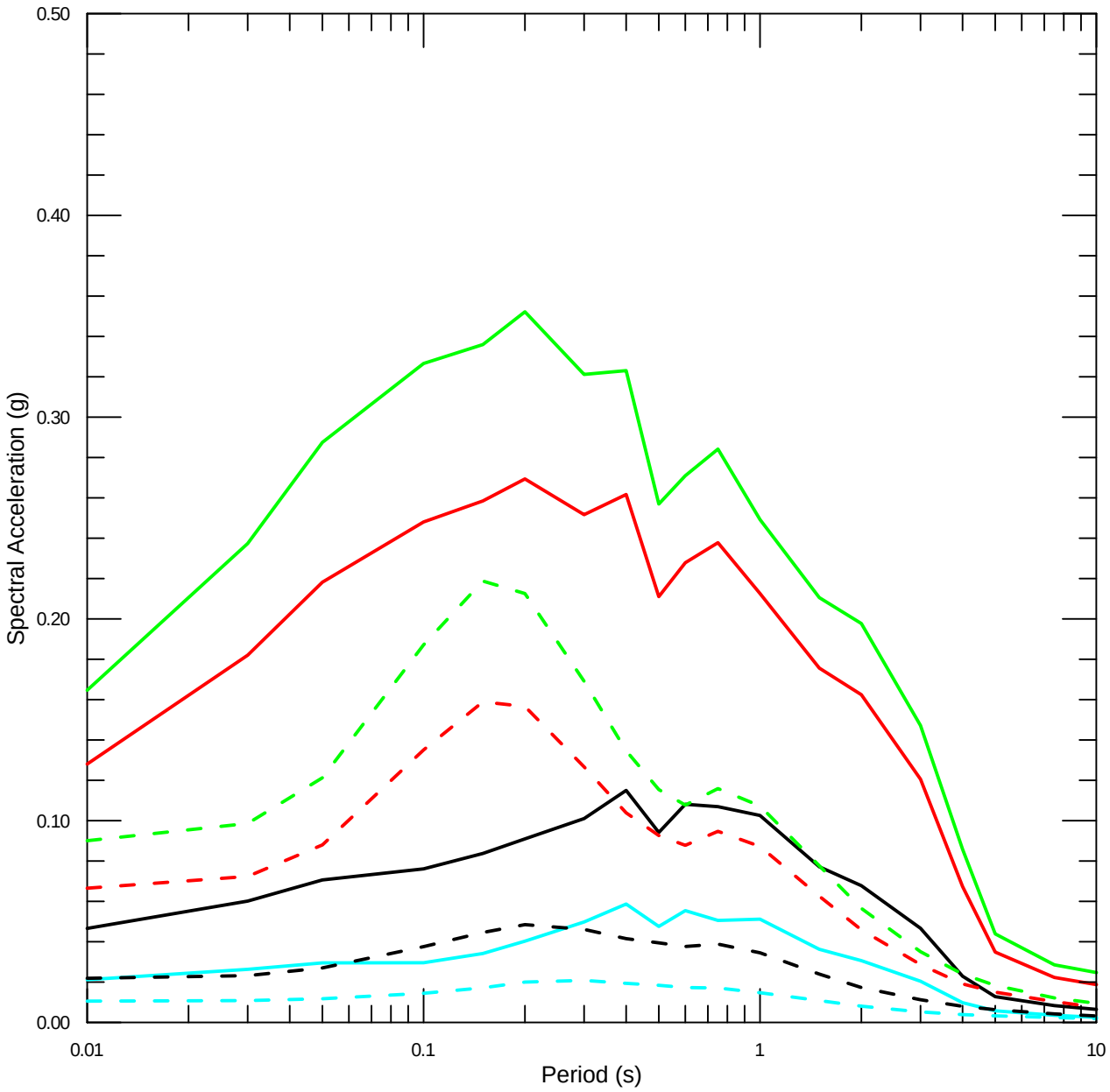
| URS | Project No. 26818581<br>Resolution Copper Mining, Arizona | STRATIGRAPHY AND $V_S$ AT FAR WEST 1 | Figure 66 |

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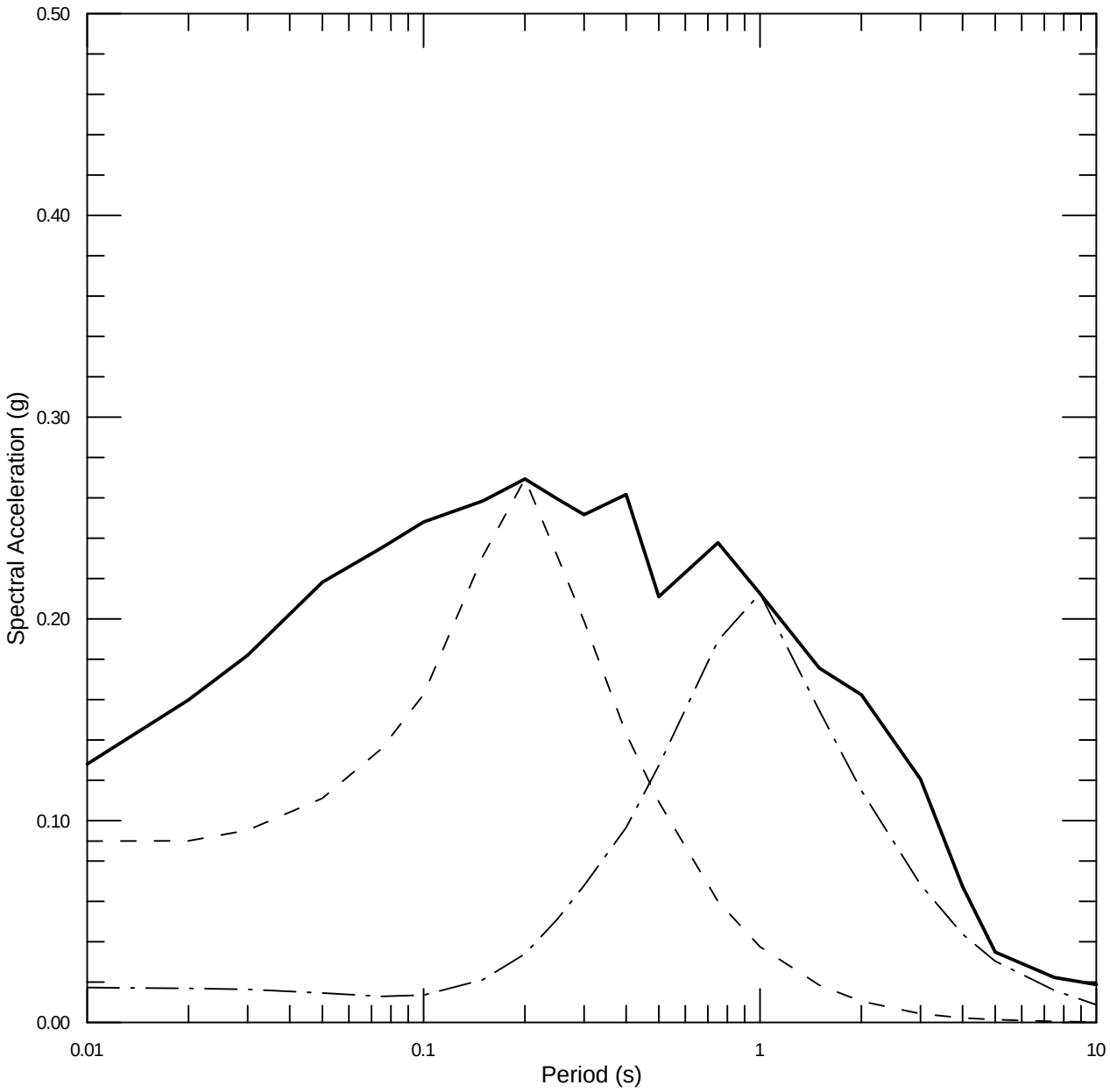
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | UHS AT FAR WEST 1<br>AT THE TOP OF HARD ROCK AND ALLUVIUM | Figure<br>67 |

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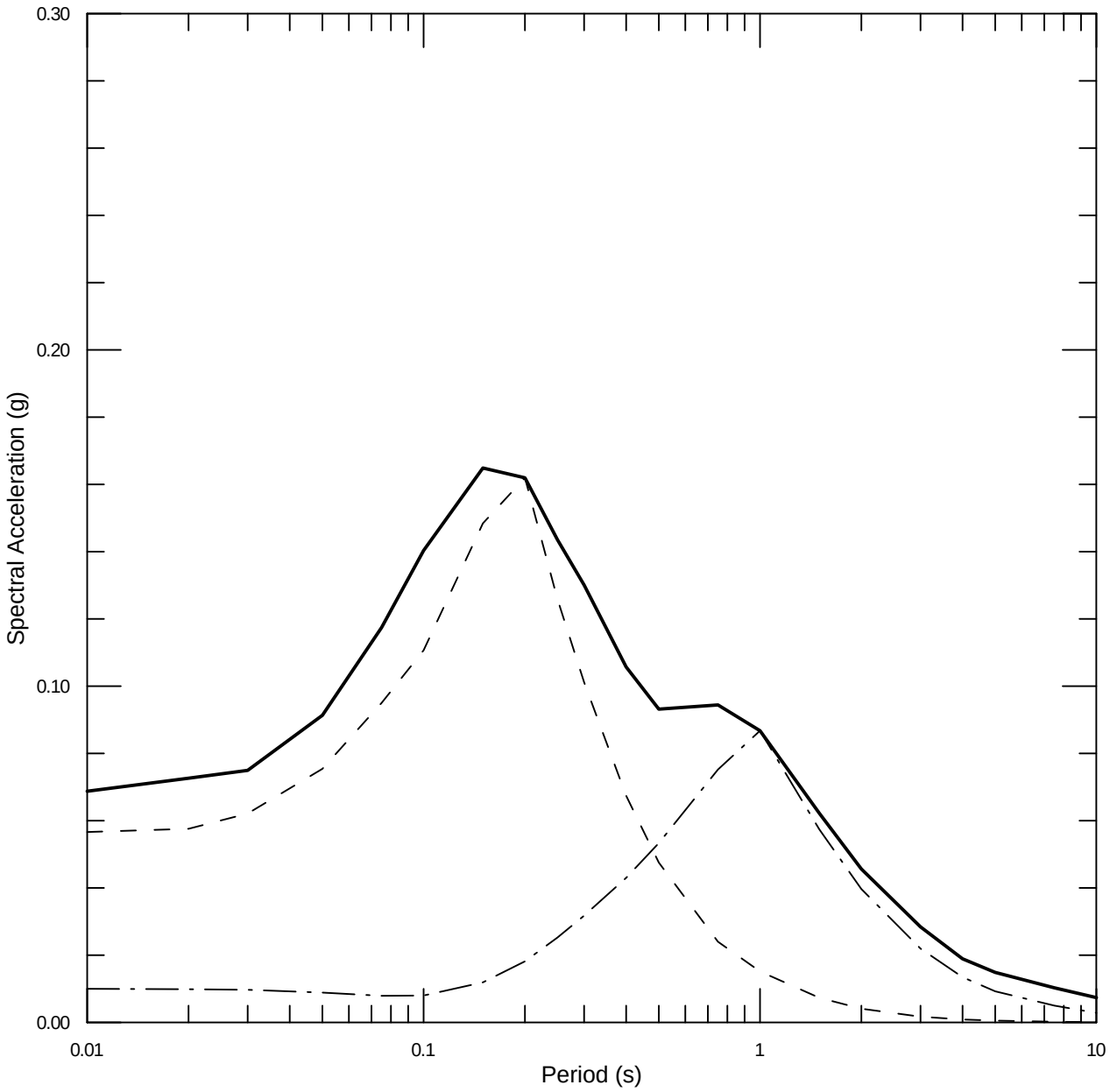
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5%-DAMPED 5000-YEAR RETURN PERIOD<br>UHS FOR TOP OF ALLUVIUM AND CMS<br>AT FAR WEST 1 SITE | Figure<br>68 |

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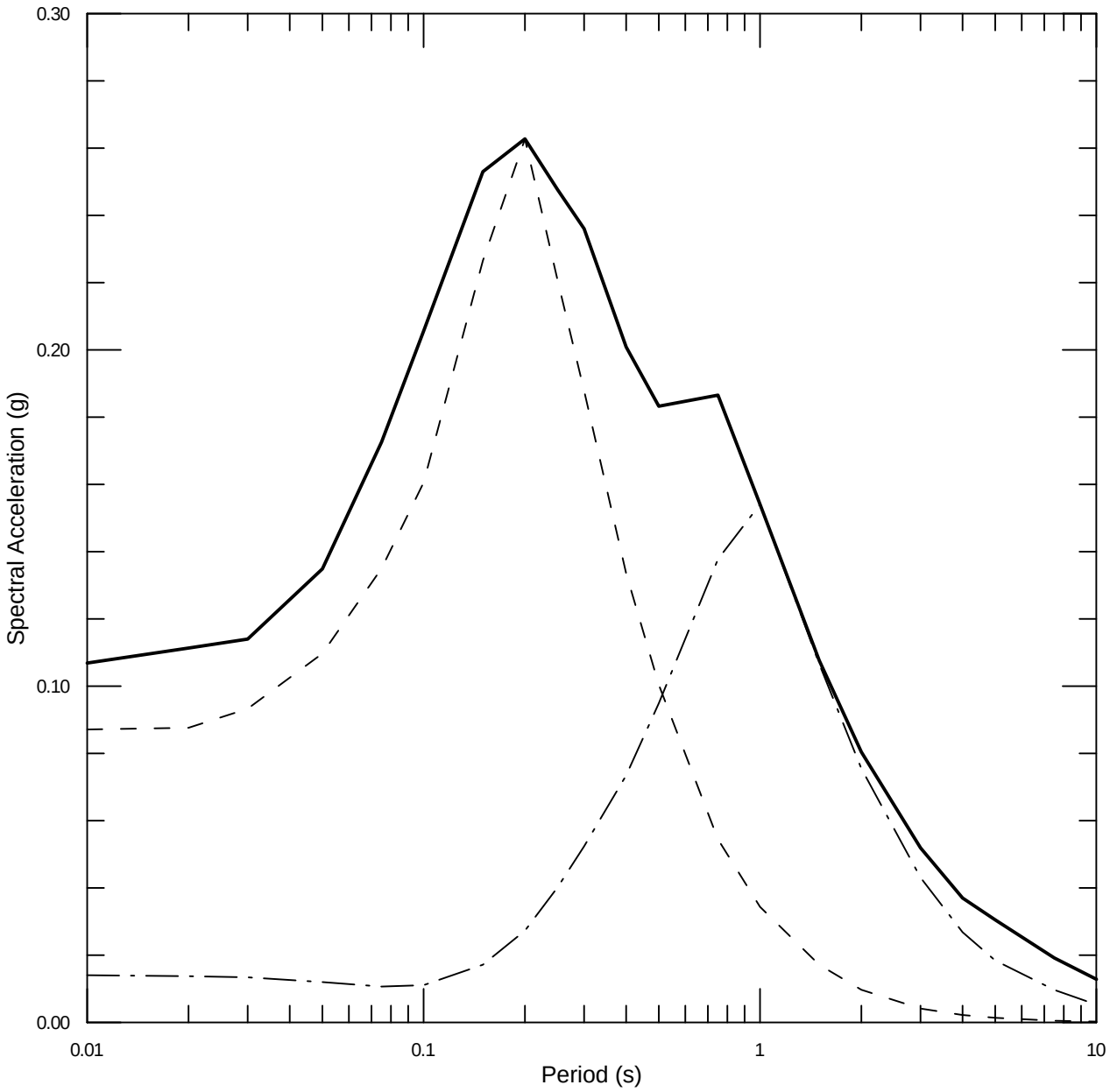
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5%-DAMPED 5000-YEAR RETURN PERIOD<br>UHS AND CMS<br>AT FAR WEST 2 SITE | Figure<br>69 |

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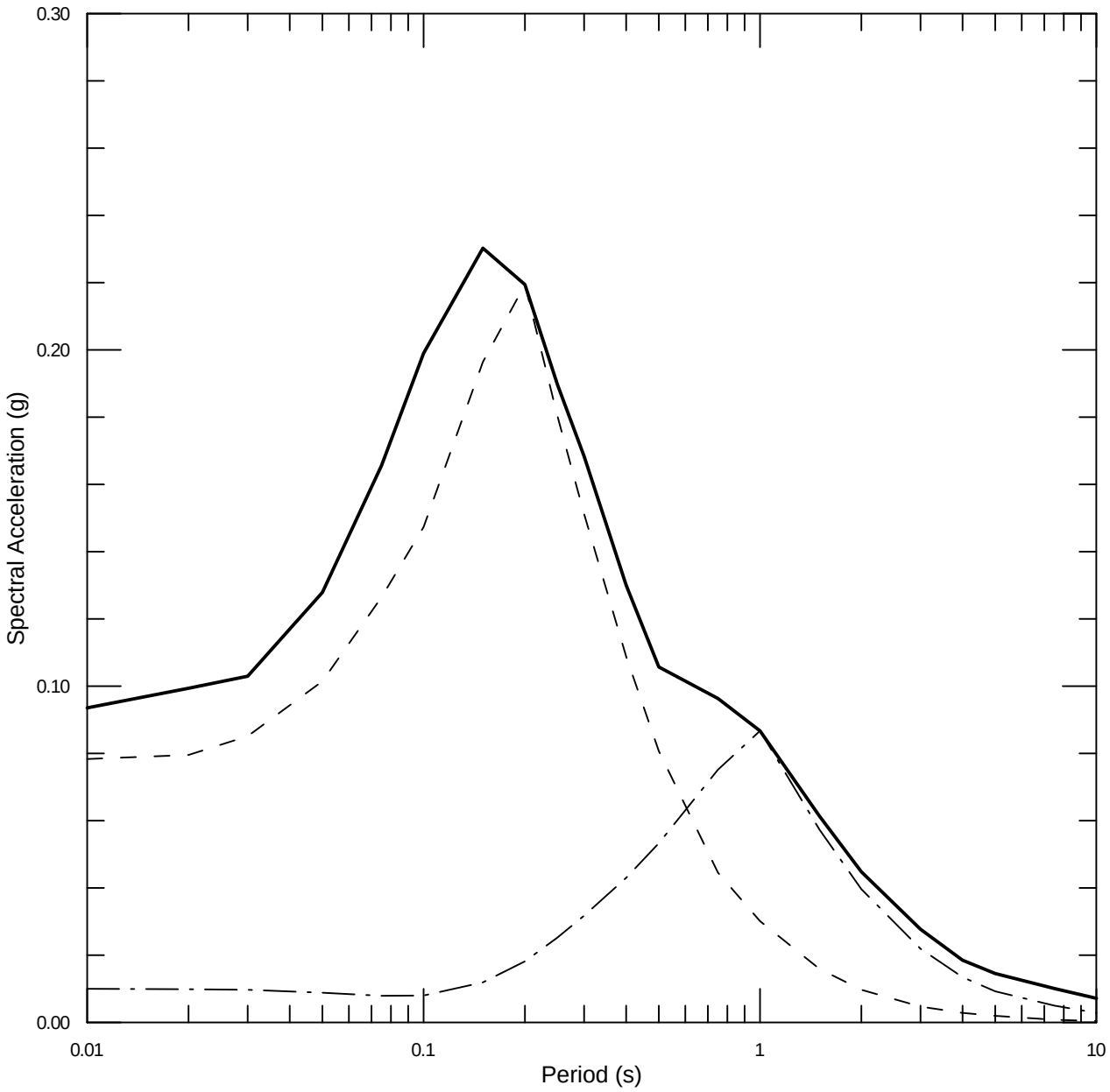
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5%-DAMPED 5000-YEAR RETURN PERIOD<br>UHS AND CMS<br>AT NEAR WEST SITE | Figure<br>70 |

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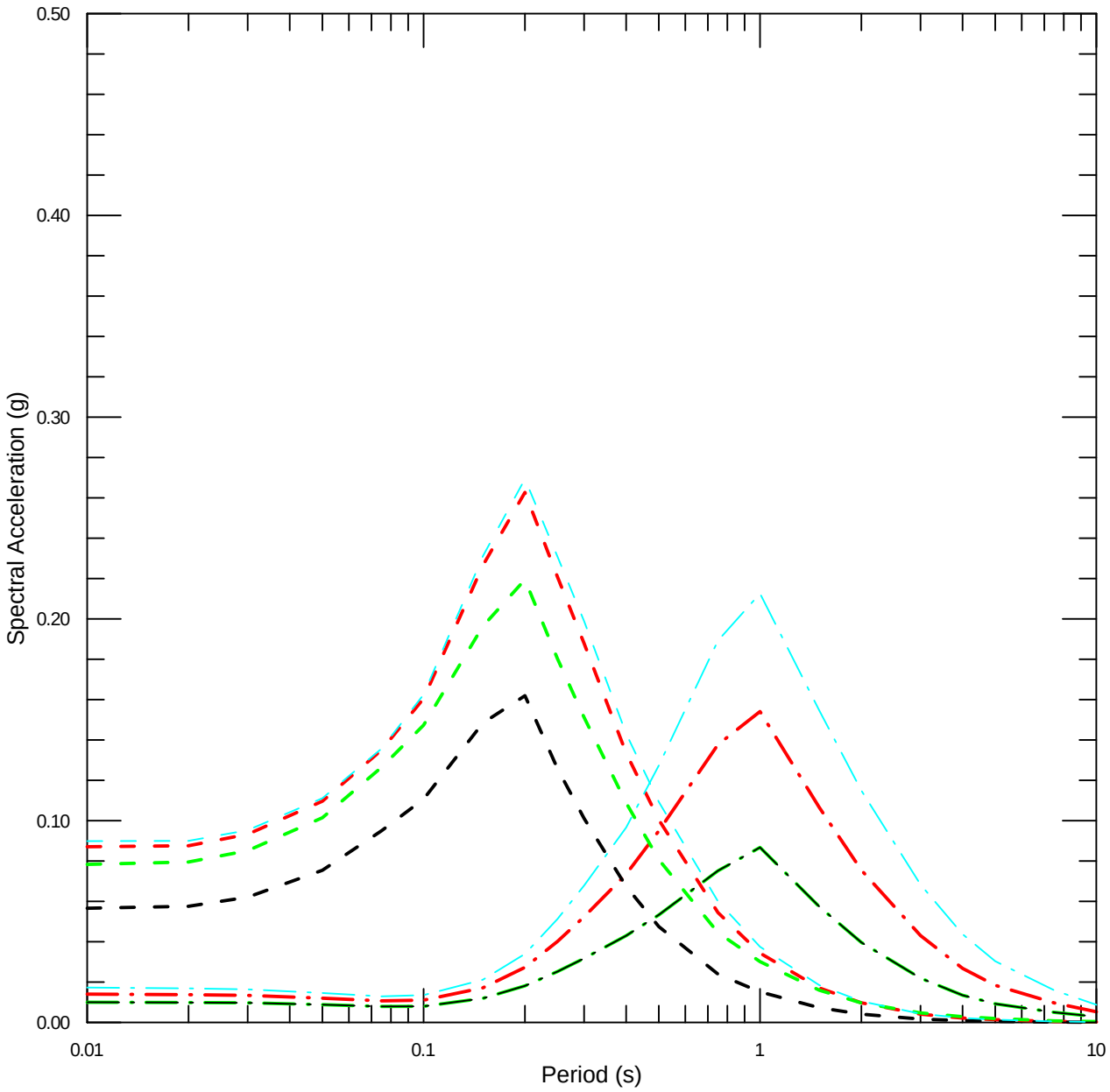
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5%-DAMPED 5000-YEAR RETURN PERIOD<br>UHS AND CMS<br>AT PINTO VALLEY SITE | Figure<br>71 |

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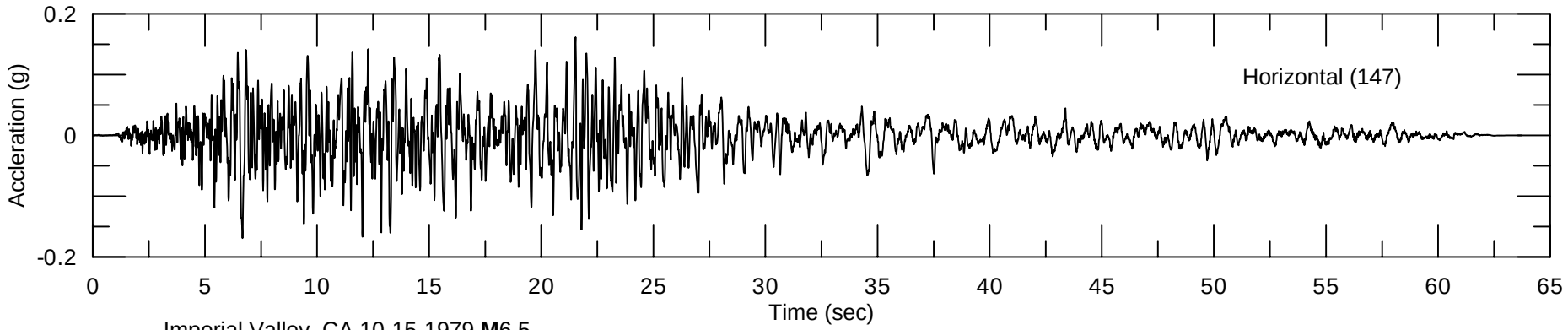
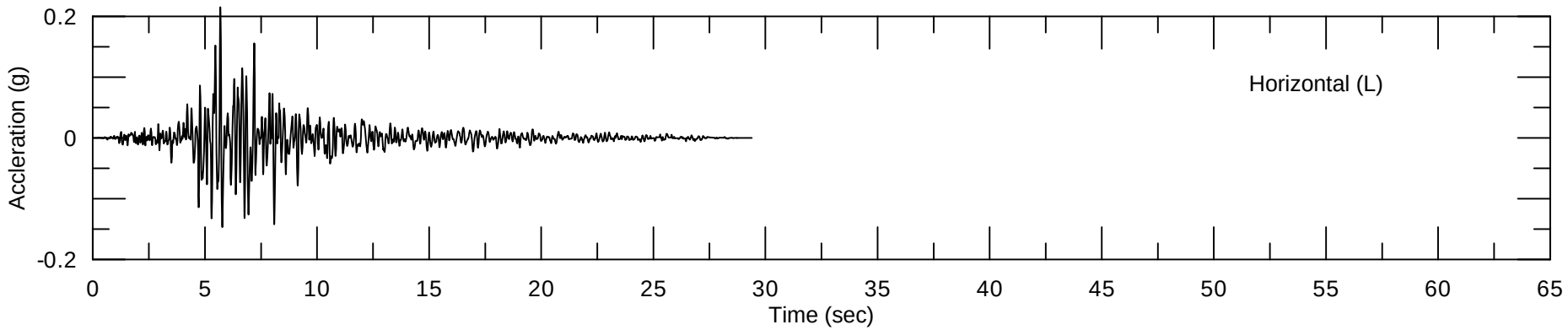
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper Mining<br>Arizona | 5,000-YEAR RETURN PERIOD<br>CMS FOR 0.2 AND 1.0 SEC SPECTRAL<br>ACCELERATION | Figure<br>72 |

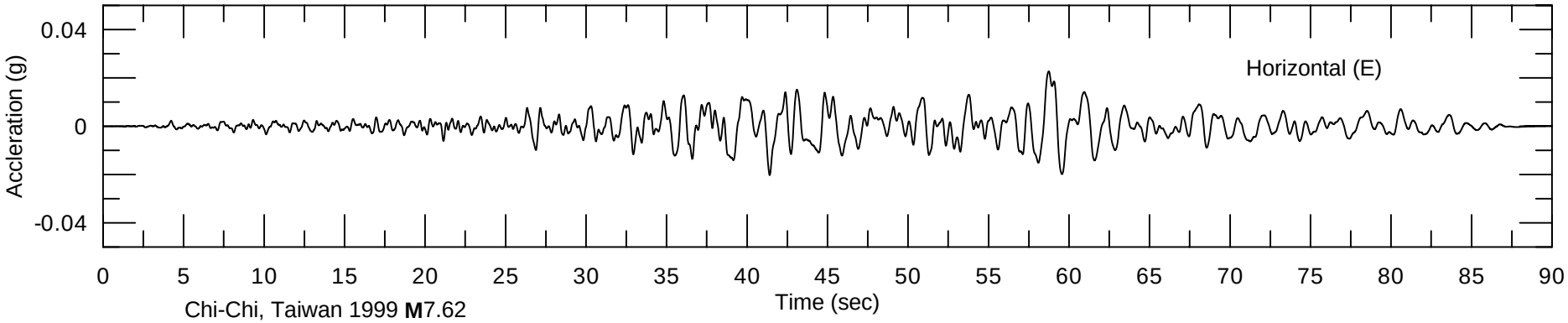



Imperial Valley, CA 10-15-1979 **M**6.5
Cerro Prieto
Dist=15.19 km
$V_S30$ = 659.6 m/s

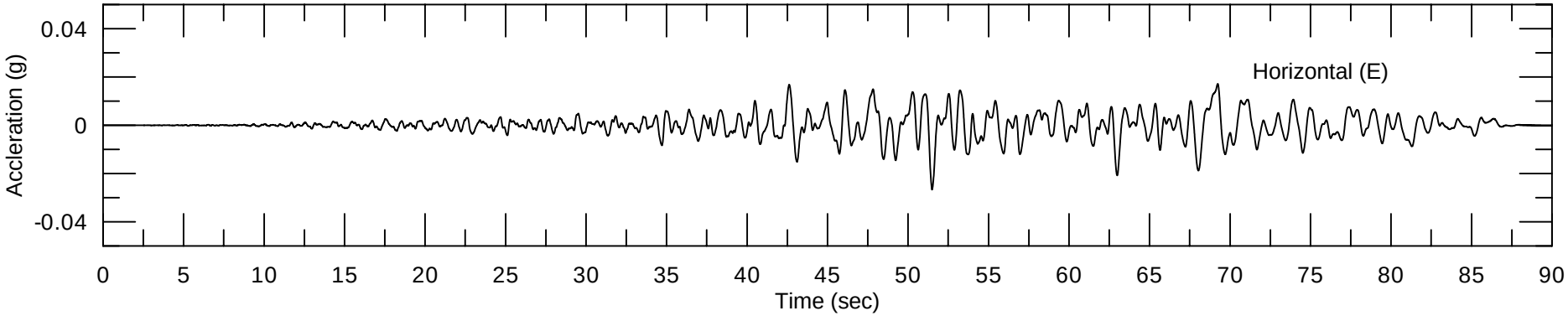



Kozani, Greece 1995 **M**6.4
Kozani
Dist=19.5 km
$V_S30$ = 659.6 m/s

| | | | |
|---|---|---|---|
| URS | Project No. 26818294<br>Resolution Copper<br>Arizona | SEED TIME HISTORIES<br>FOR 0.2 SEC CMS SPECTRUM<br>1979 IMPERIAL VALLEY AND 1995 KOZANI | Figure<br>73 |




Chi-Chi, Taiwan 1999 **M**7.62
KAU046
Dist= 162 km
$V_S30$ =204.2 m/s




Chi-Chi, Taiwan 1999 **M**7.62
KAU081
Dist= 161 km
$V_S30$ =272.4 m/s

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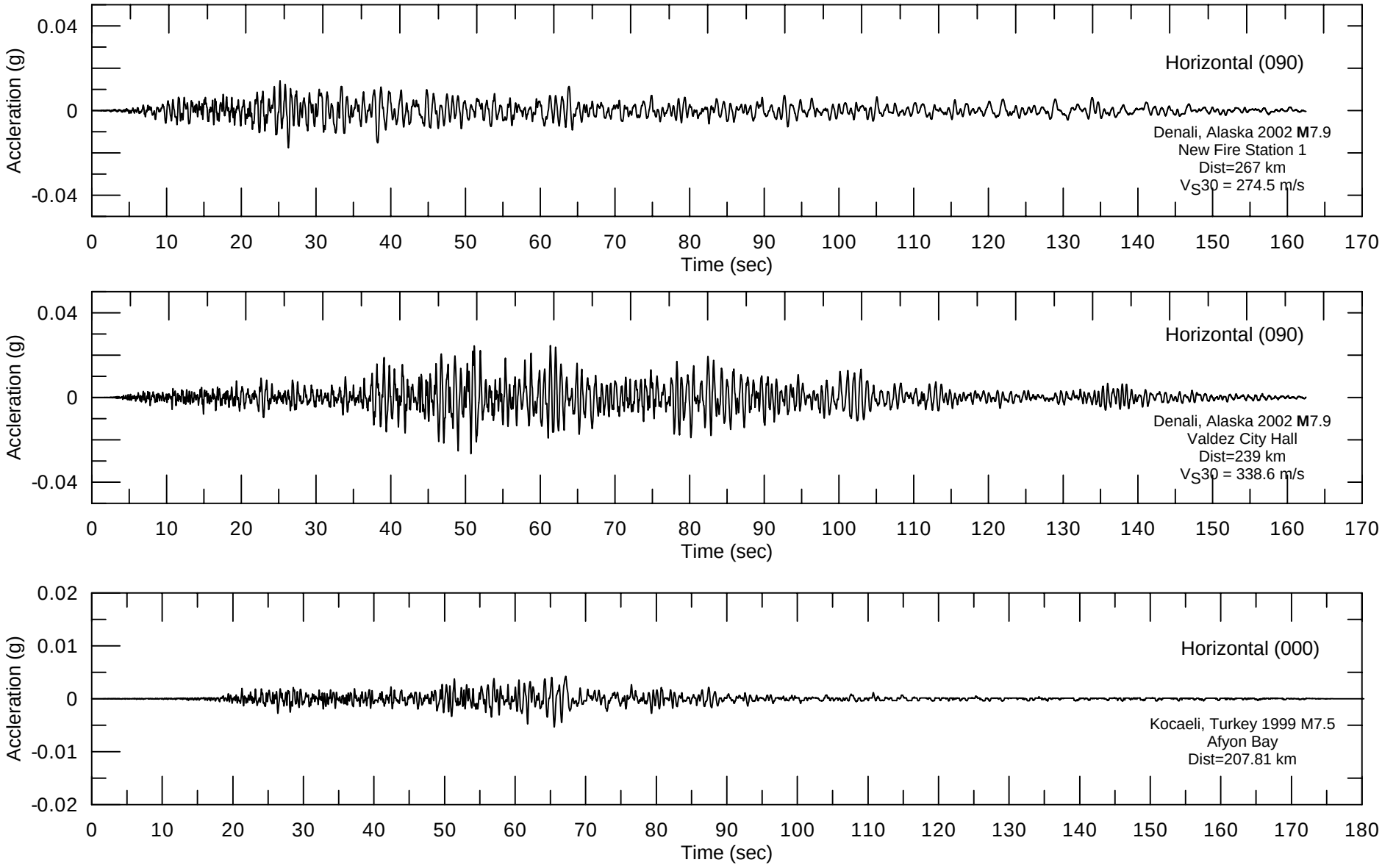
|---|---|---|---|
| URS | Project No. 26818294<br>Resolution Copper<br>Arizona | SEED TIME HISTORIES<br>FOR 1.0 SEC CMS SPECTRUM<br>1999 CHI-CHI | Figure<br>74 |

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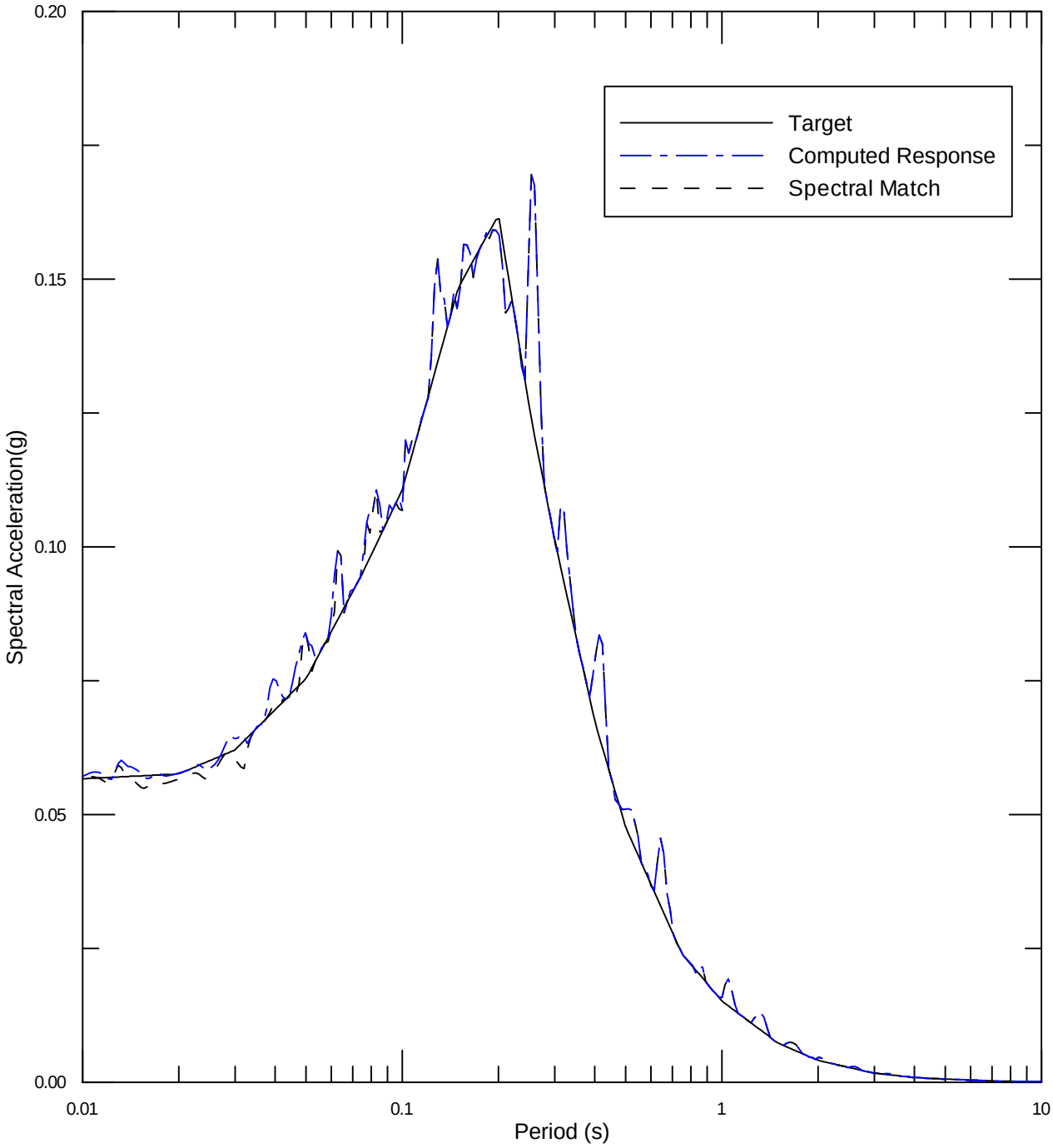
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SEED TIME HISTORIES<br>FOR 1.0 SEC CMS SPECTRUM<br>1999 KOCAELI AND 2002 DENALI | Figure<br>75 |

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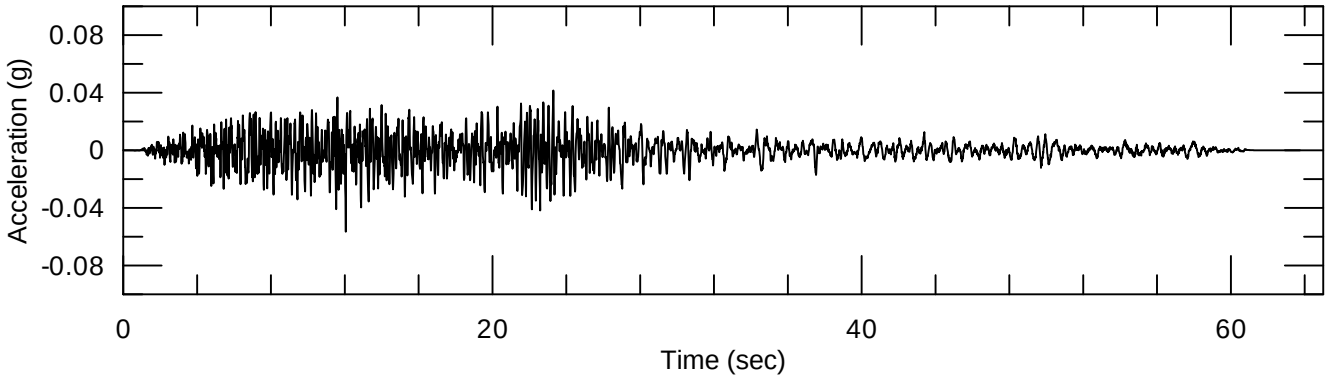
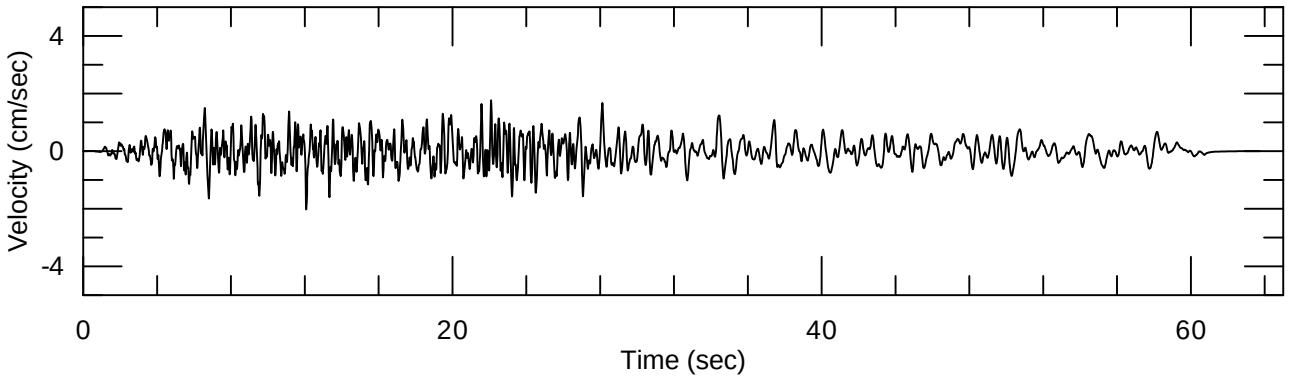
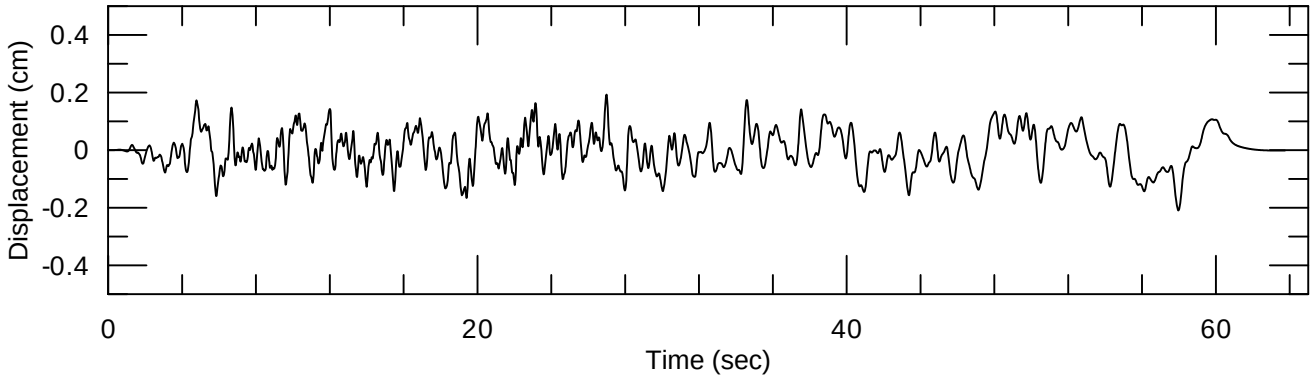
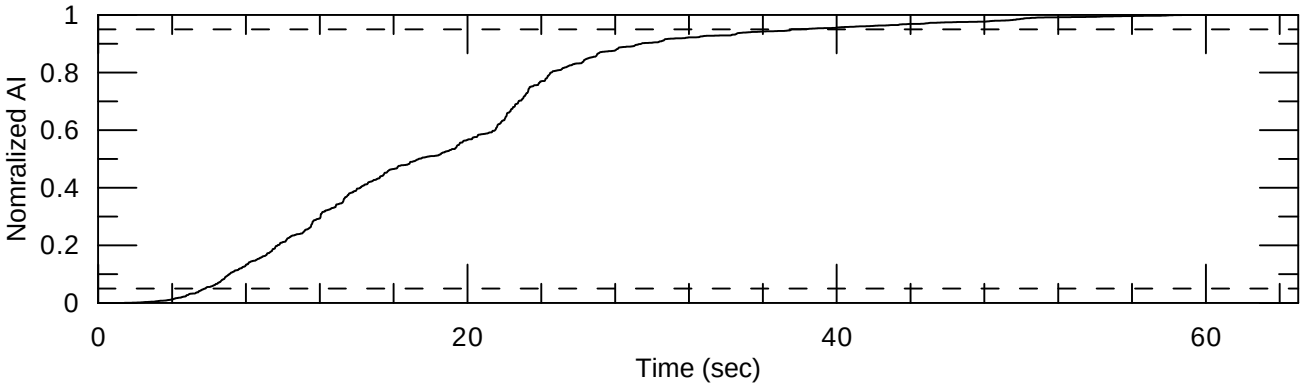
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM<br>1979 IMPERIAL VALEY - CERRO PRIETO (147)<br>FOR FAR WEST 2 (ROCK) SITE | Figure<br>76 |

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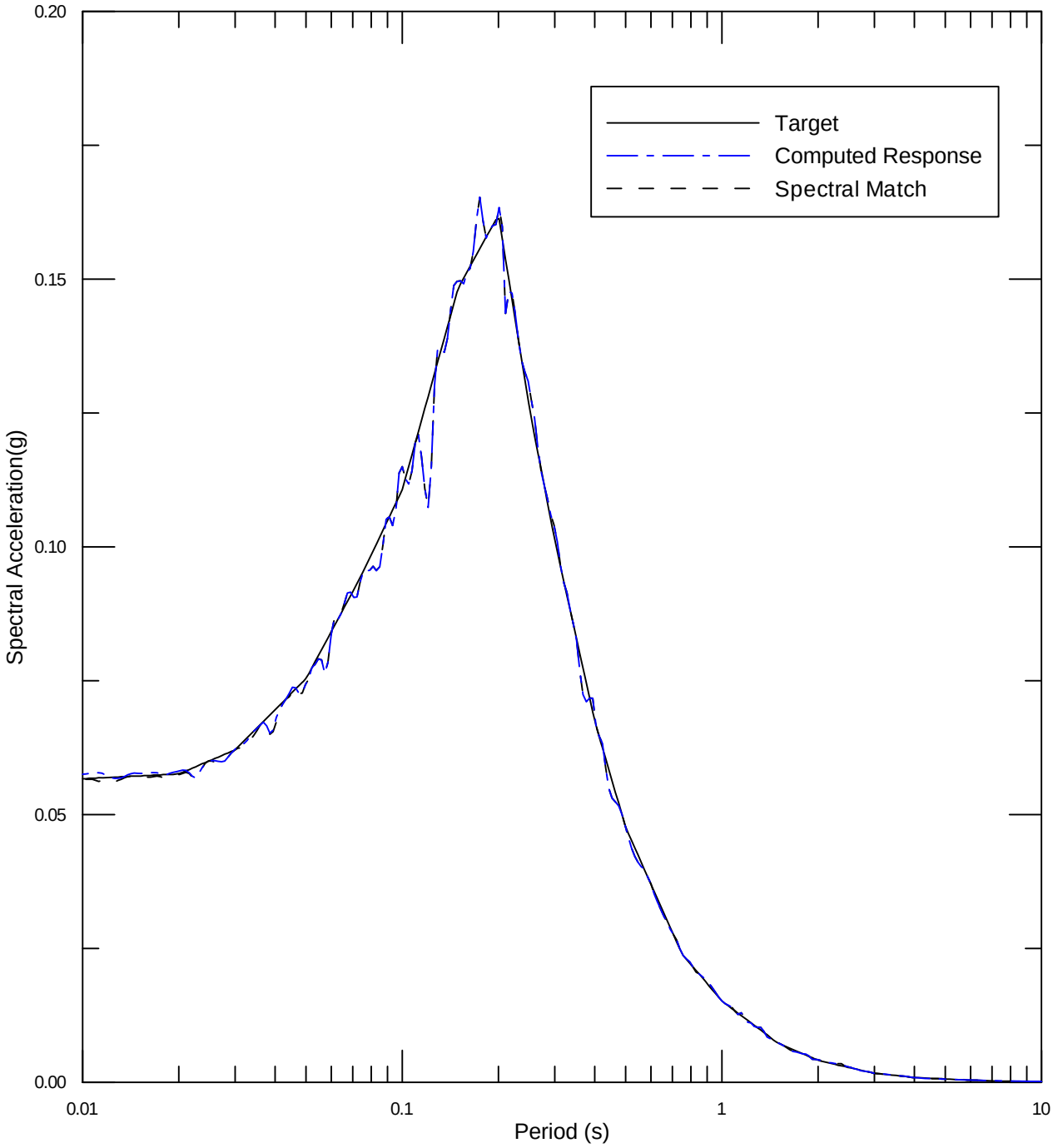
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM 1979 IMPERIAL VALLEY-CERRO PRIETO (147) FOR FAR WEST 2 (ROCK) SITE | Figure 77 |

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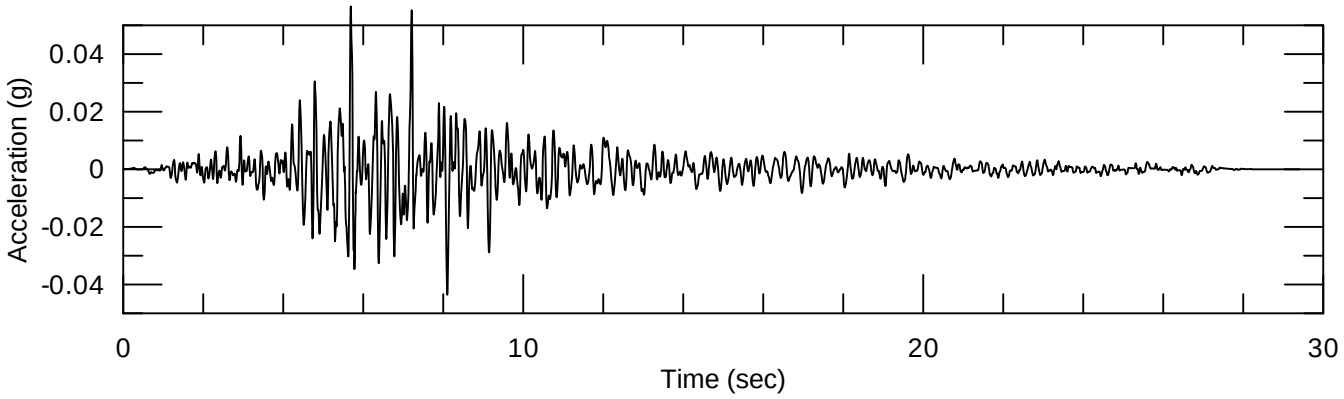
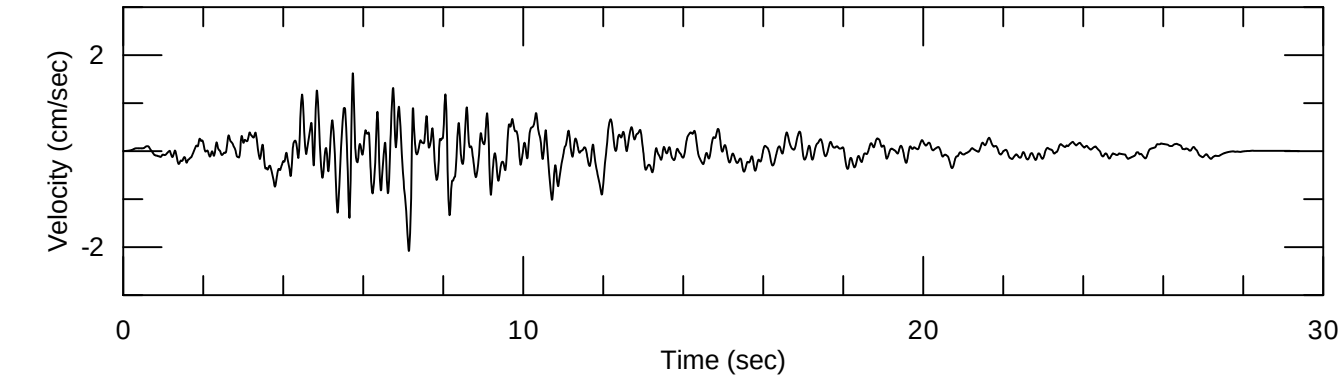
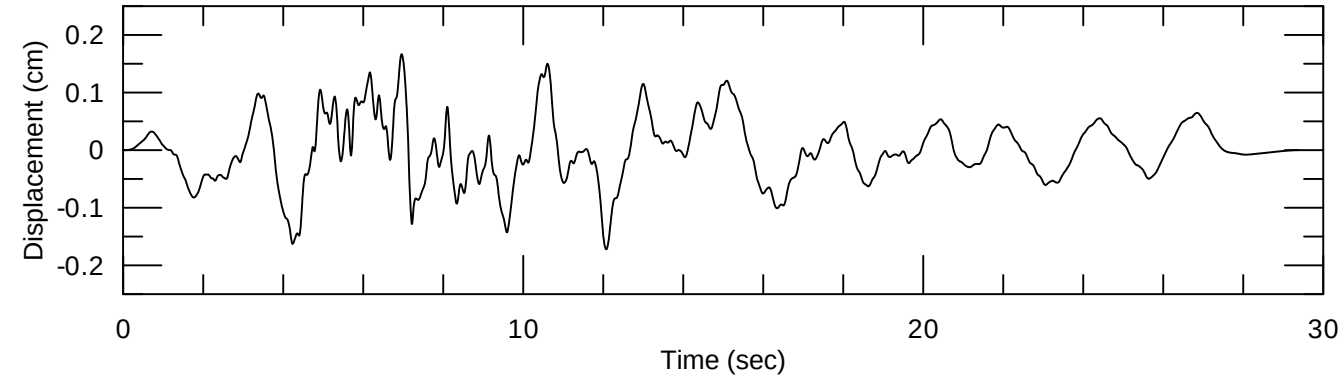
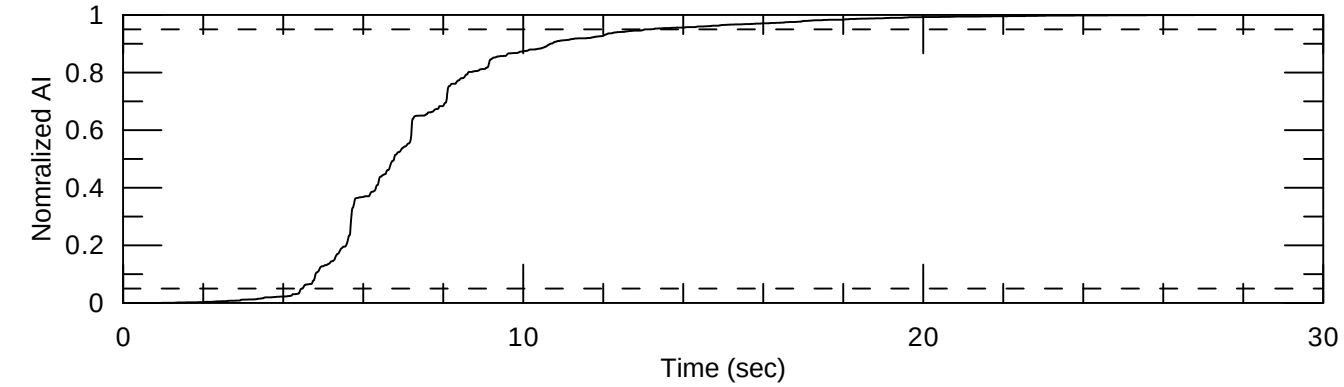
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD0.2 SEC CMS SPECTRUM<br>1995 KOZANI - KOZANI (L)<br>FOR FAR WEST 2 (ROCK) SITE | Figure<br>78 |

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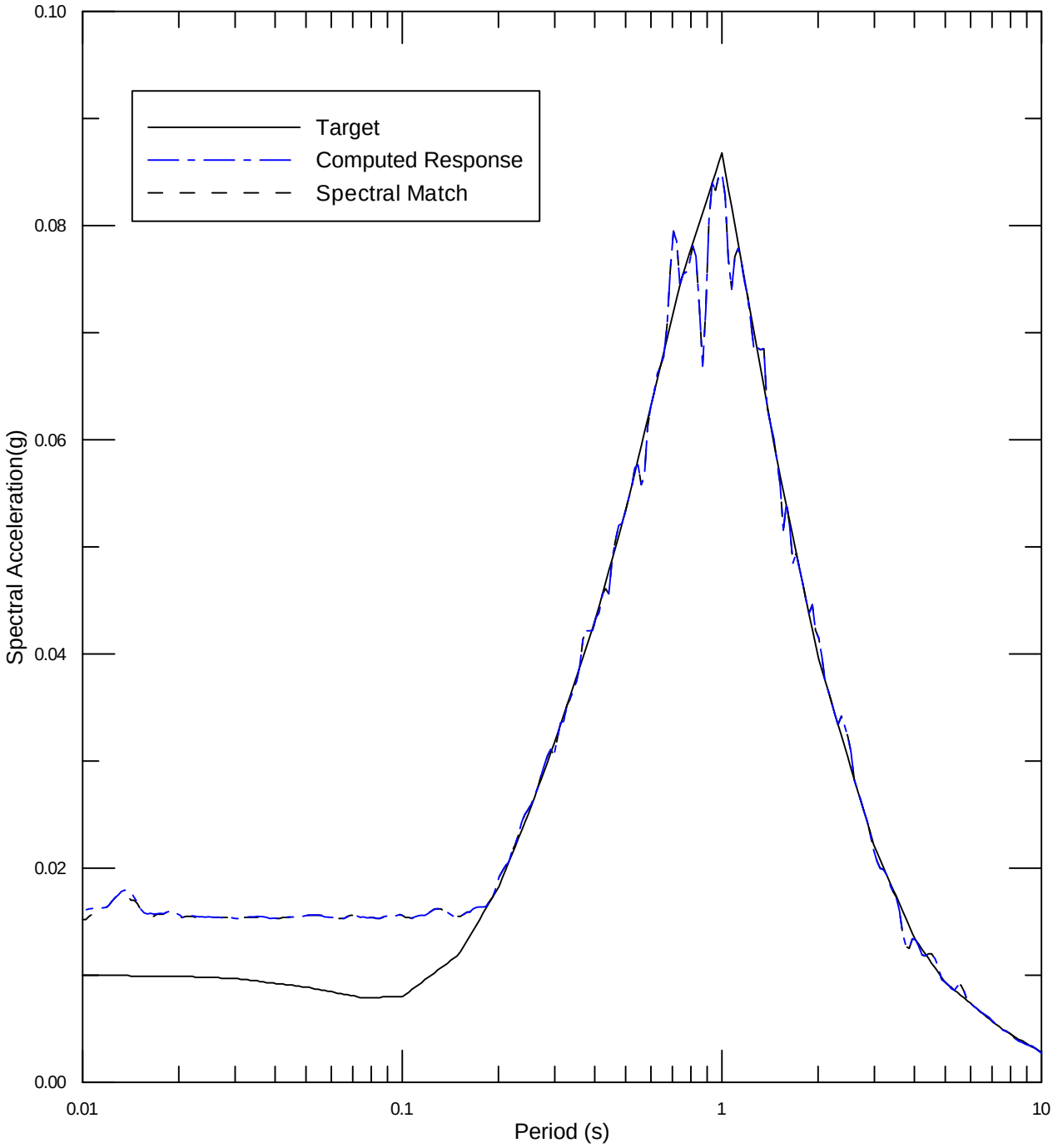
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM 1995 KOZANI- KOZANI (L) FOR FAR WEST 2 (ROCK) SITE | Figure 79 |

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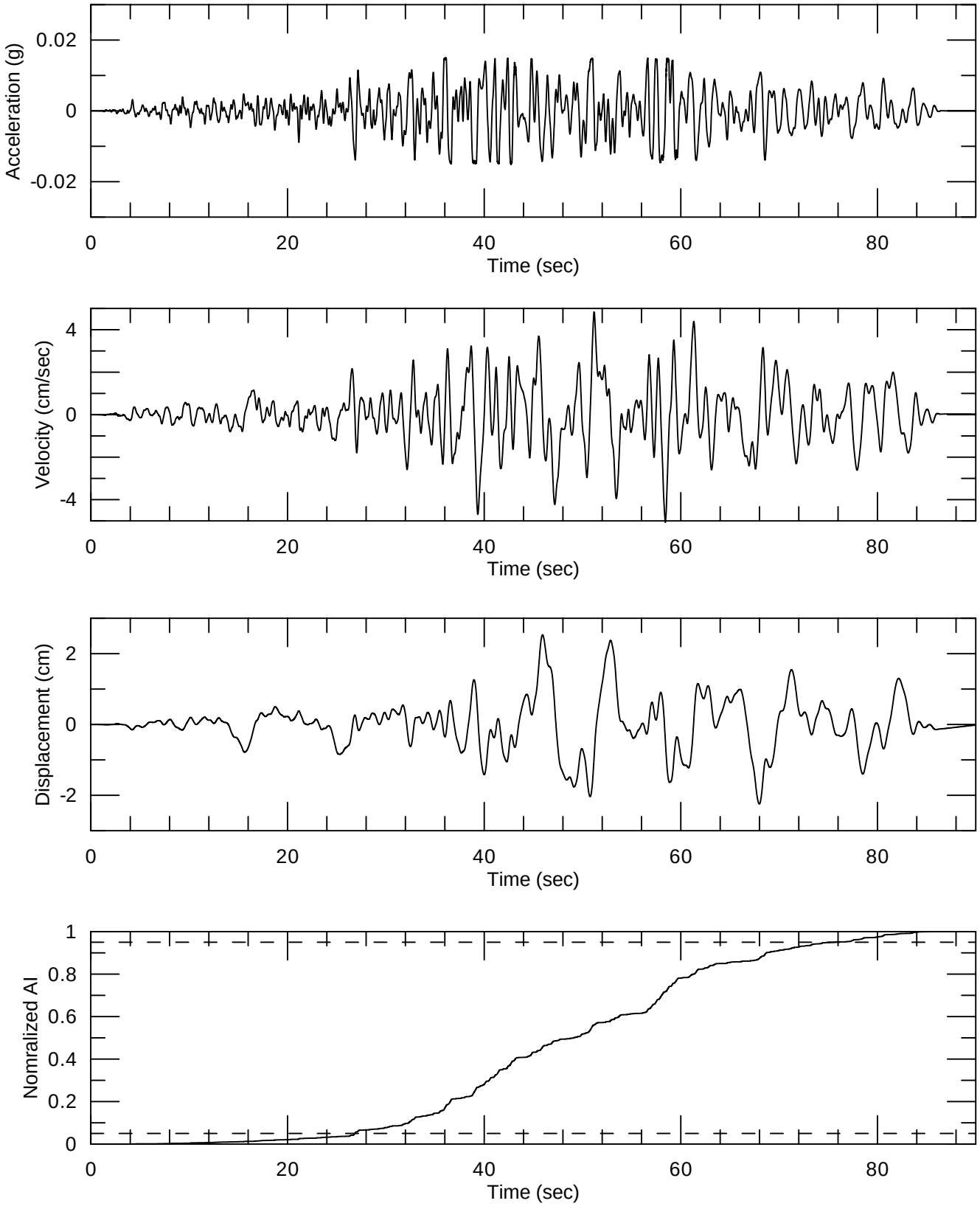
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 CHI-CHI - KAU046 (E)<br>FOR FAR WEST 2 (ROCK) SITE | Figure<br>80 |

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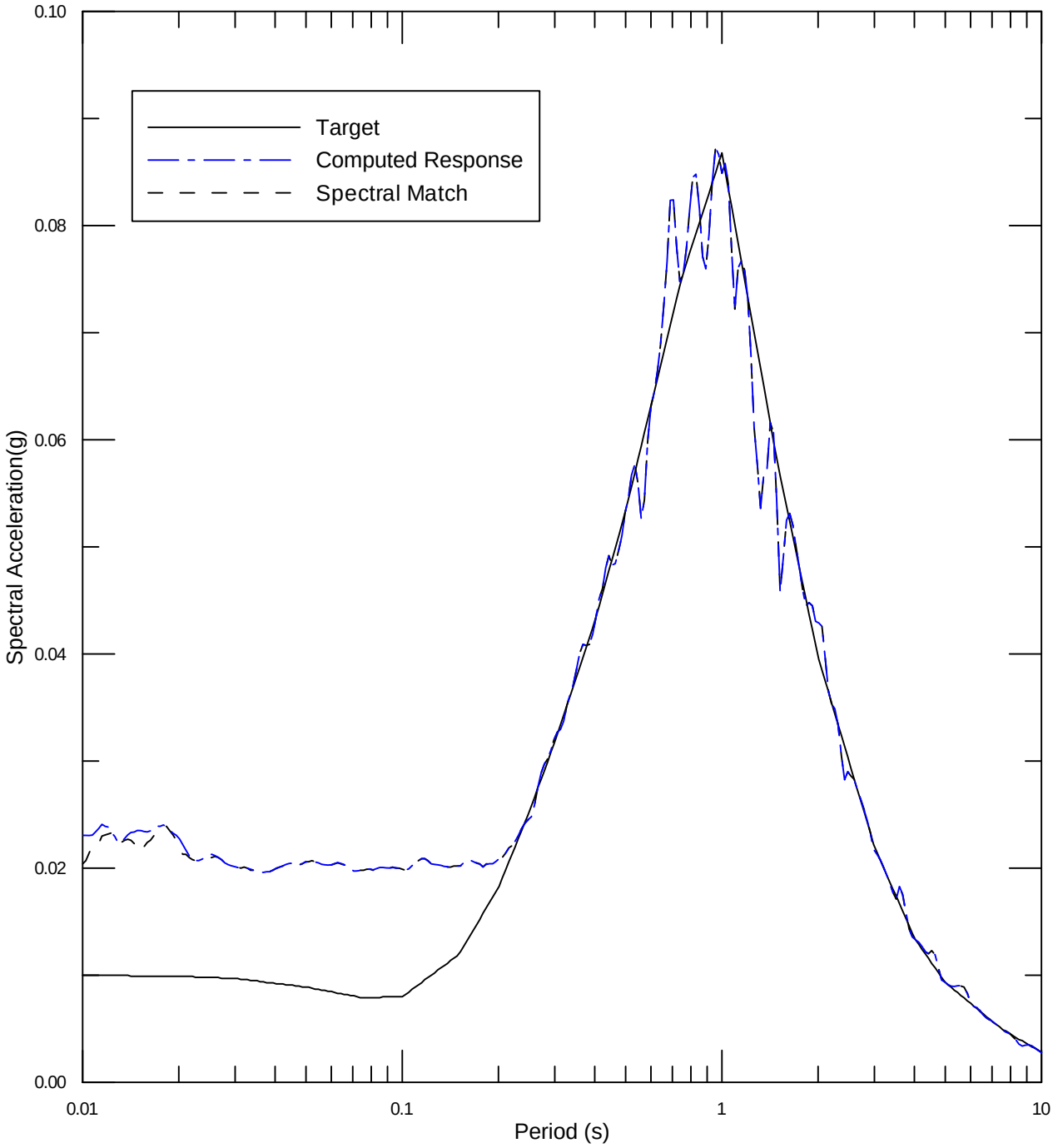
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 CHI-CHI - NAU046 (E) FOR FAR WEST 2 (ROCK) SITE | Figure 81 |

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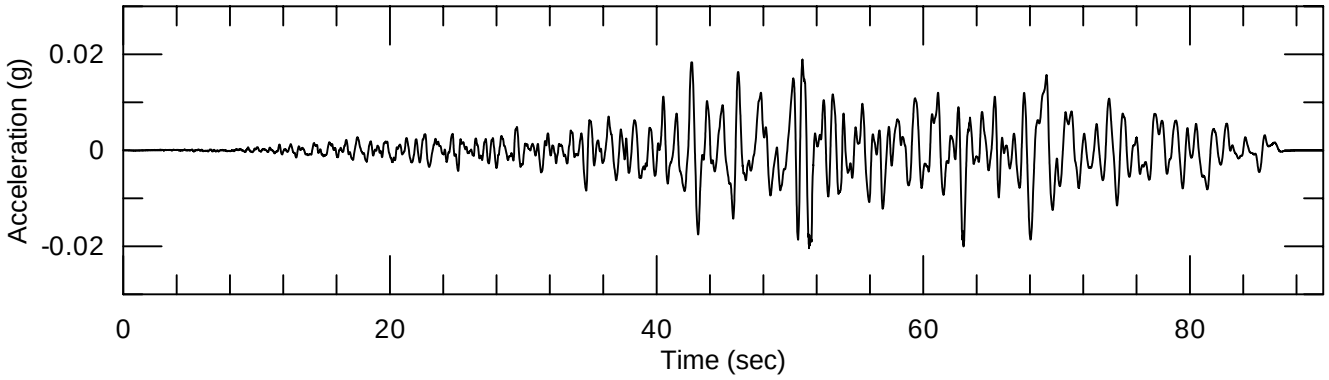
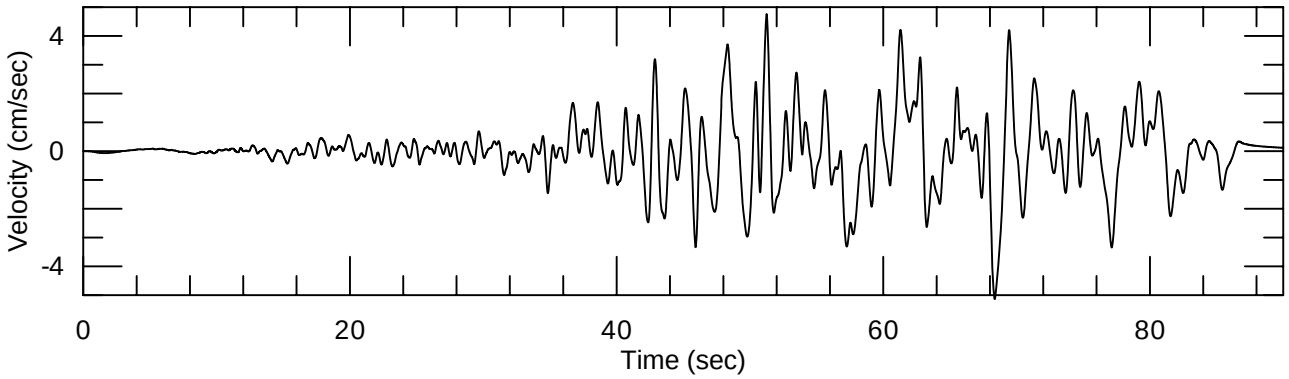
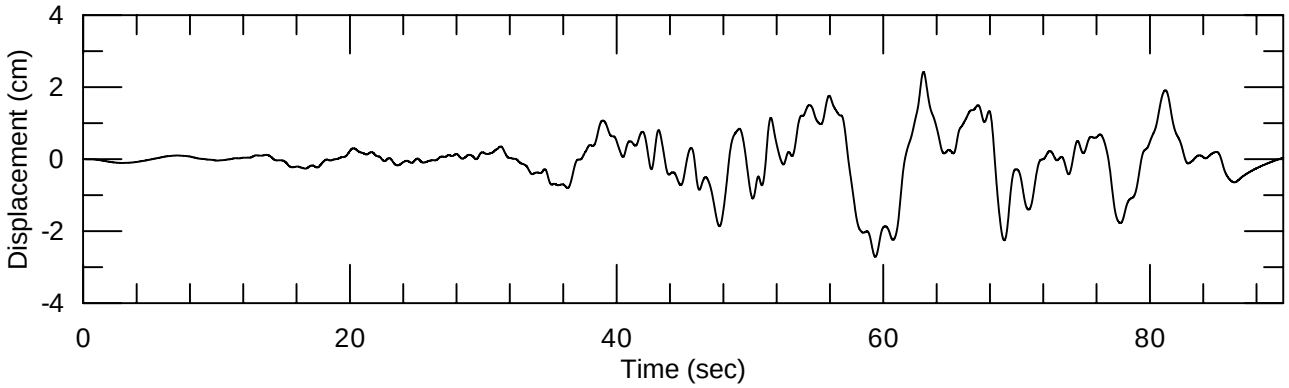
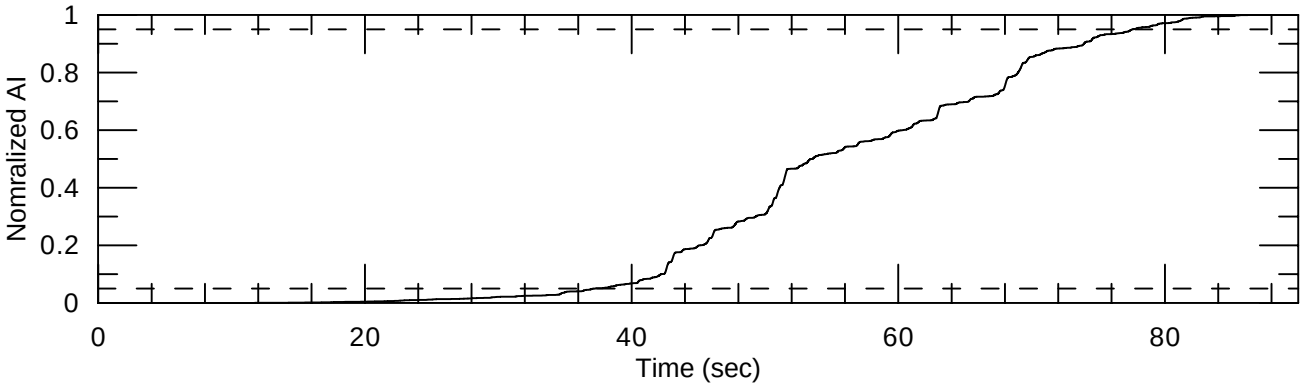
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 CHI-CHI - KAU081 (E)<br>FOR FAR WEST 2 (ROCK) SITE | Figure<br>82 |

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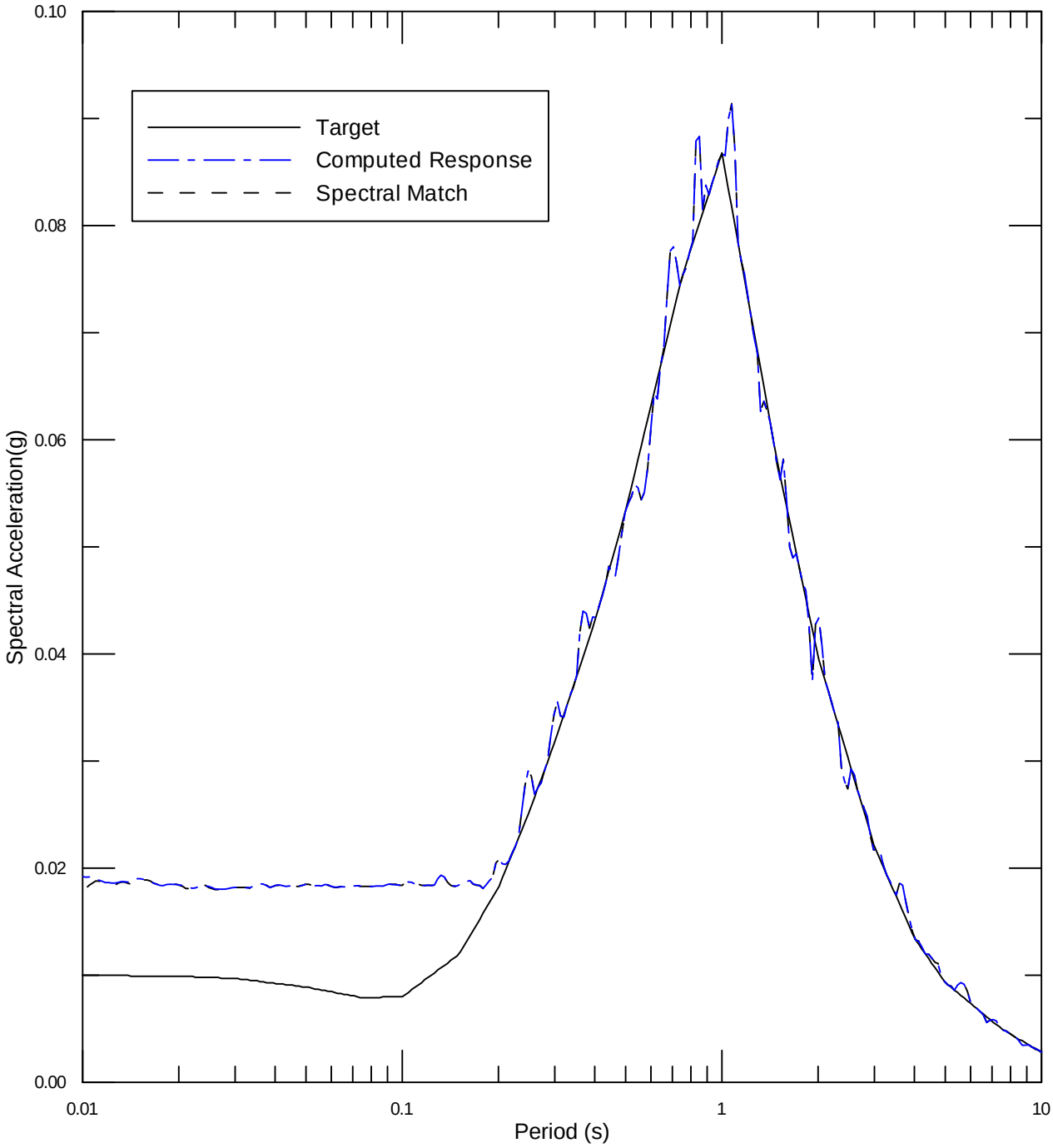
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 CHI-CHI - KAU081 (E) FOR FOR FAR WEST 2 (ROCK) SITE | Figure 83 |

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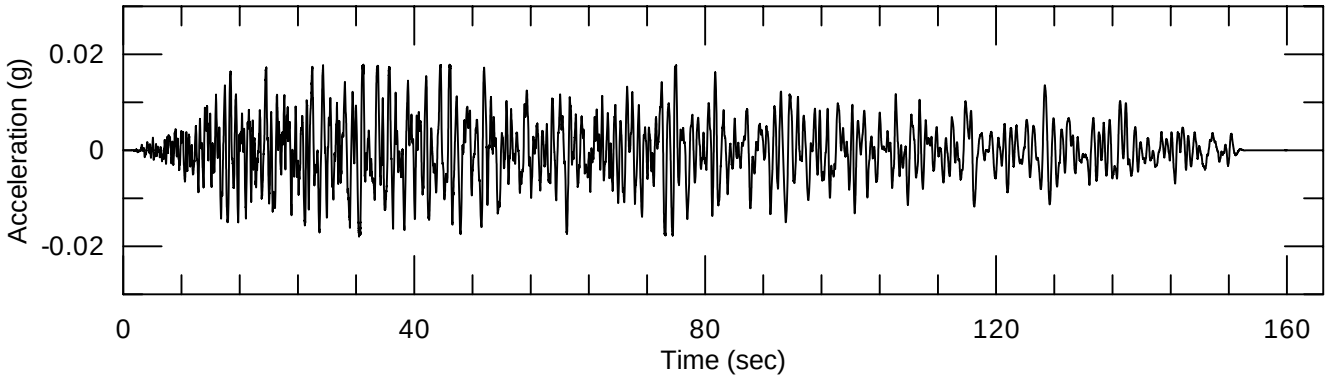
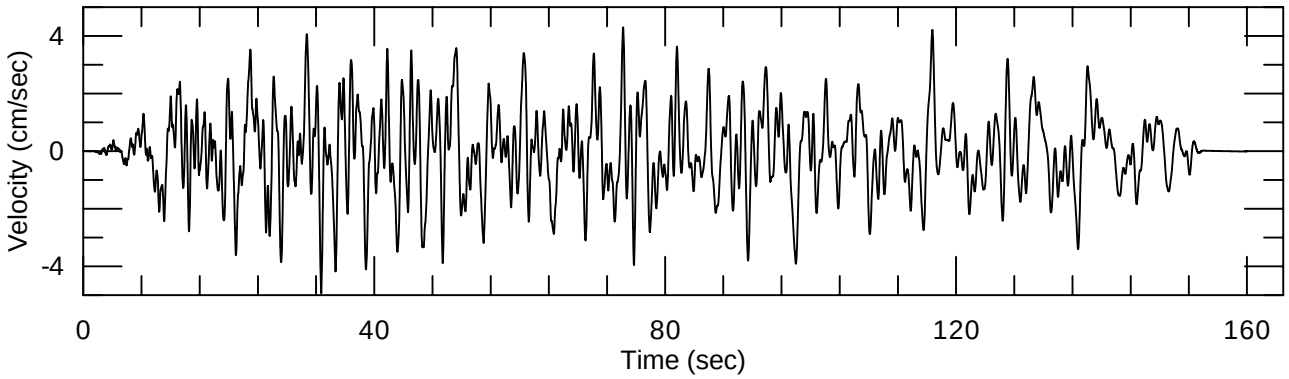
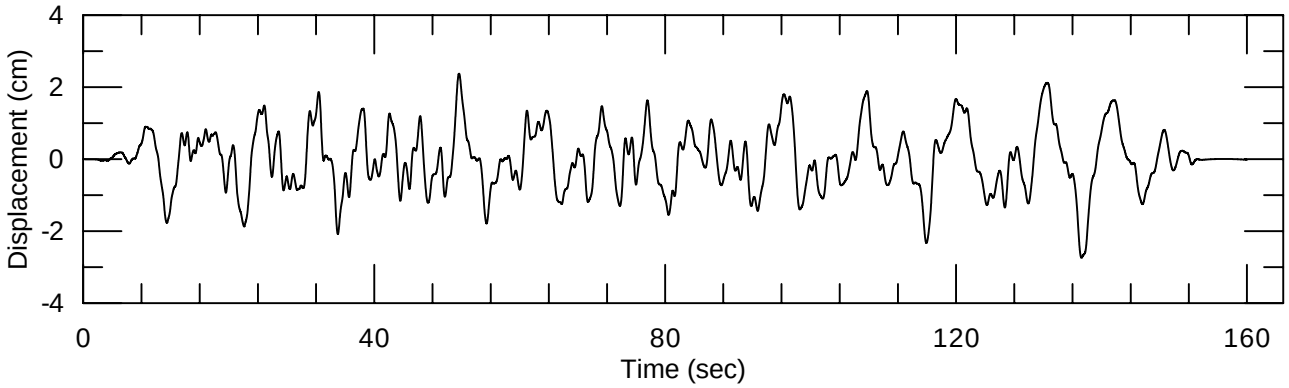
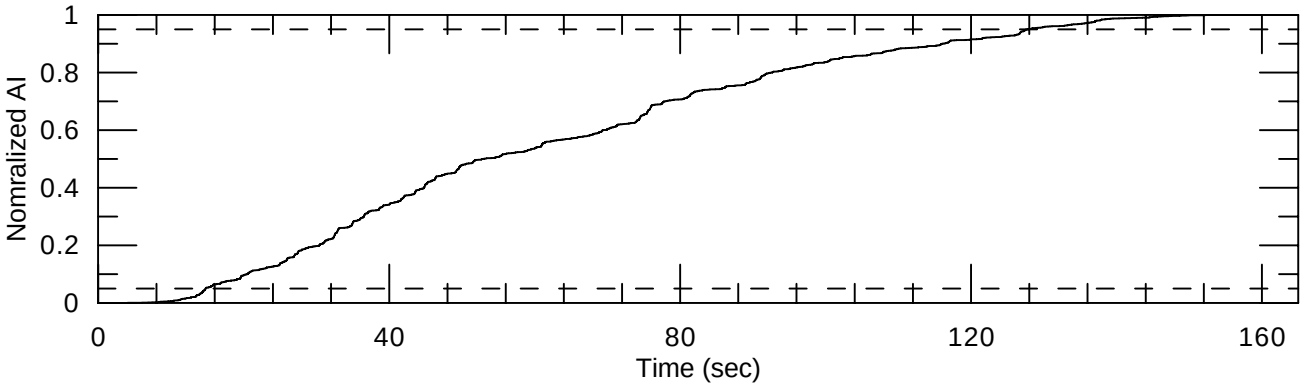
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>2002 DENALI - FIRE STATION 1 (090)<br>FOR FAR WEST 2 (ROCK) SITE | Figure<br>84 |

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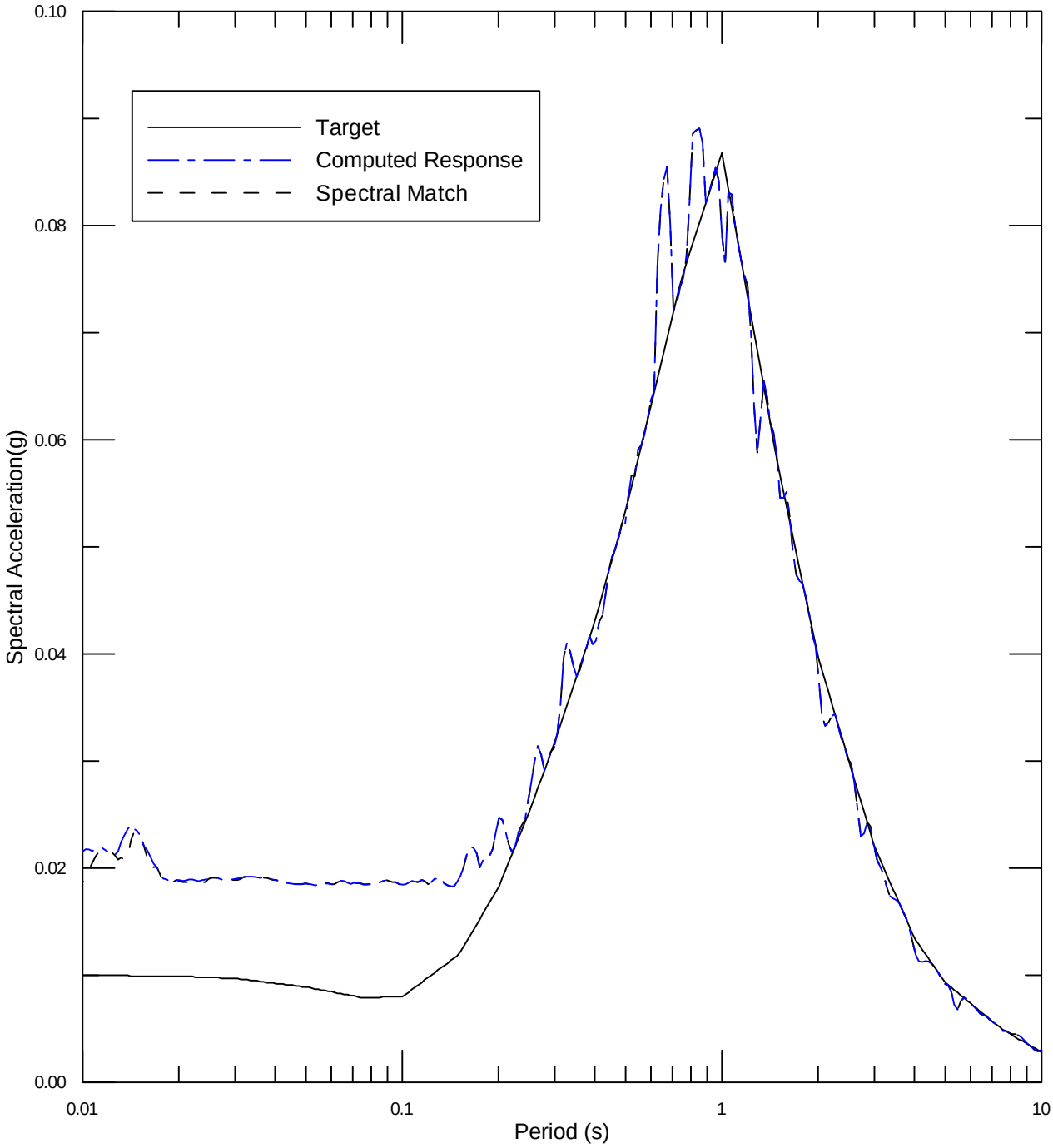
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 2002 DENALI - FIRE STATION 1 (090) FOR FAR WEST 2 (ROCK) SITE | Figure 85 |

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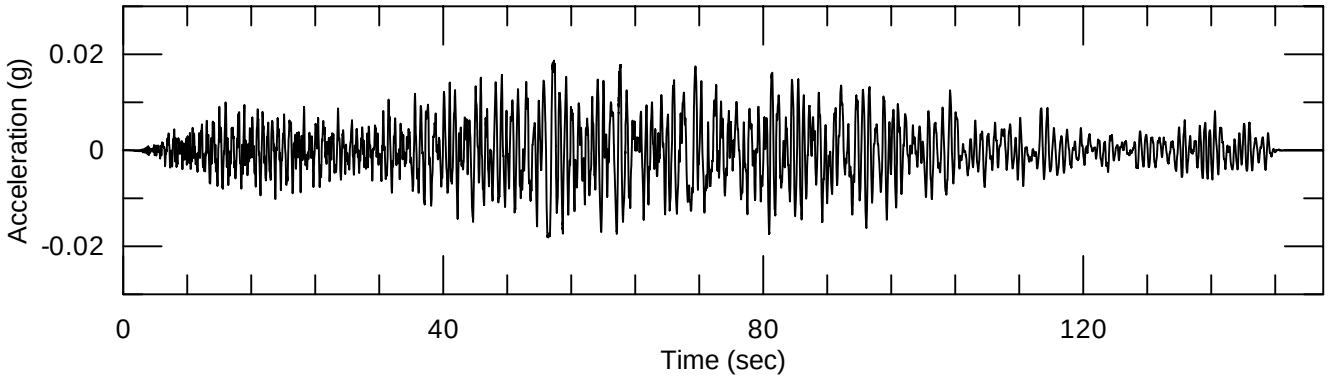
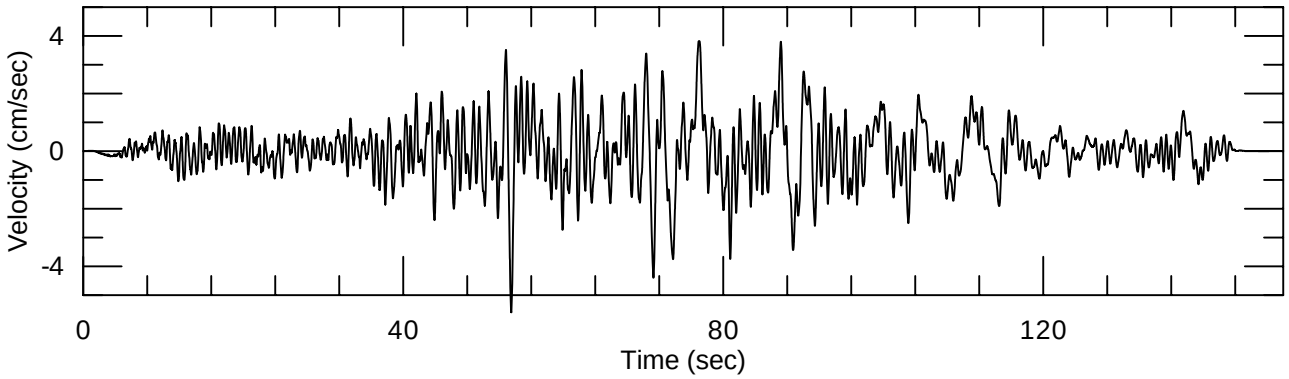
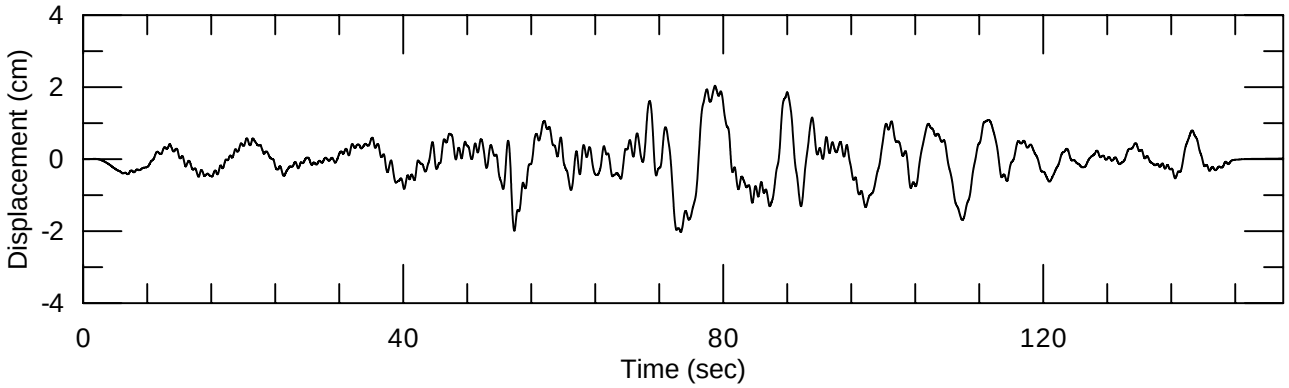
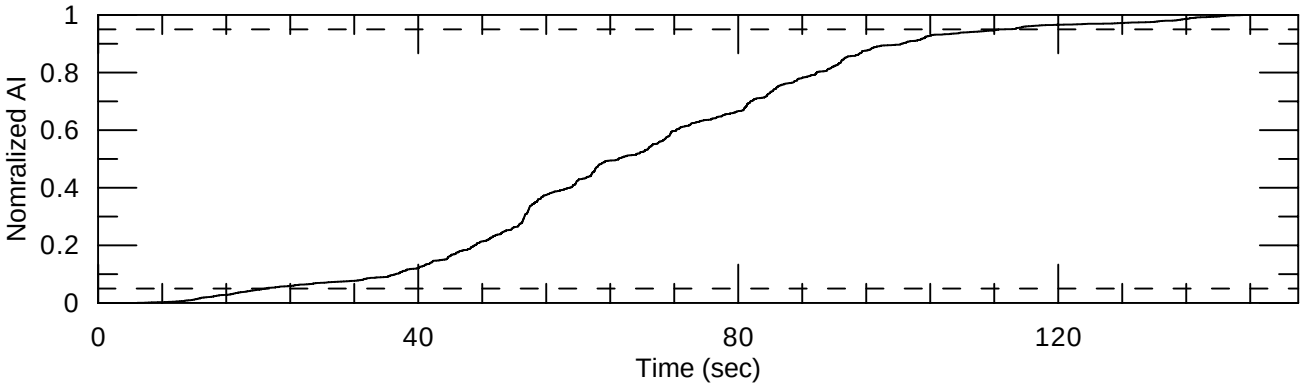
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>2002 DENALI - VALDEZ CITY HALL (090)<br>FOR FAR WEST 2 (ROCK) SITE | Figure<br>86 |

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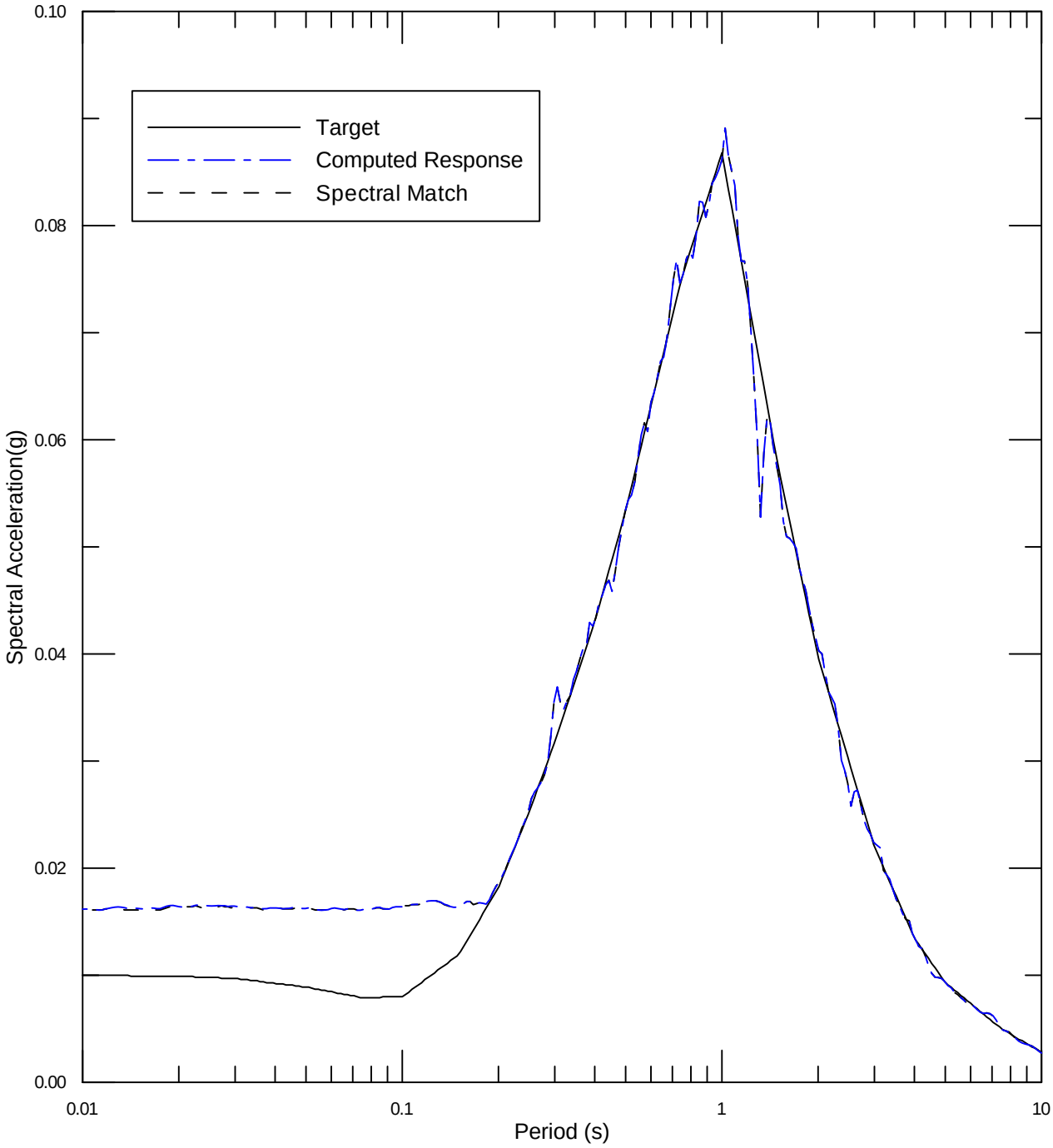
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 2002 DENALI - VALDEZ CITY HALL (090) FOR FAR WEST 2 (ROCK) SITE | Figure 87 |

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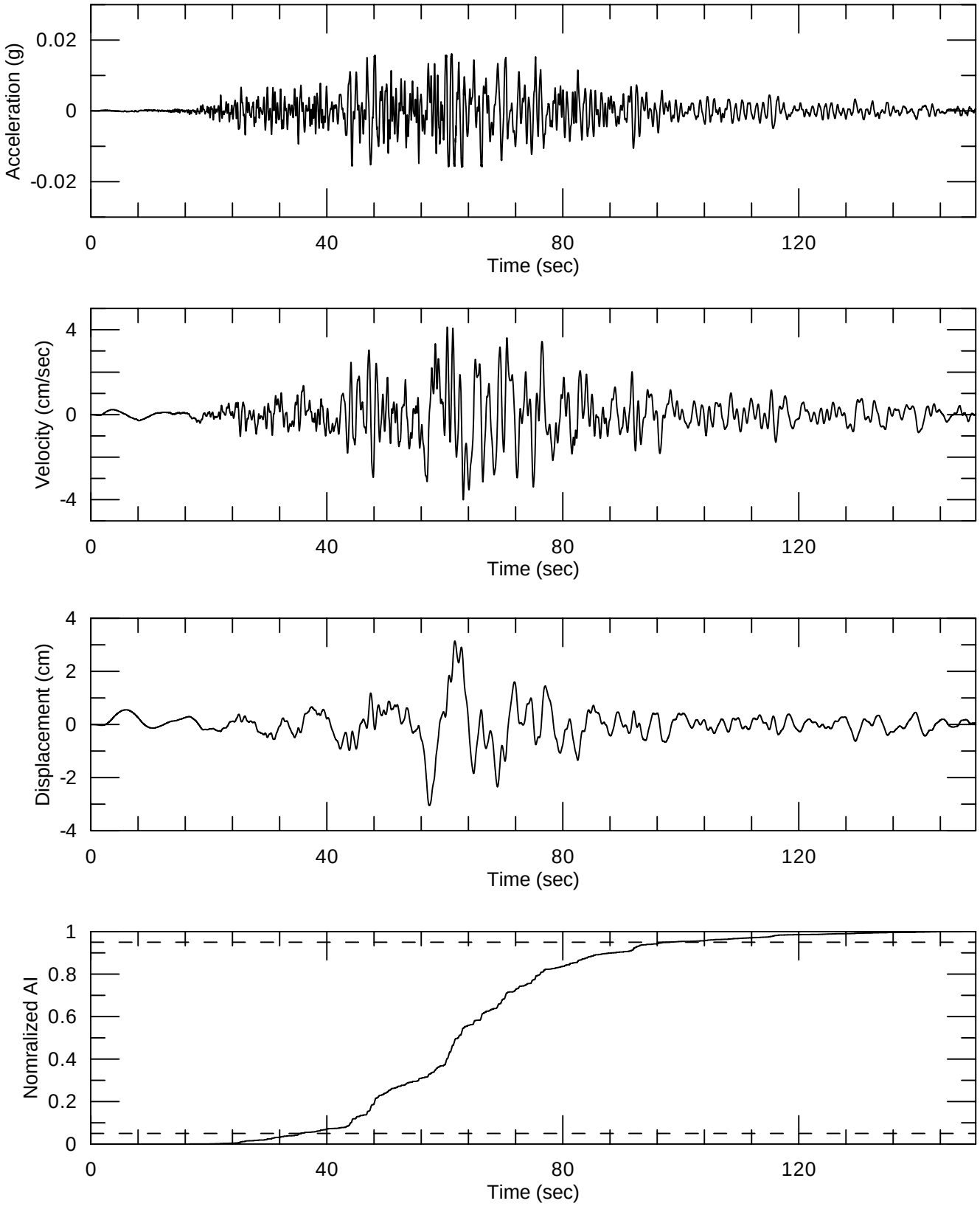
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 KOCAELI - AFYON (000)<br>FOR FAR WEST 2 (ROCK) SITE | Figure<br>88 |

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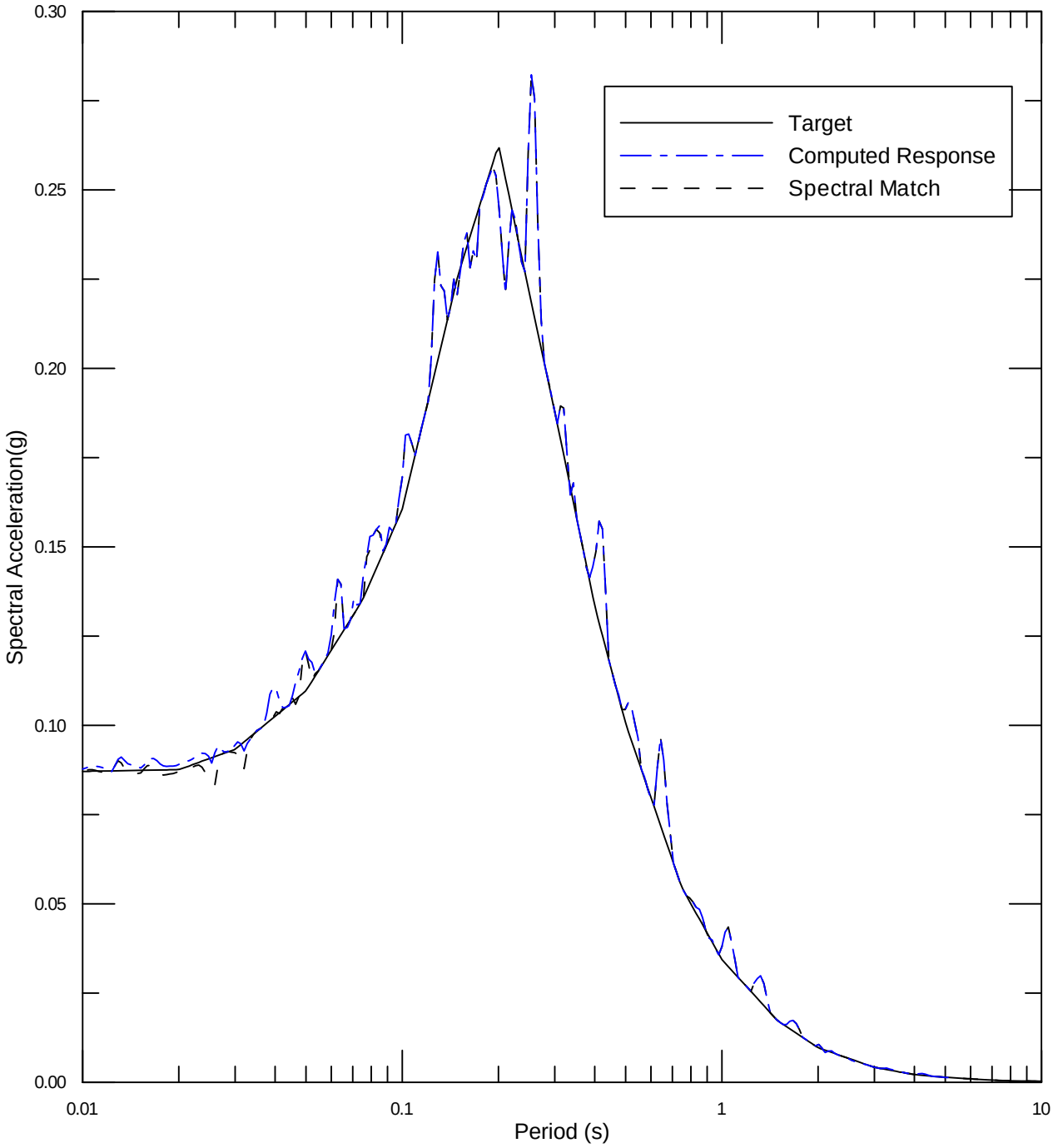
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 KOCAELI - AFYON (000) FOR FAR WEST 2 (ROCK) SITE | Figure 89 |

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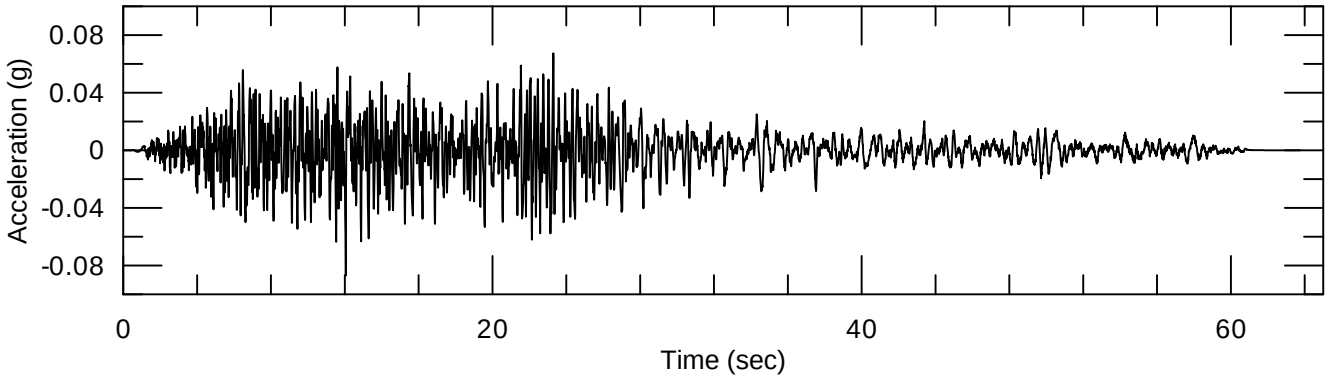
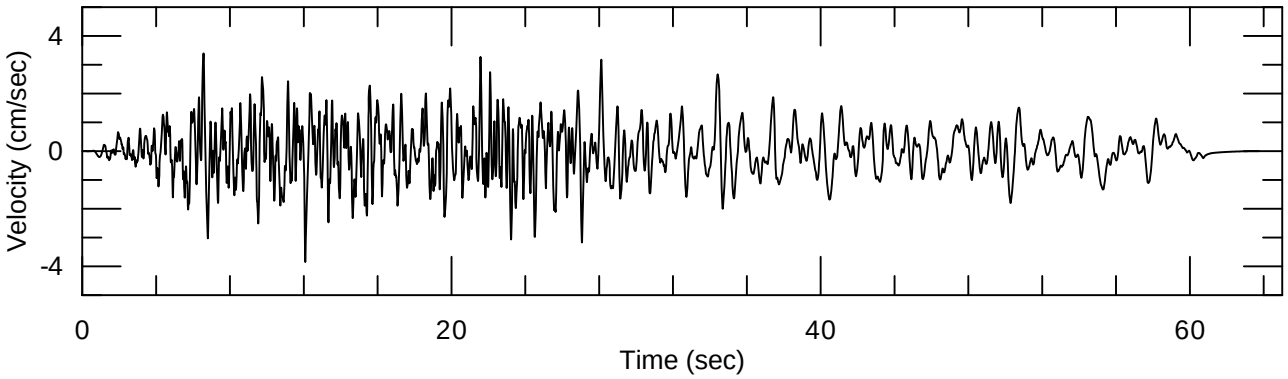
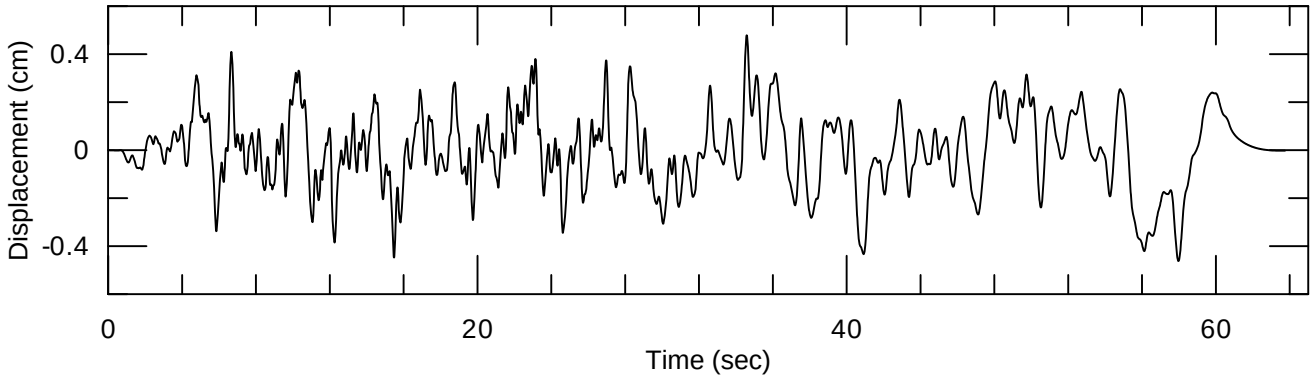
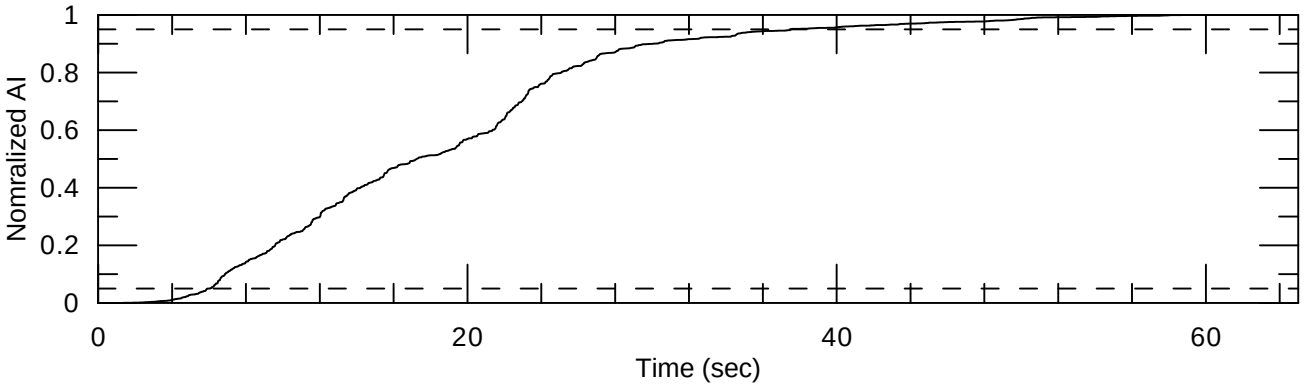
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM<br>1979 IMPERIAL VALEY - CERRO PRIETO (147)<br>FOR NEAR WEST SITE | Figure<br>90 |

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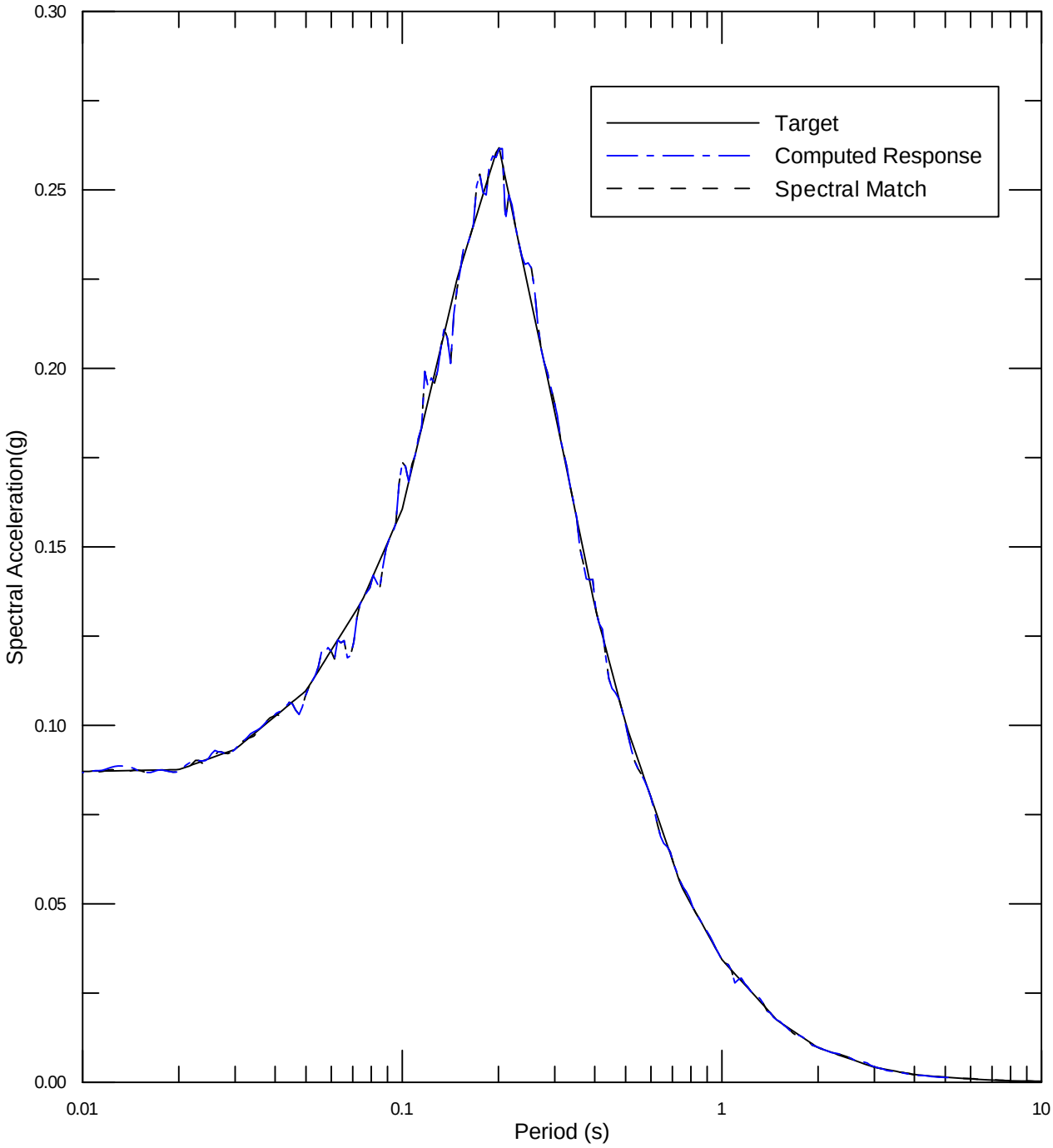
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM 1979 IMPERIAL VALLEY-CERRO PRIETO (147) FOR NEAR WEST SITE | Figure 91 |

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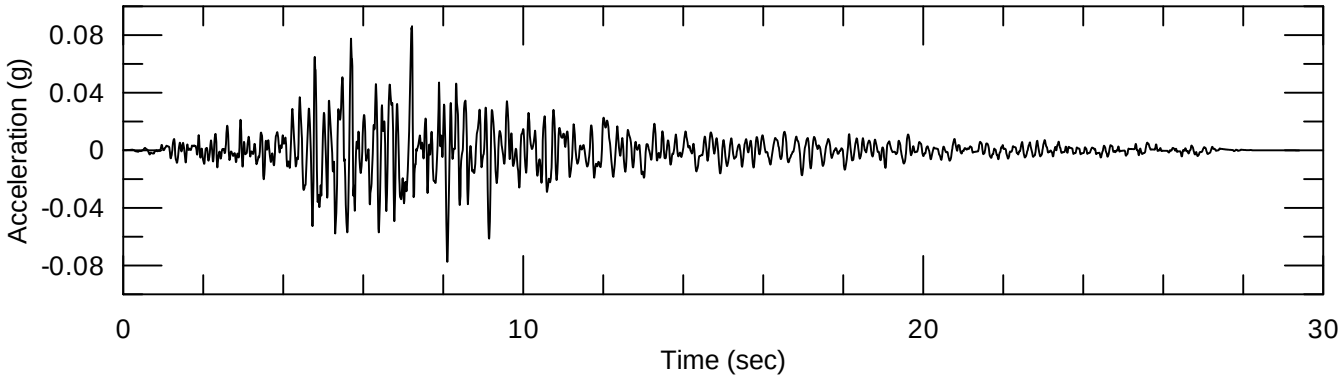
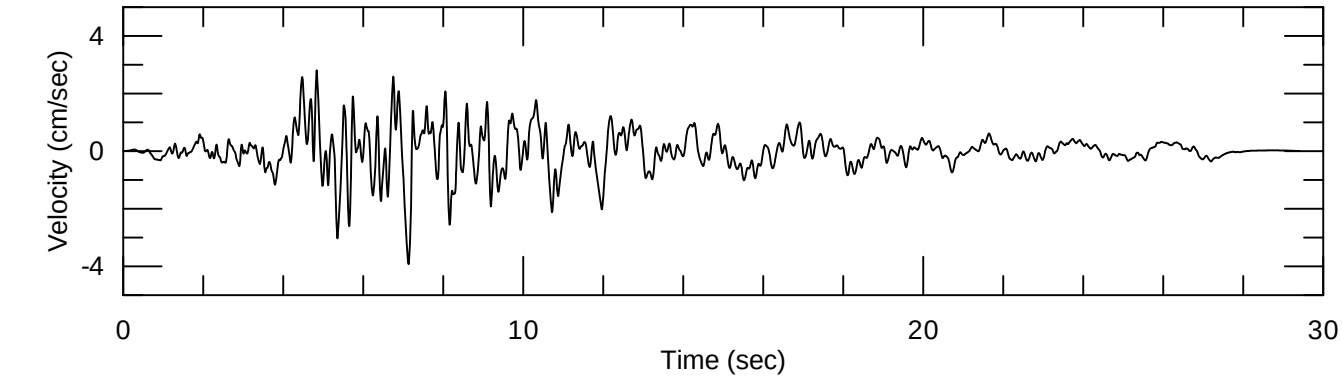
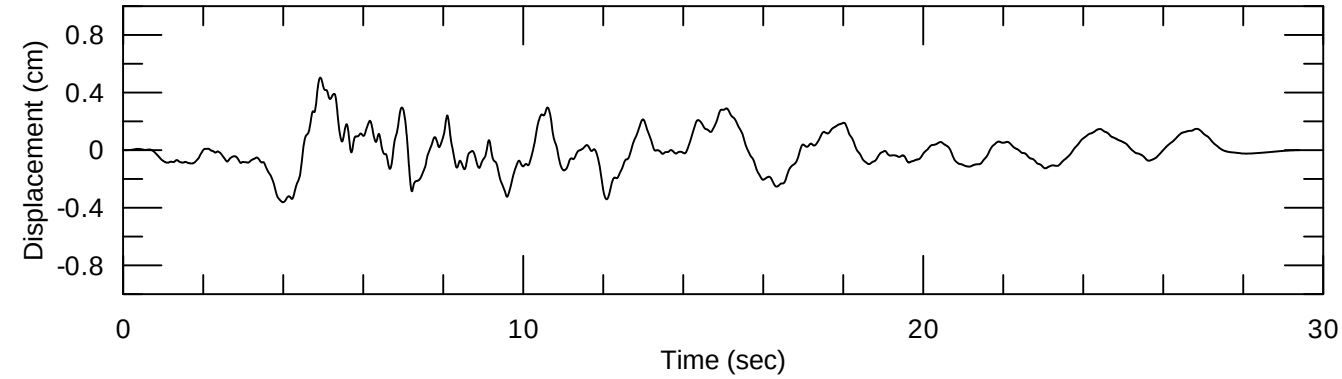
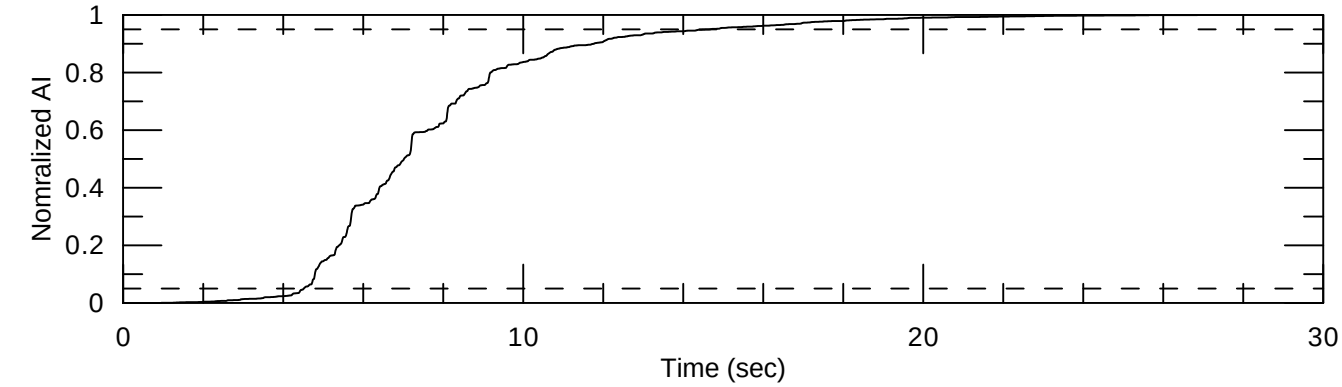
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD0.2 SEC CMS SPECTRUM<br>1995 KOZANI - KOZANI (L)<br>FOR NEAR WEST SITE | Figure<br>92 |

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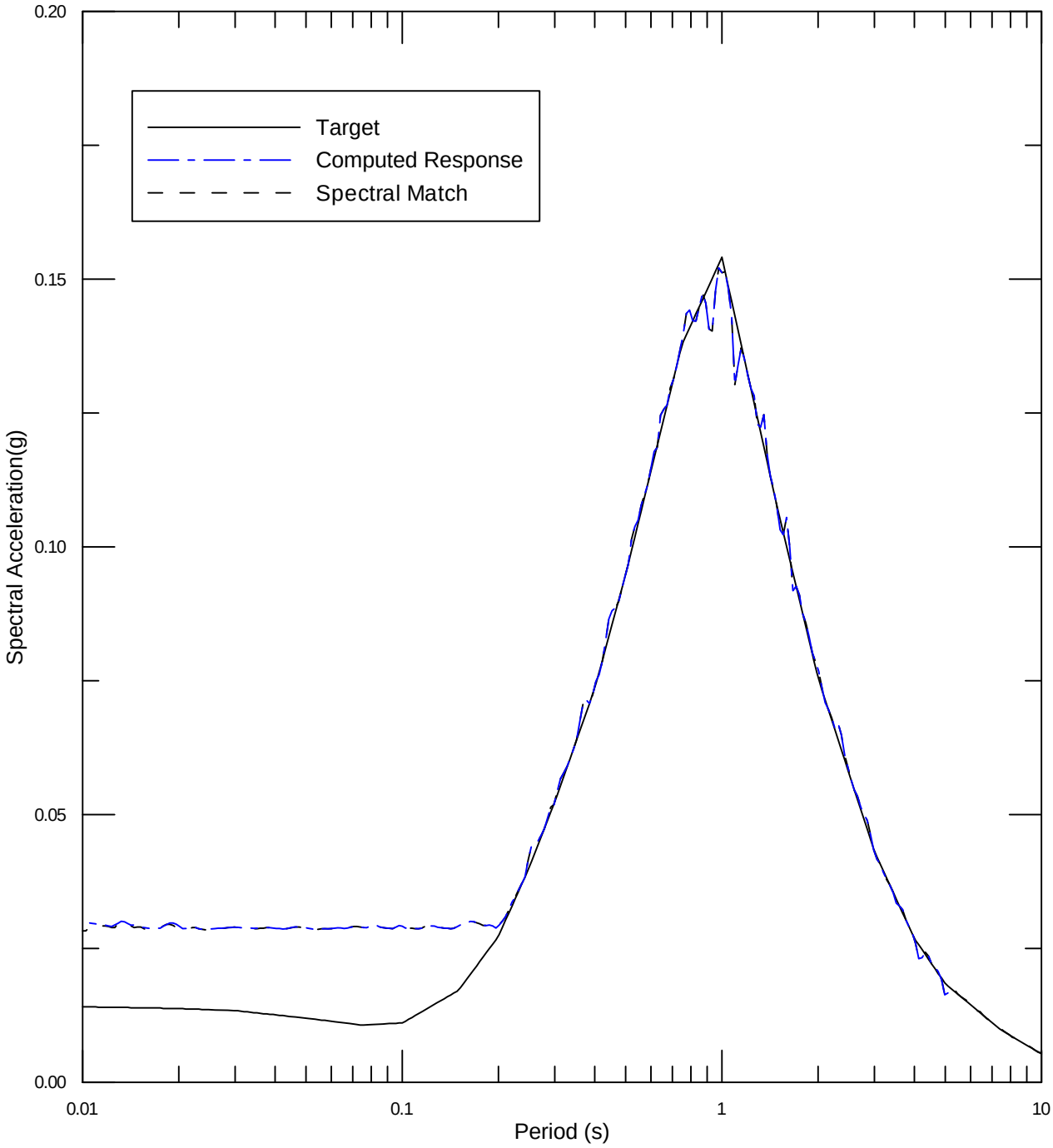
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM 1995 KOZANI- KOZANI (L) FOR NEAR WEST SITE | Figure 93 |

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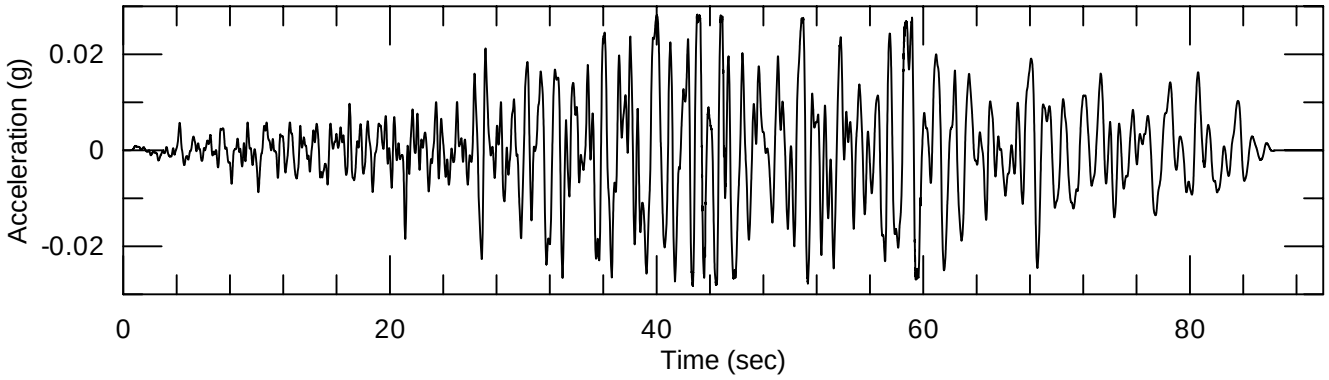
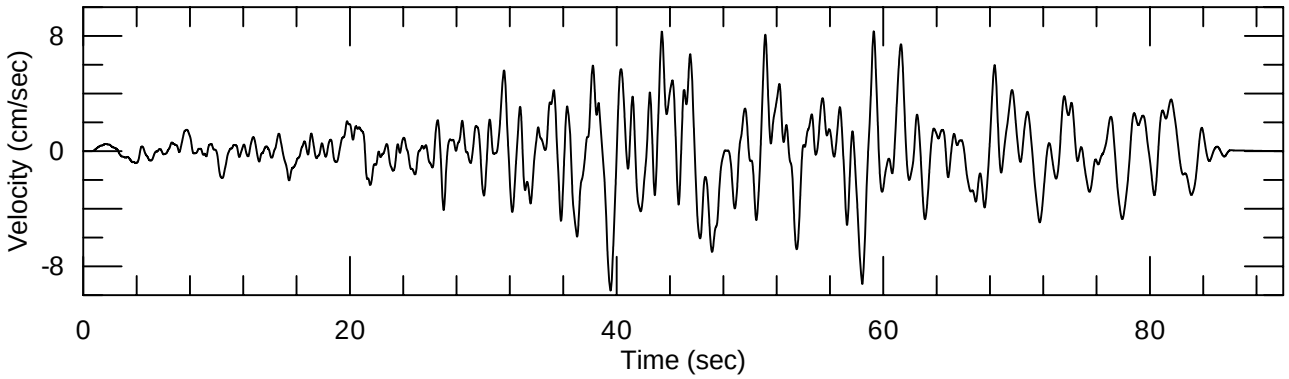
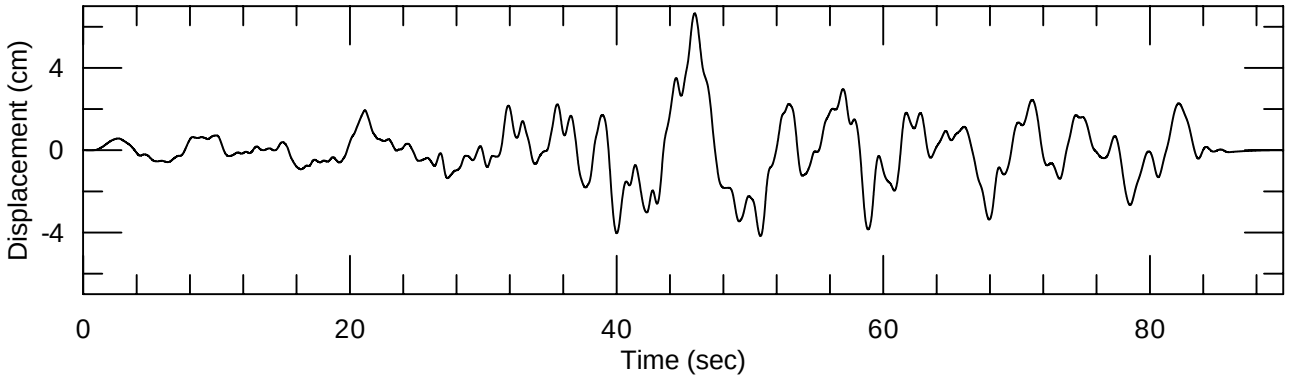
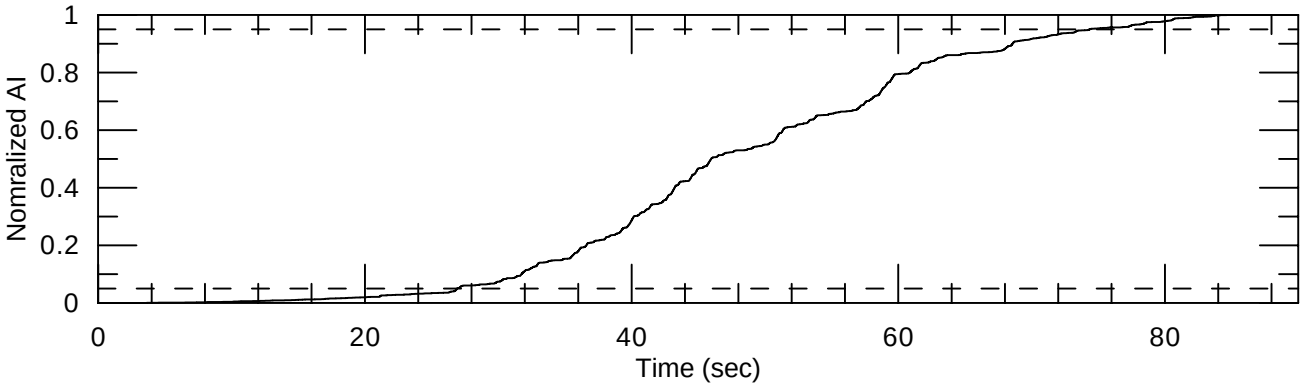
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 CHI-CHI - KAU046 (E)<br>FOR NEAR WEST SITE | Figure<br>94 |

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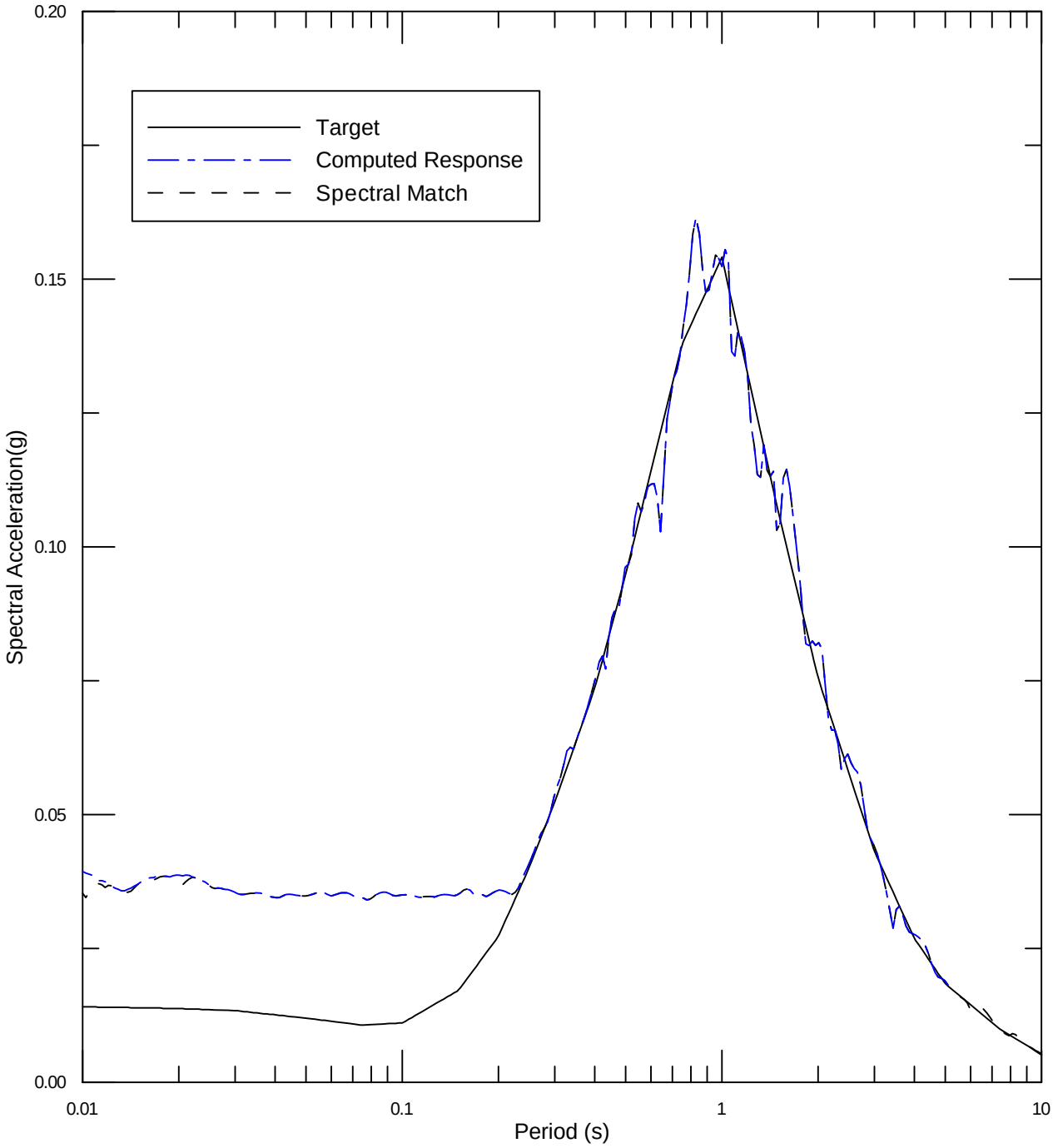
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 CHI-CHI - KAU046 (E) FOR NEAR WEST SITE | Figure 95 |

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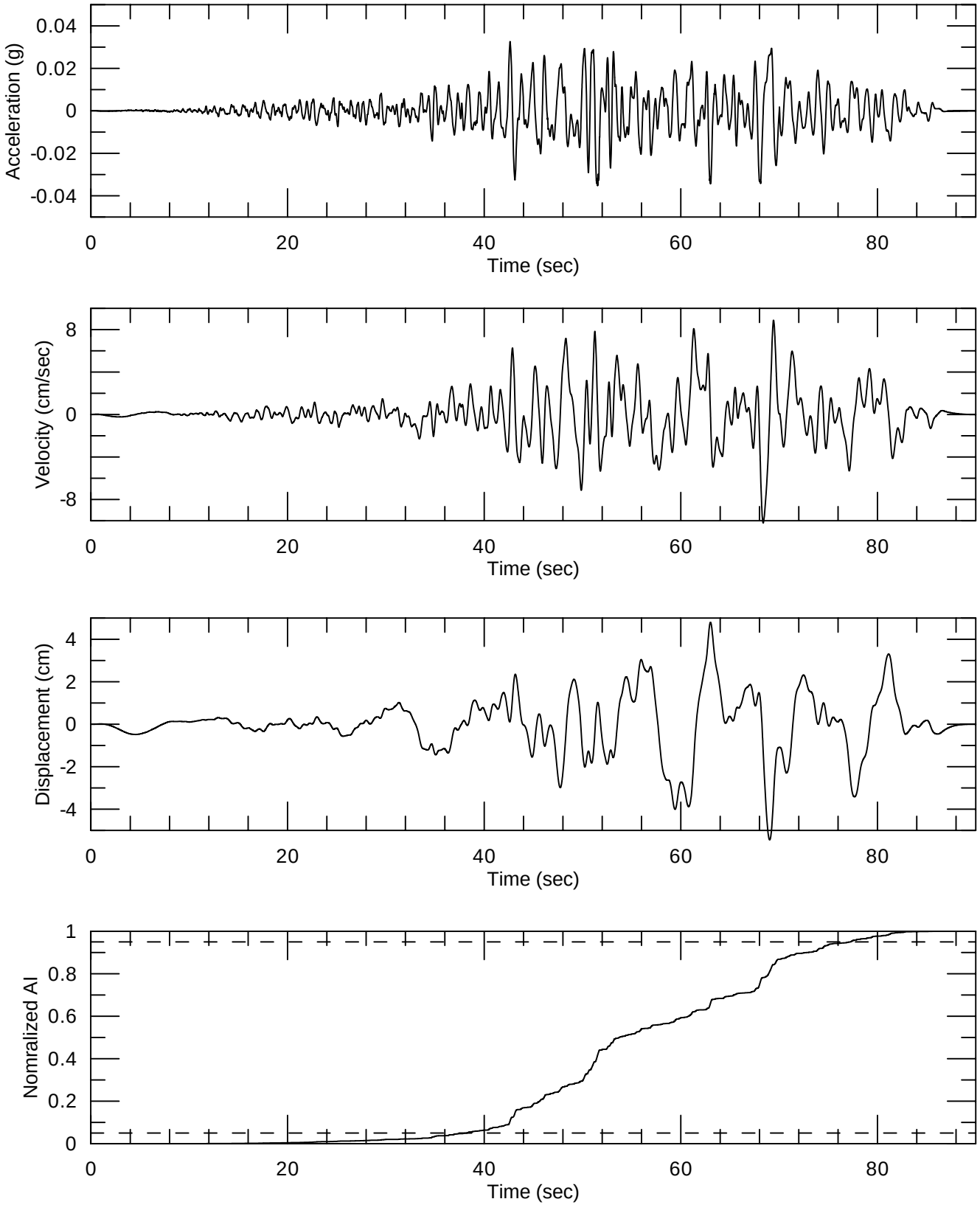
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 CHI-CHI - KAU081 (E)<br>FOR NEAR WEST SITE | Figure<br>96 |

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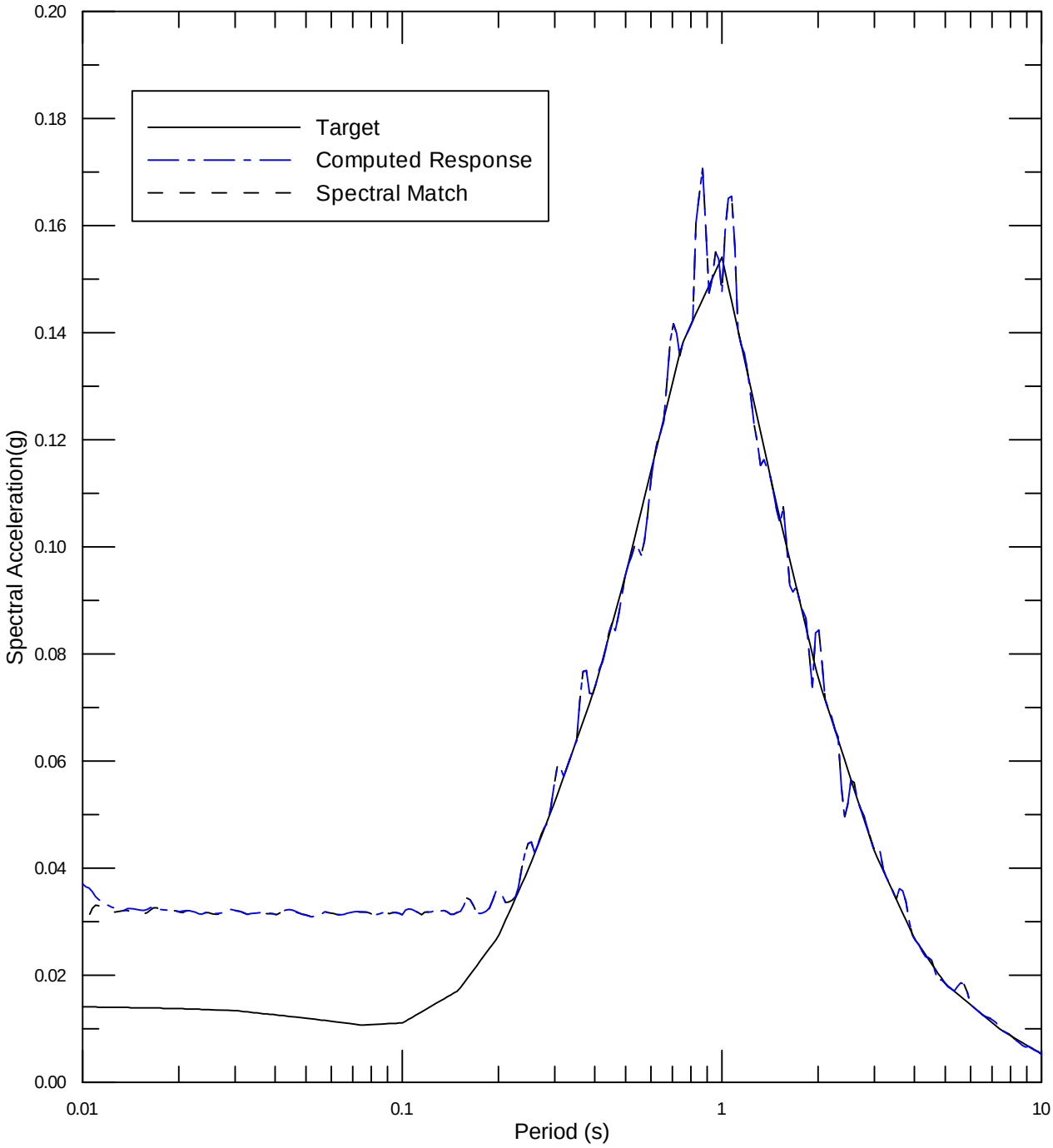
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 CHI-CHI - KAU081 (E) FOR NEAR WEST SITE | Figure 97 |

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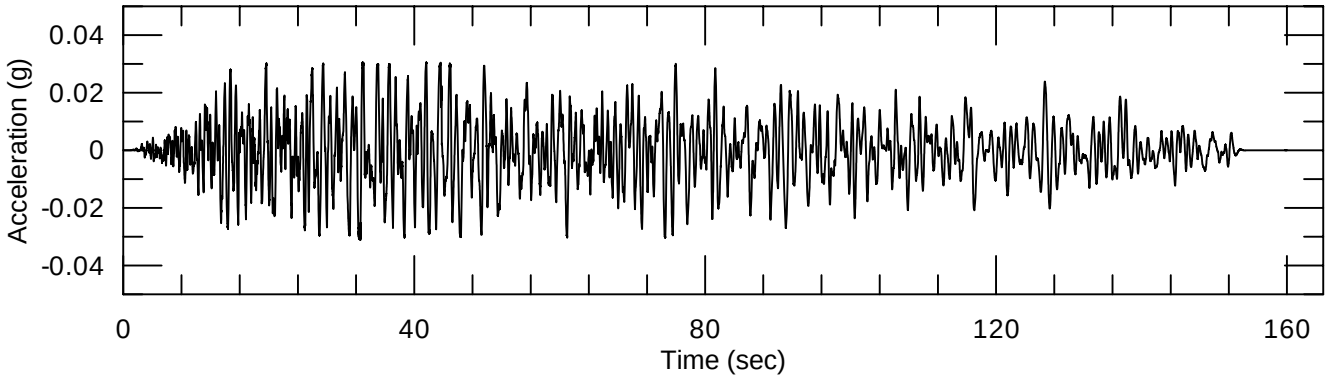
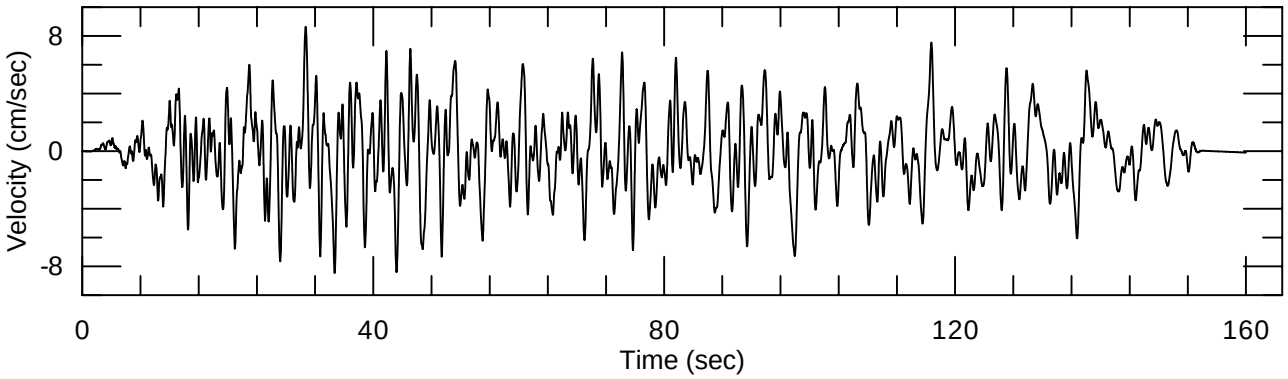
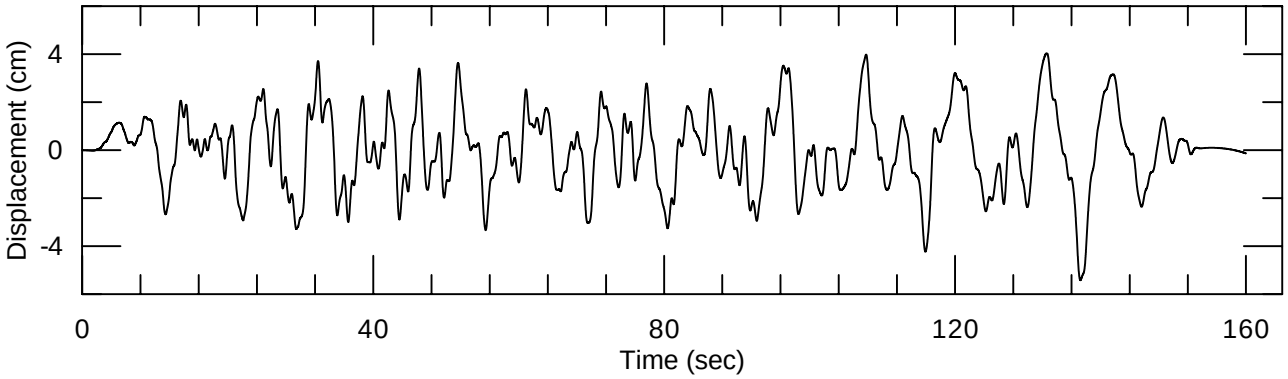
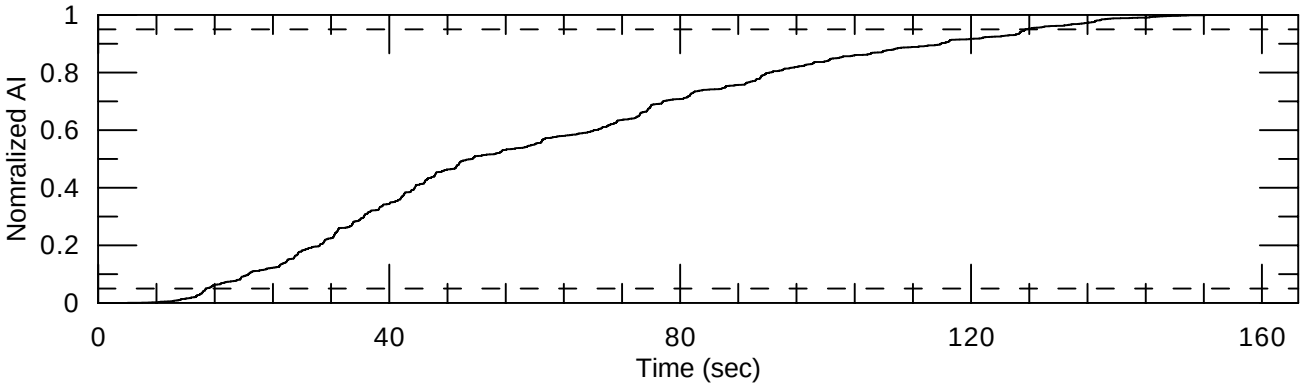
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>2002 DENALI - FIRE STATION 1 (090)<br>FOR NEAR WEST SITE | Figure<br>98 |

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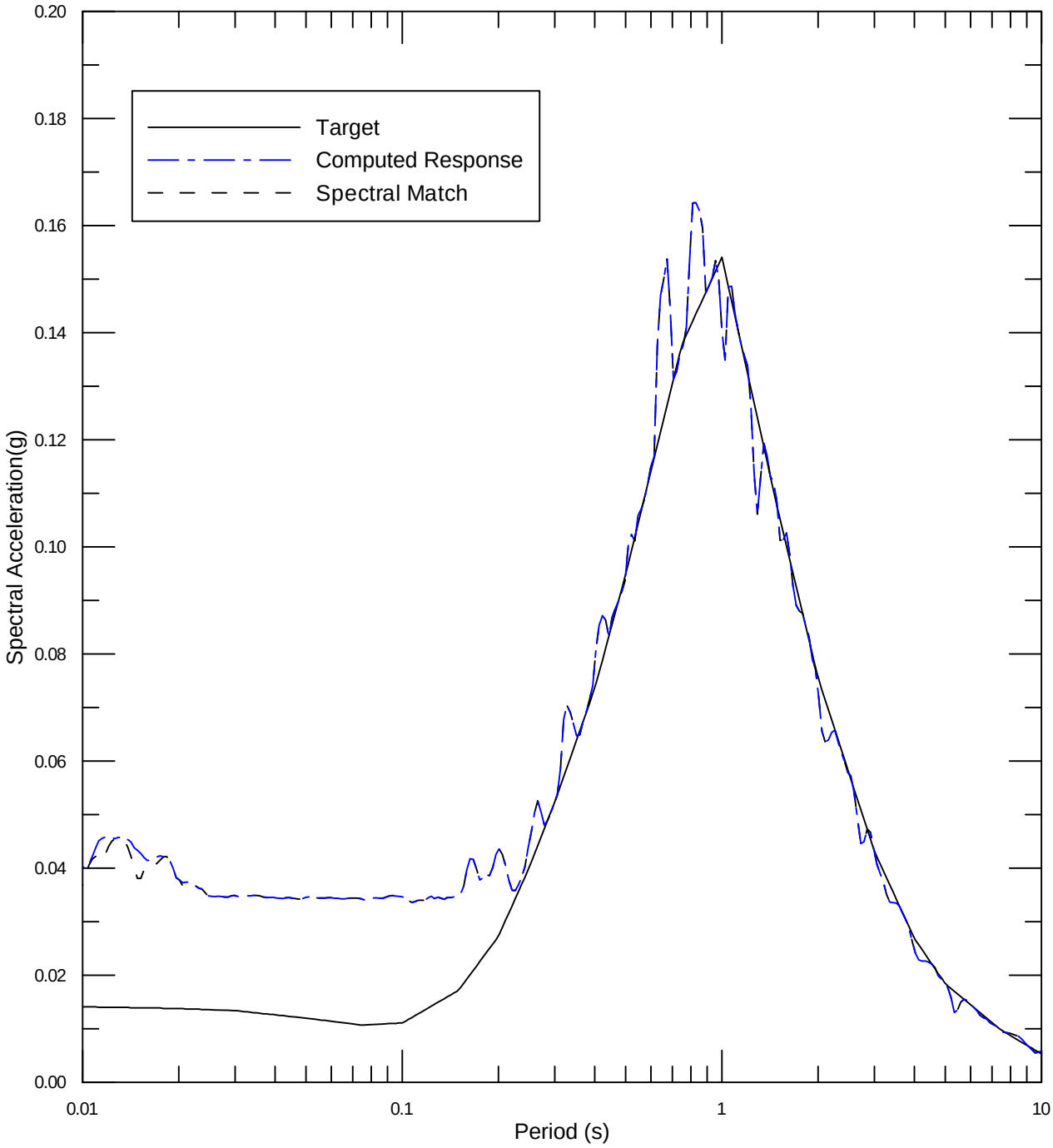
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 2002 DENALI - FIRE STATION 1 (090) FOR NEAR WEST SITE | Figure 99 |

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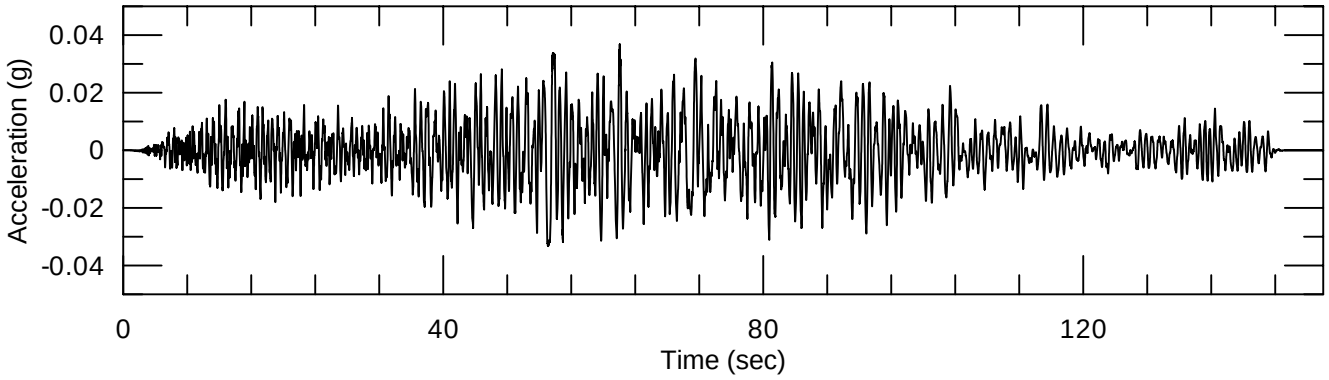
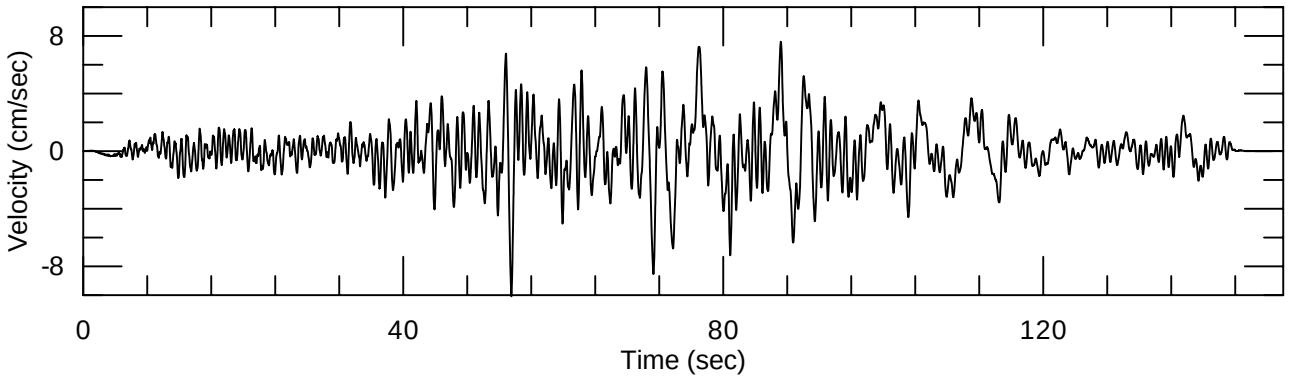
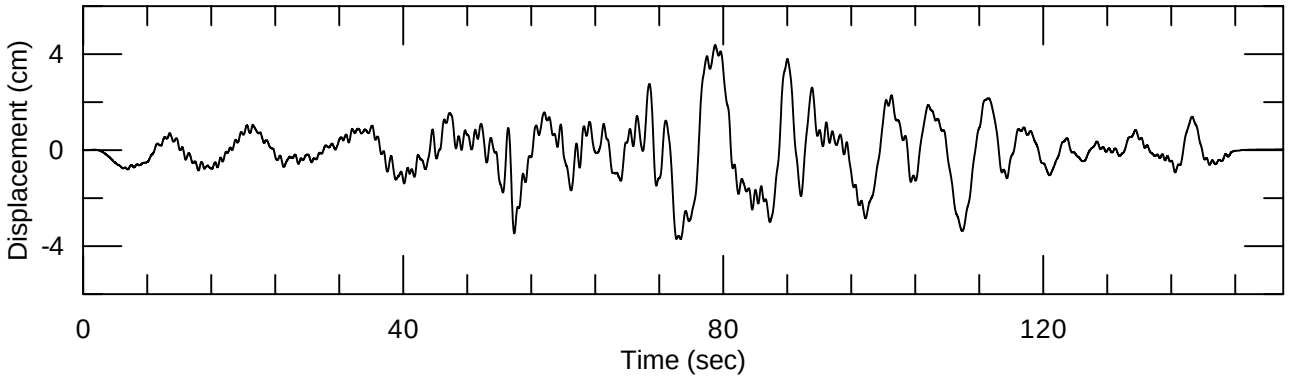
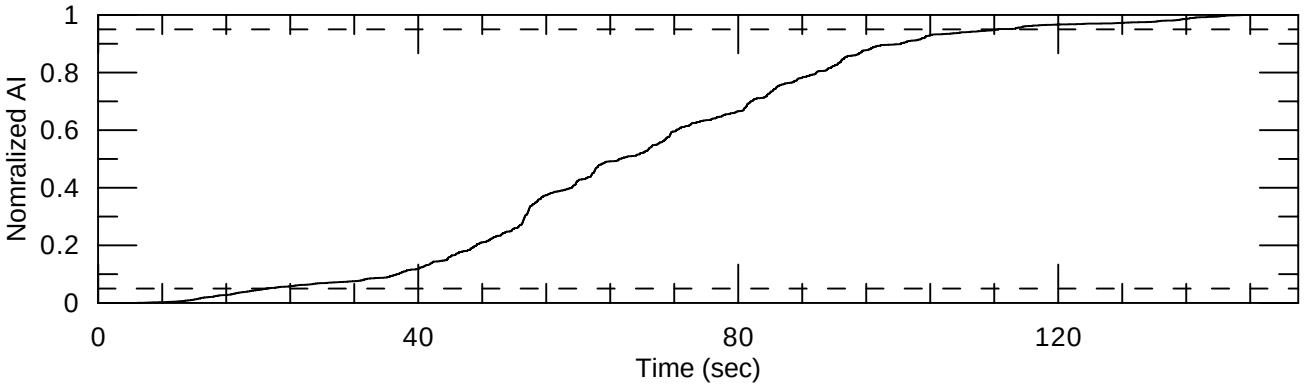
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>2002 DENALI - VALDEZ CITY HALL (090)<br>FOR NEAR WEST SITE | Figure<br>100 |

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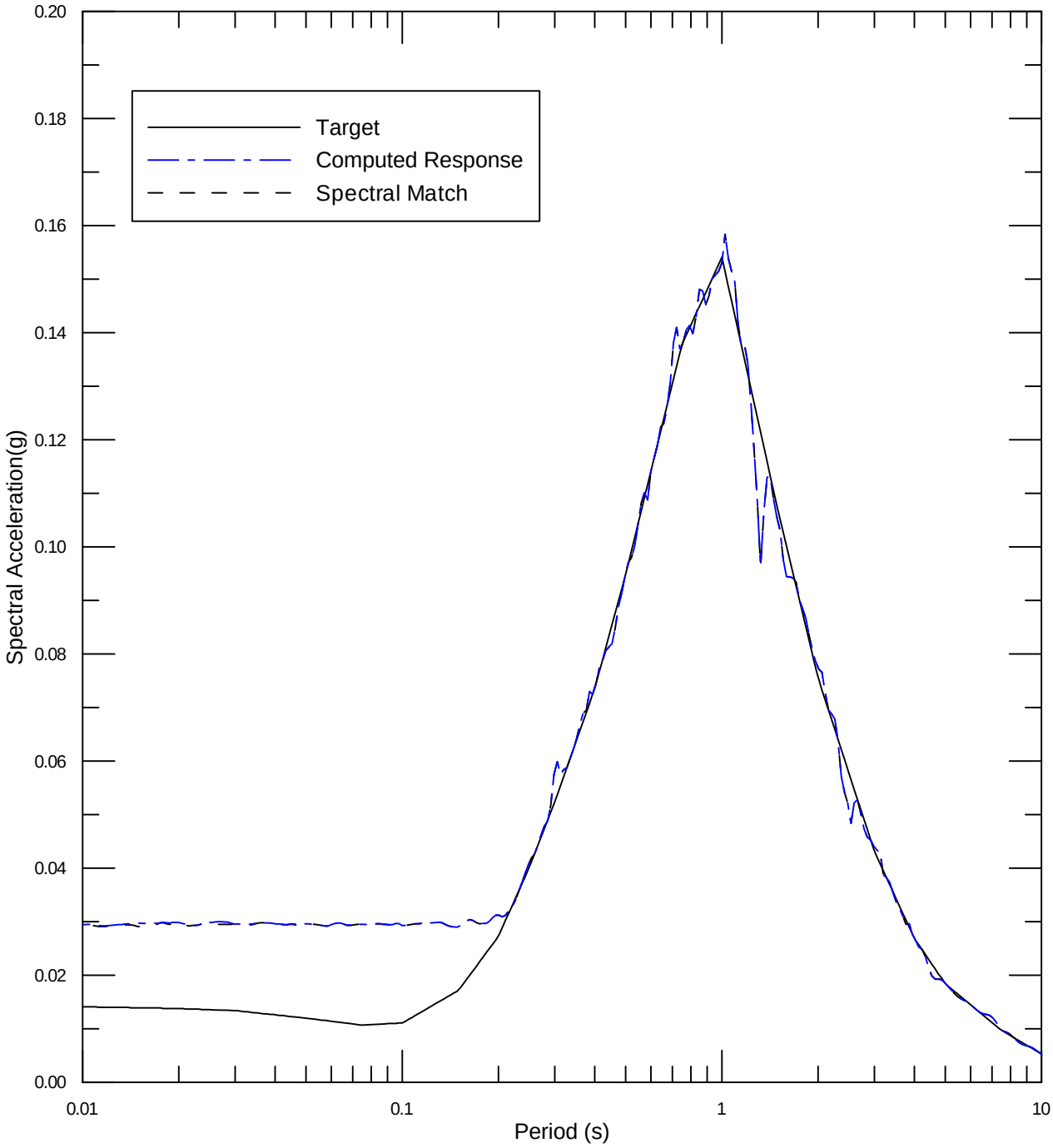
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 2002 DENALI - VALDEZ CITY HALL (090) FOR NEAR WEST SITE | Figure 101 |

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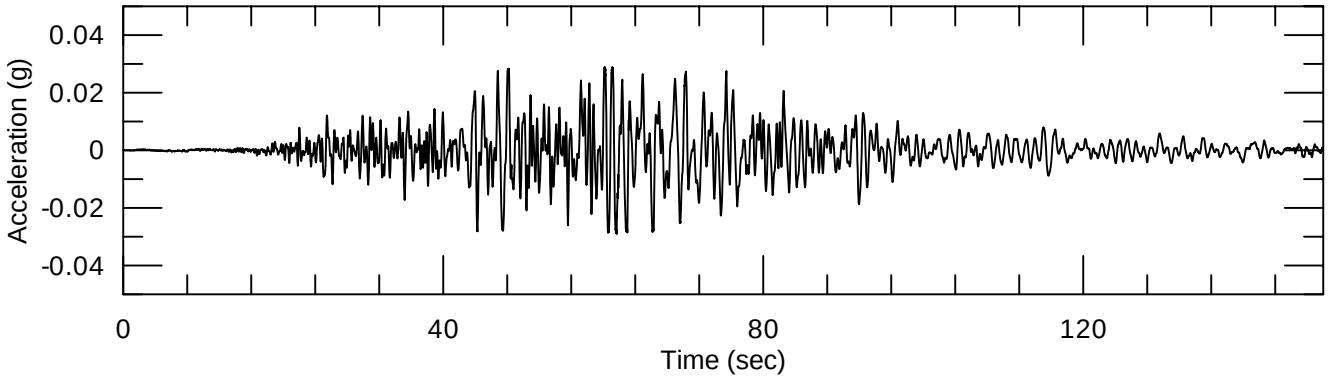
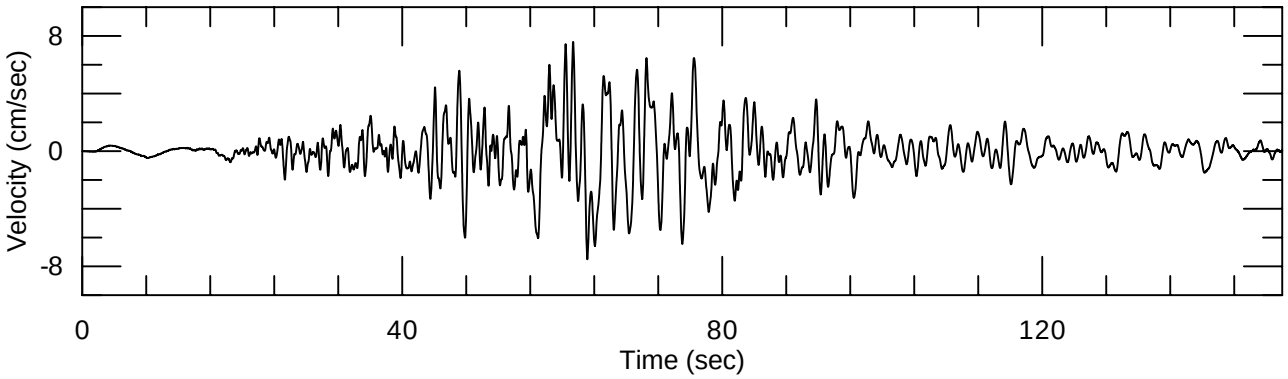
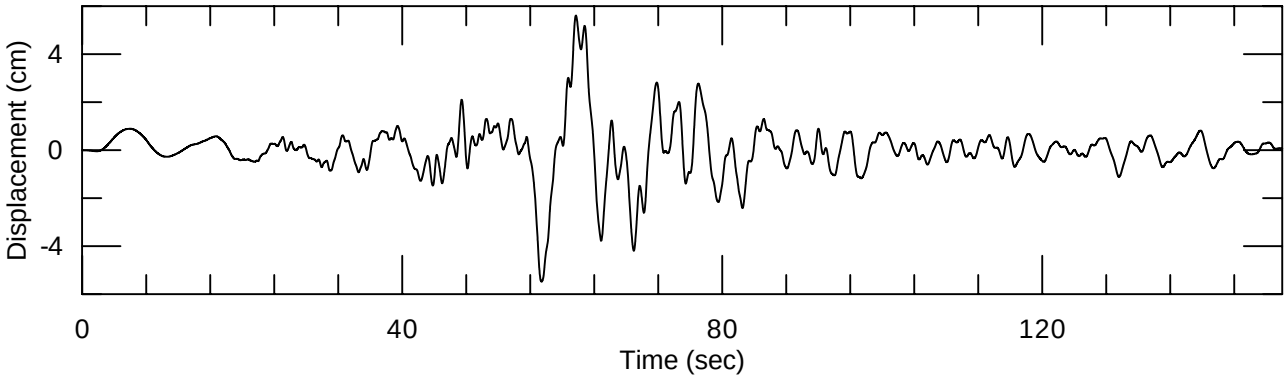
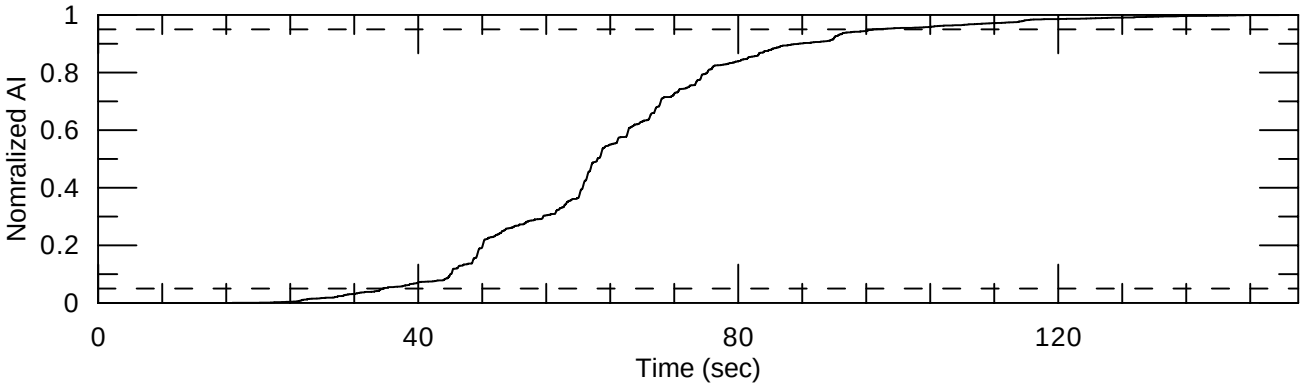
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 KOCAELI - AFYON (000)<br>FOR NEAR WEST SITE | Figure<br>102 |

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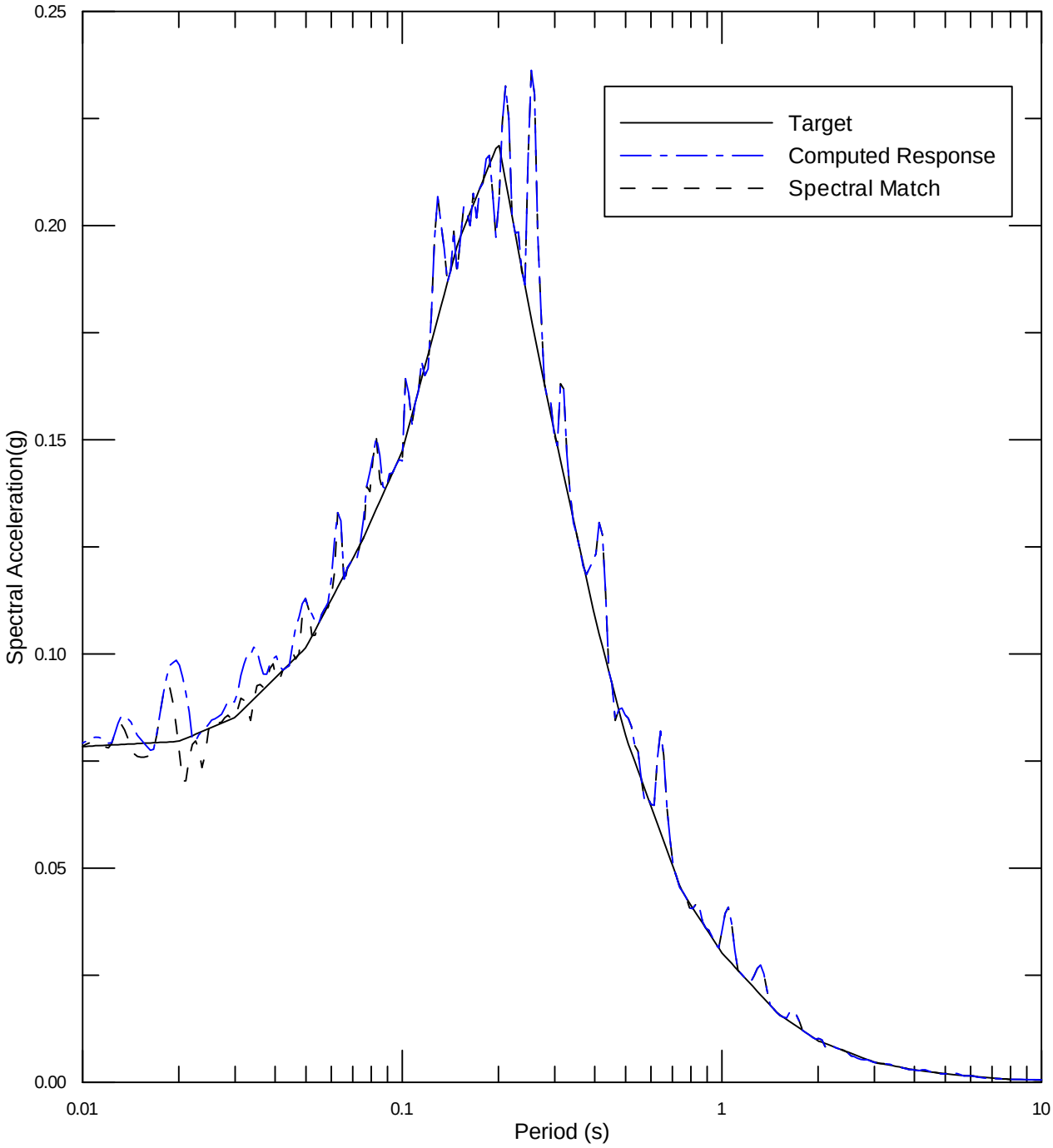
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 KOCAELI - AFYON (000) FOR NEAR WEST SITE | Figure 103 |

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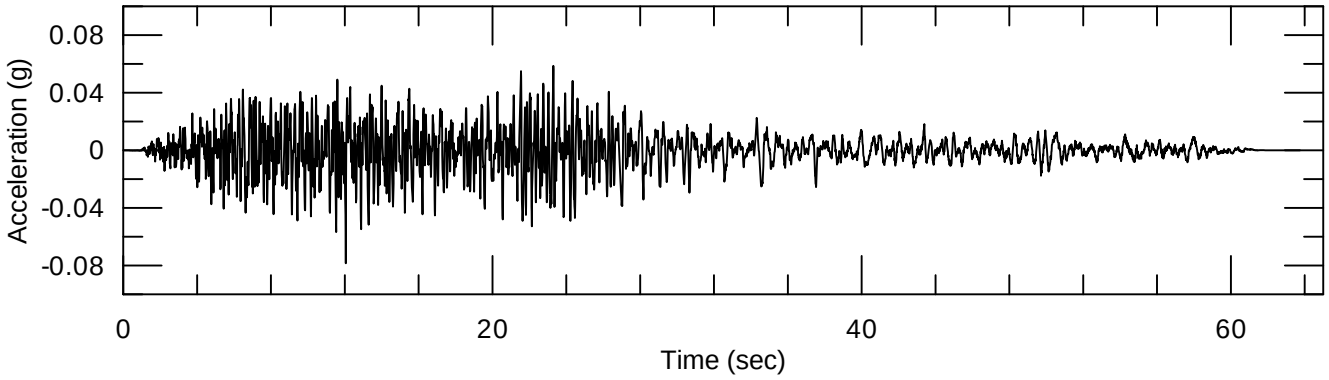
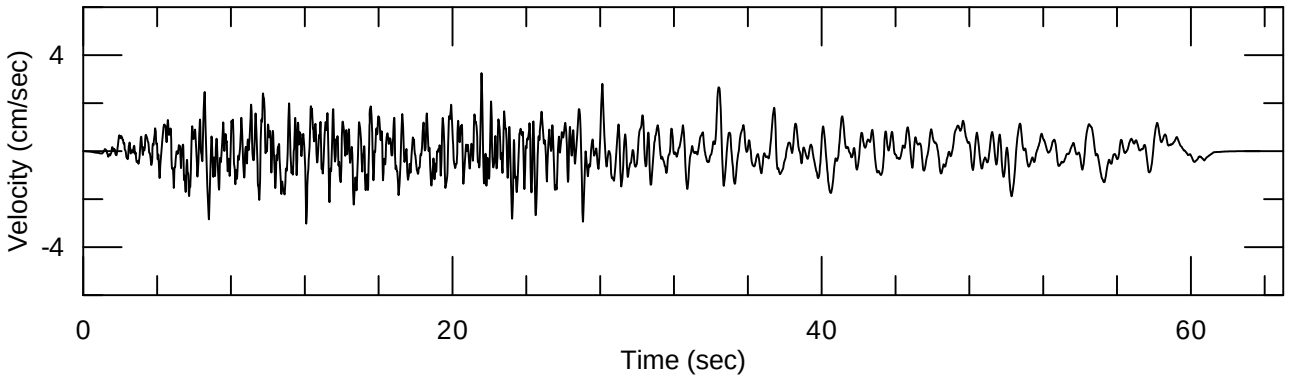
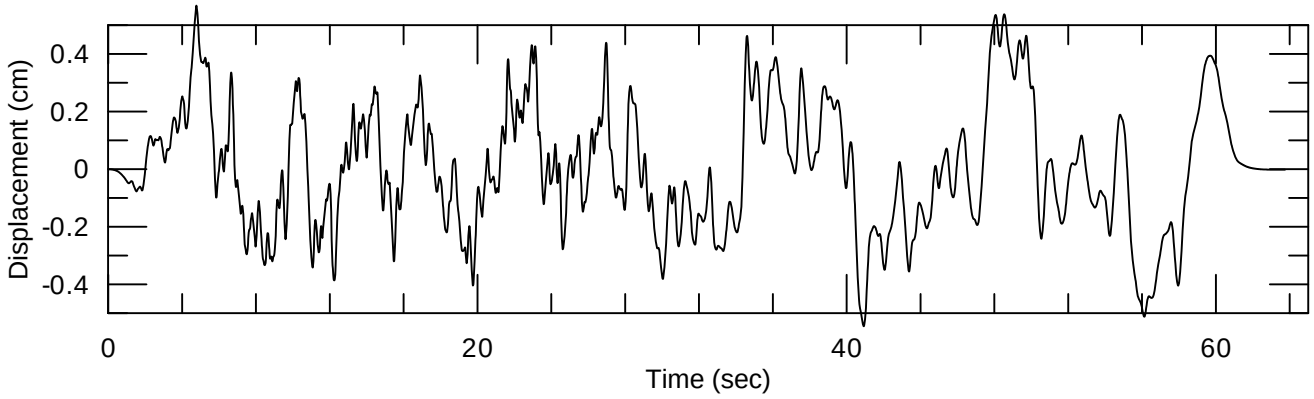
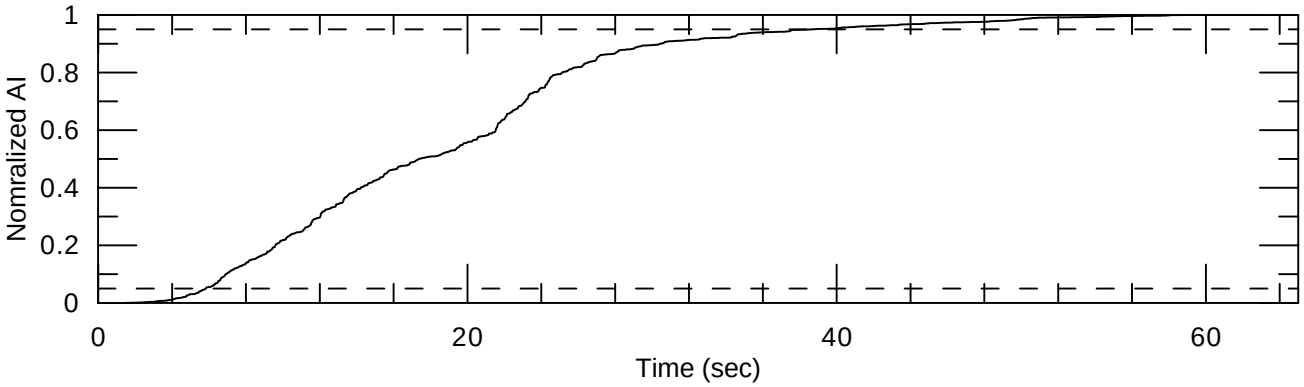
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM<br>1979 IMPERIAL VALEY - CERRO PRIETO (147)<br>FOR PINTO VALLEY SITE | Figure<br>104 |

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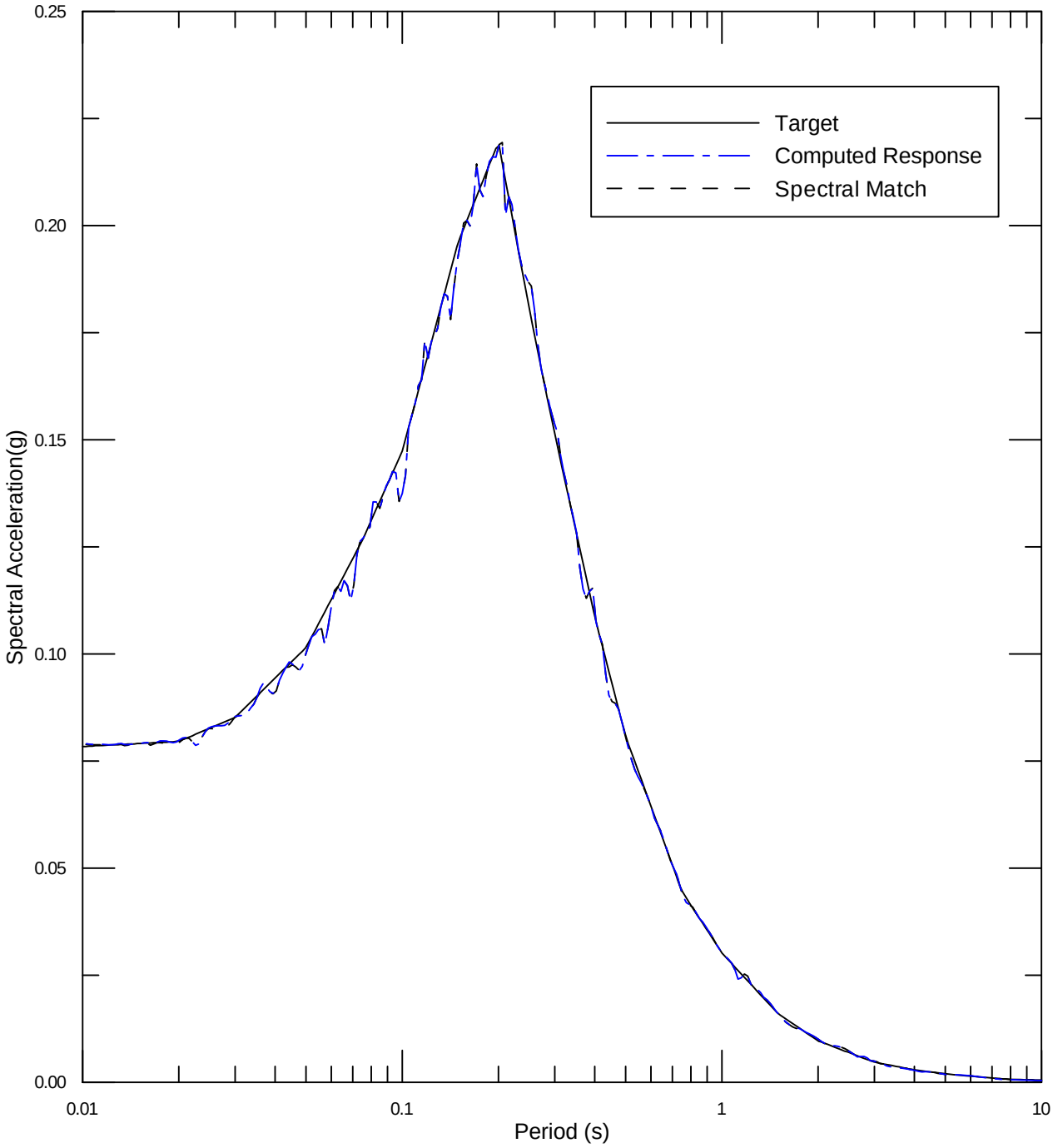
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM 1979 IMPERIAL VALLEY-CERRO PRIETO (147) FOR PINTO VALLEY SITE | Figure 105 |

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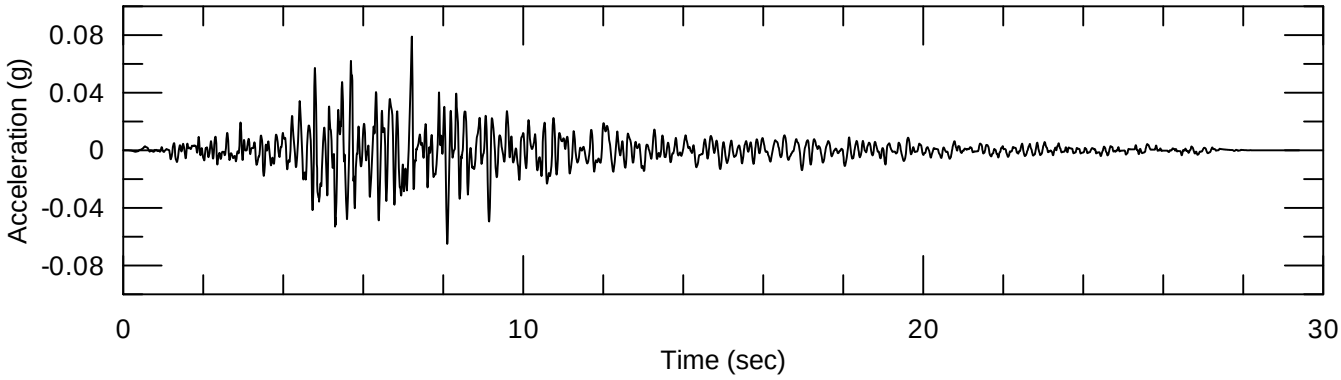
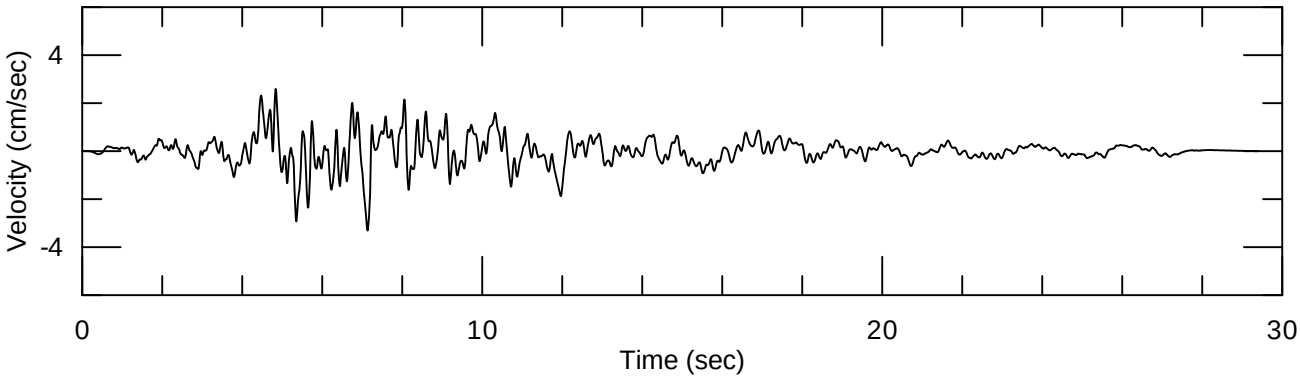
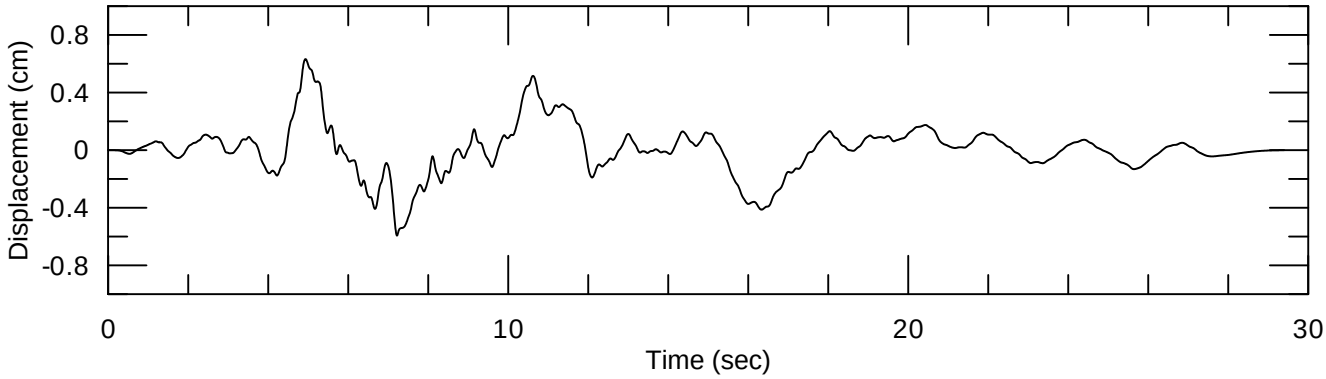
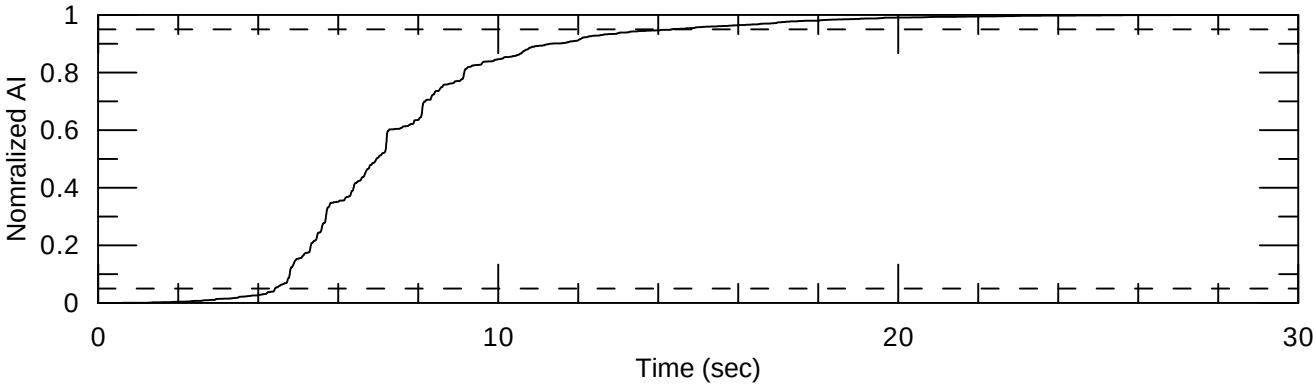
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD0.2 SEC CMS SPECTRUM<br>1995 KOZANI - KOZANI (L)<br>FOR PINTO VALLEY SITE | Figure<br>106 |

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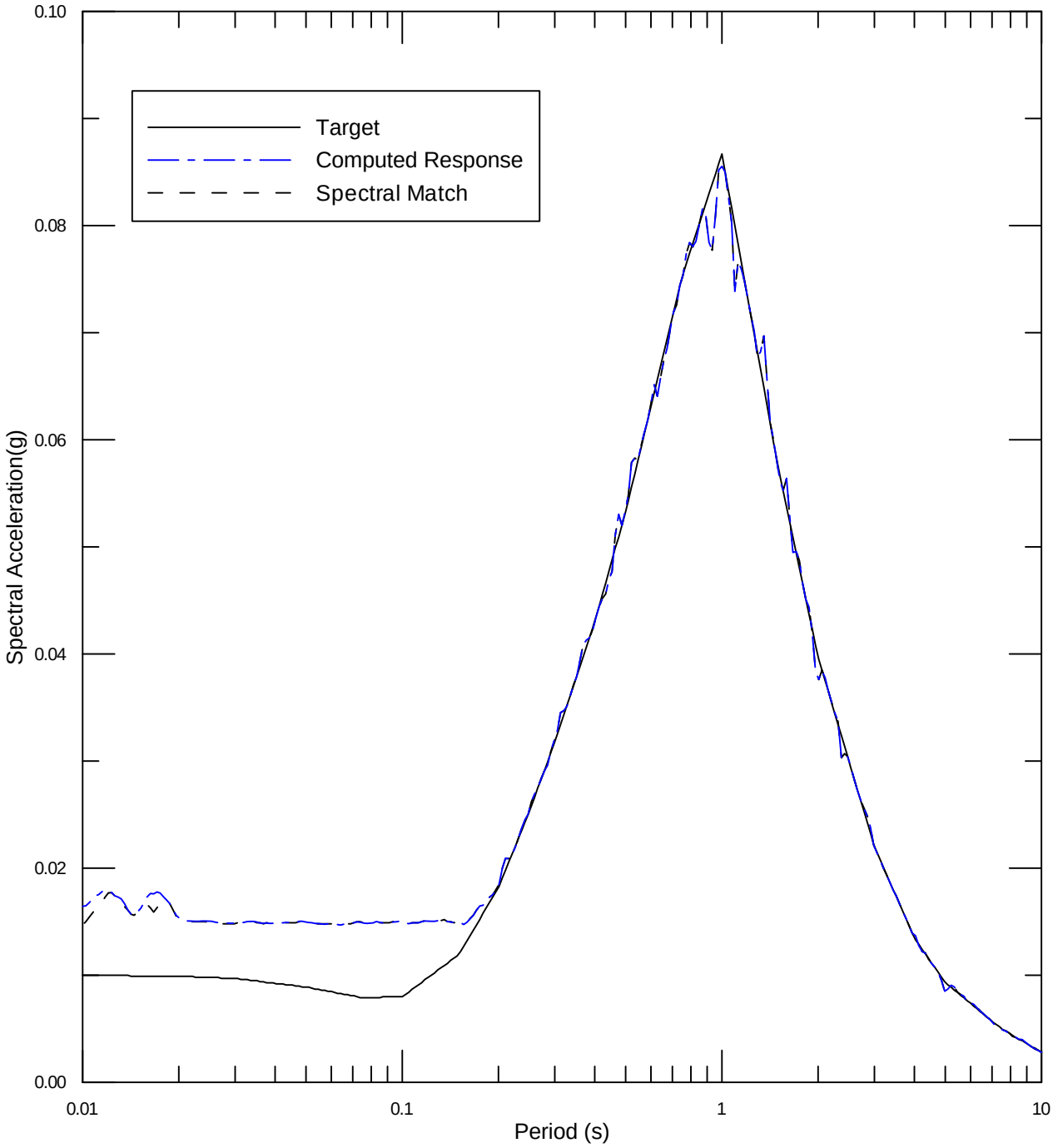
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM 1995 KOZANI- KOZANI (L) FOR PINTO VALLEY SITE | Figure 107 |

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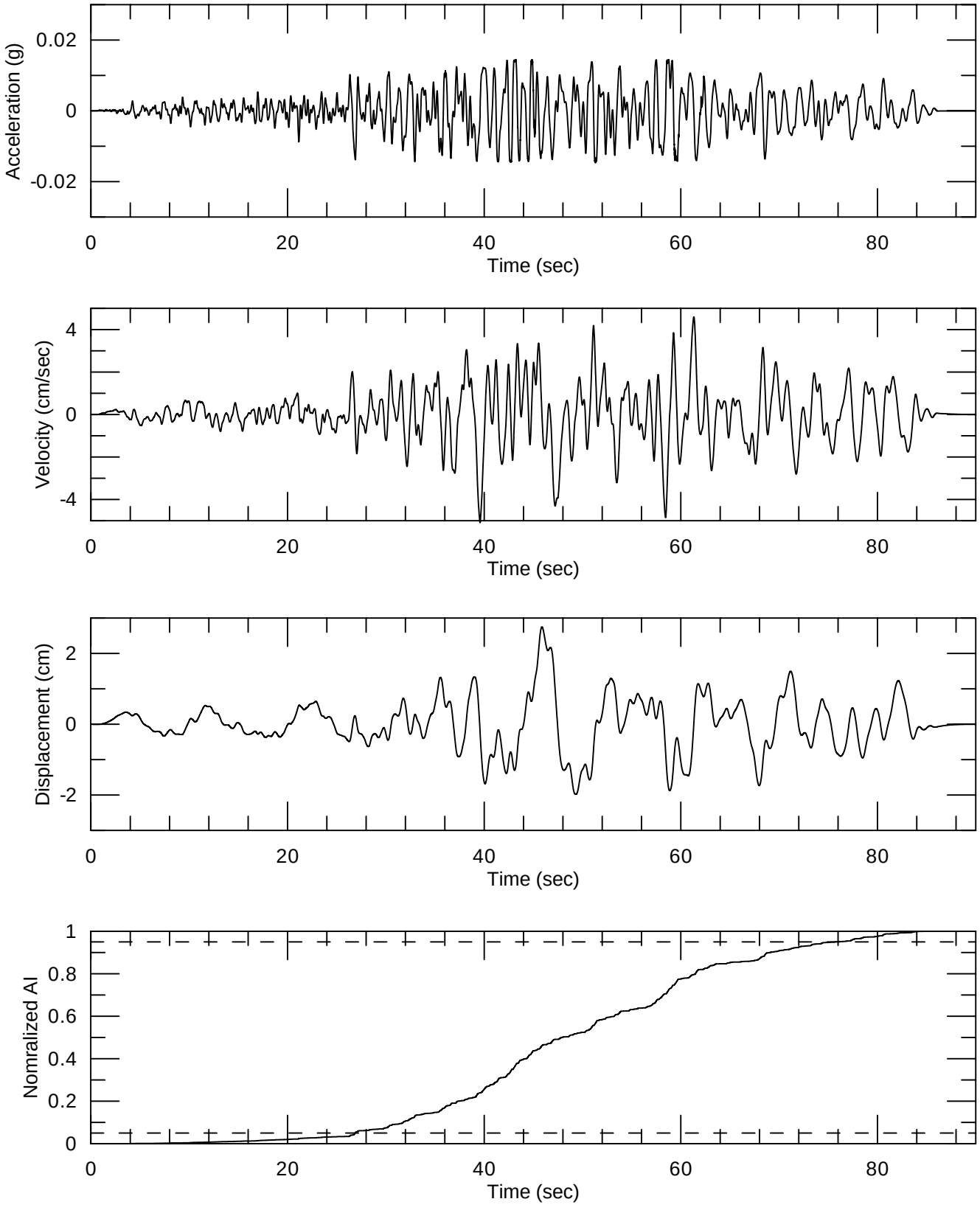
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 CHI-CHI - KAU046 (E)<br>FOR PINTO VALLEY SITE | Figure<br>108 |

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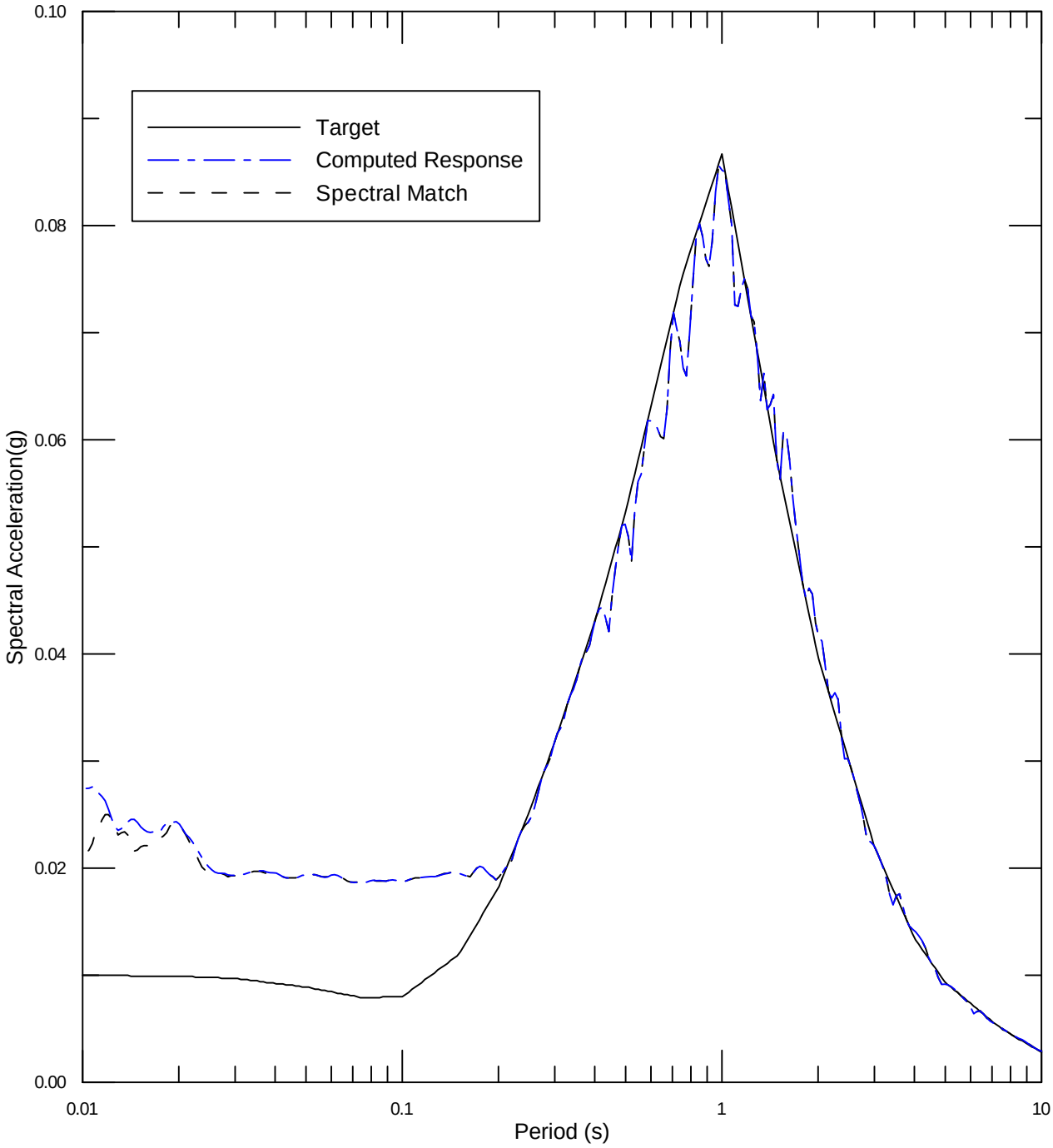
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 CHI-CHI - KAU046 (E) FOR PINTO VALLEY SITE | Figure 109 |

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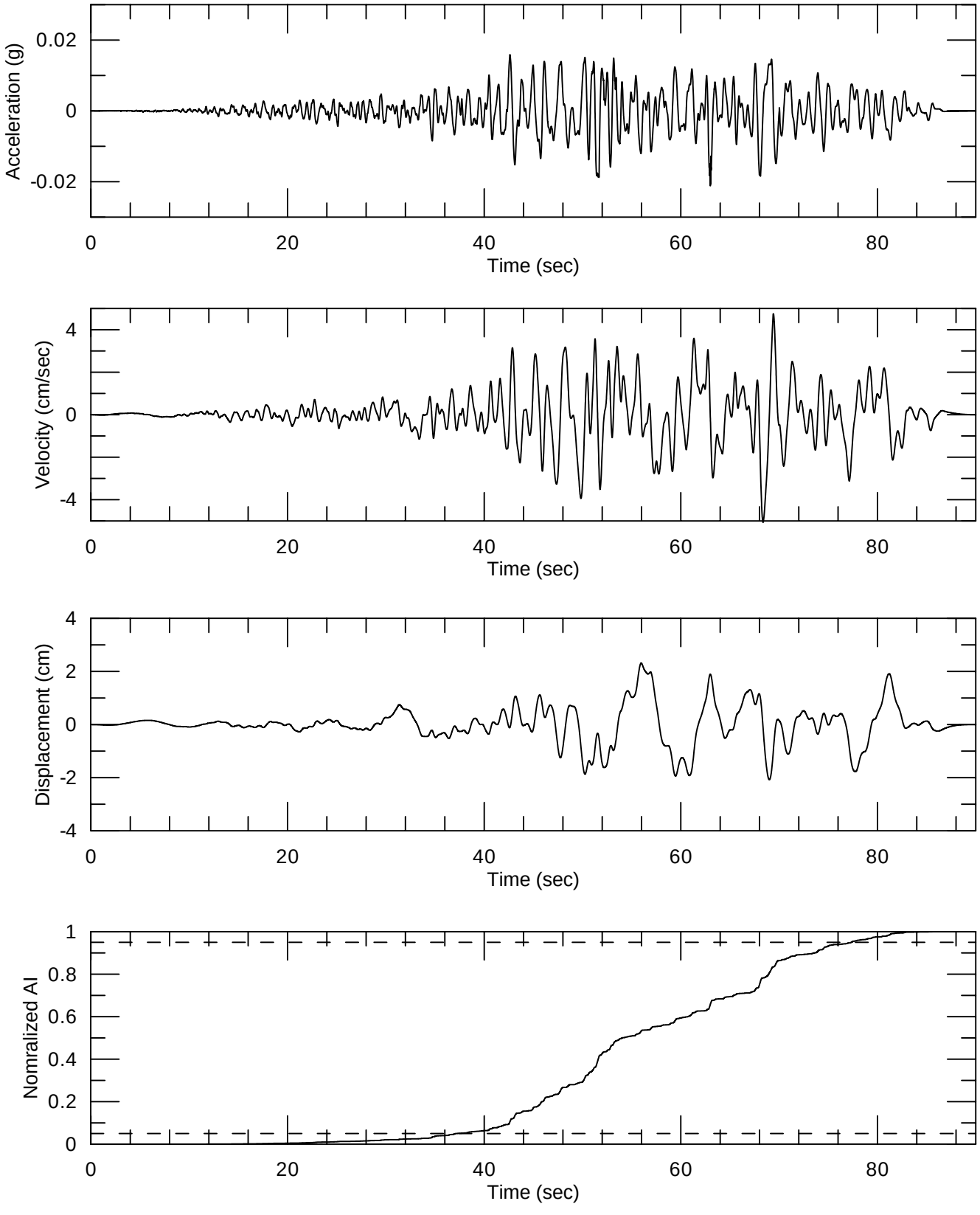
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 CHI-CHI - KAU081 (E)<br>FOR PINTO VALLEY SITE | Figure<br>110 |

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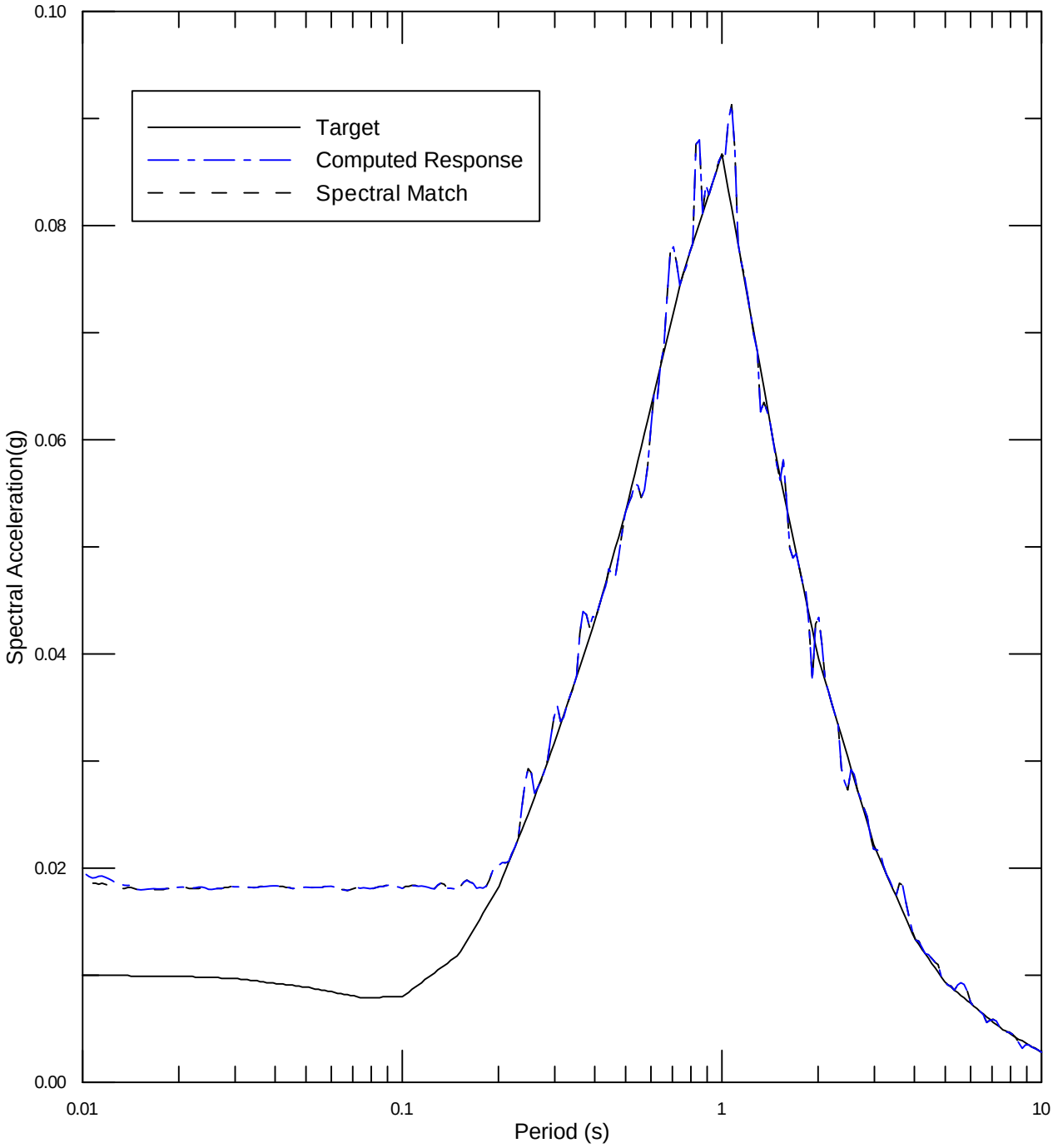
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 CHI-CHI - KAU081 (E) FOR PINTO VALLEY SITE | Figure 111 |

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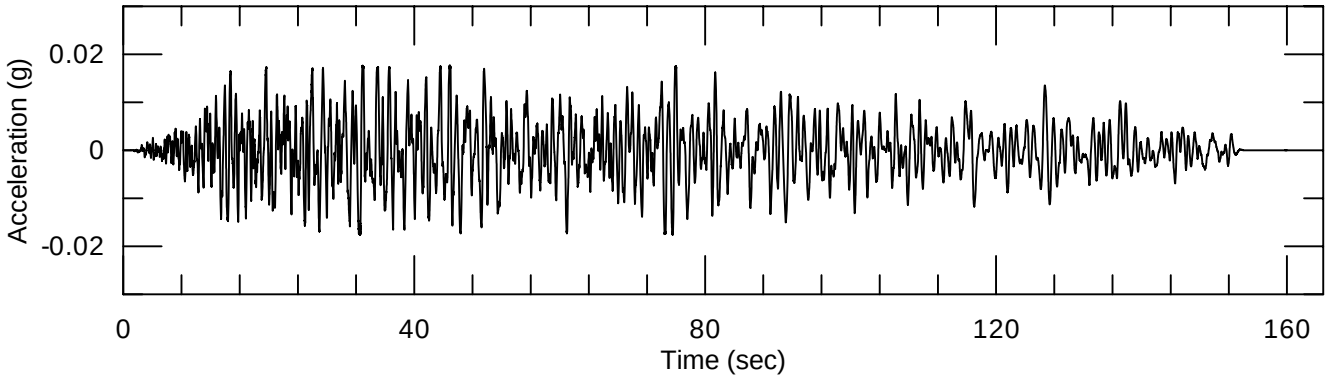
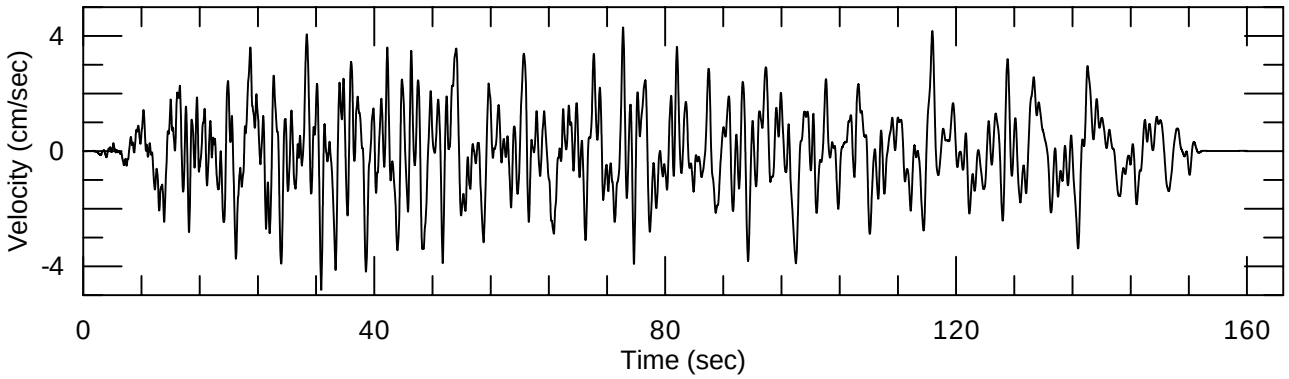
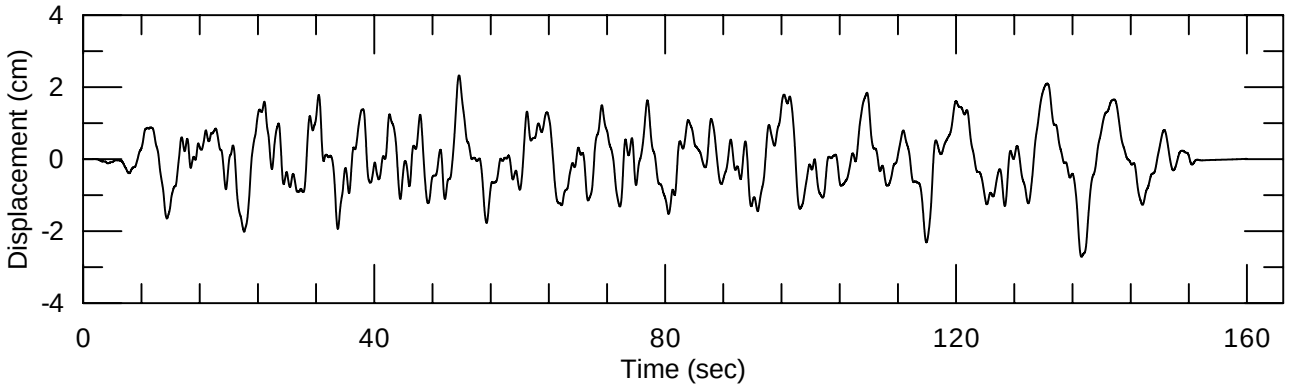
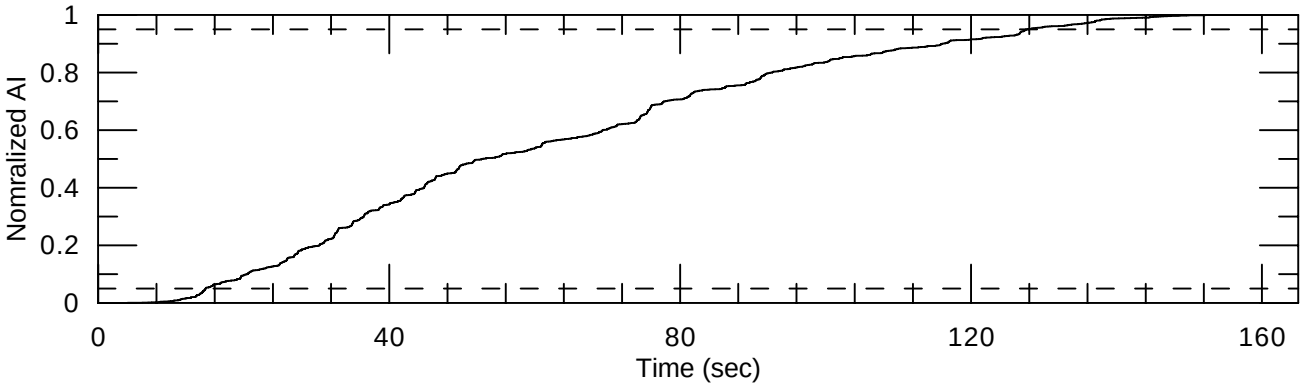
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>DENALI 2002 - FIRE STATION 1 (090)<br>FOR PINTO VALLEY SITE | Figure<br>112 |

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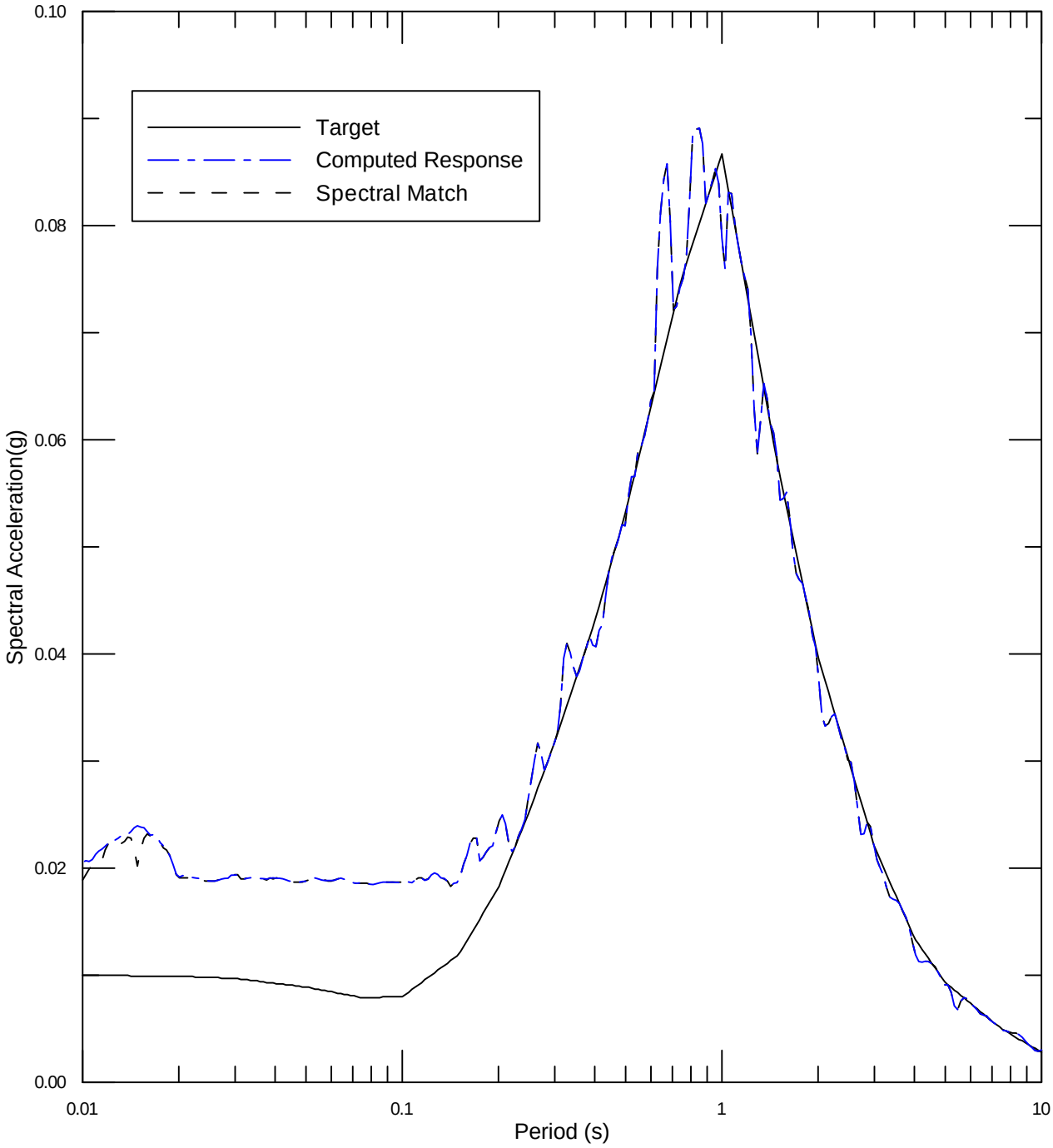
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 2002 DENALI - FIRE STATION 1 (090) FOR PINTO VALLEY SITE | Figure 113 |

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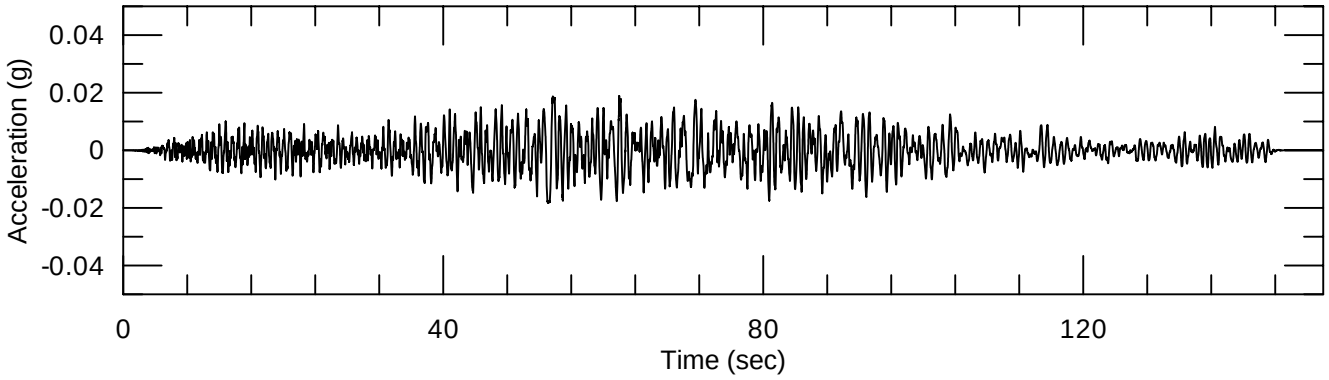
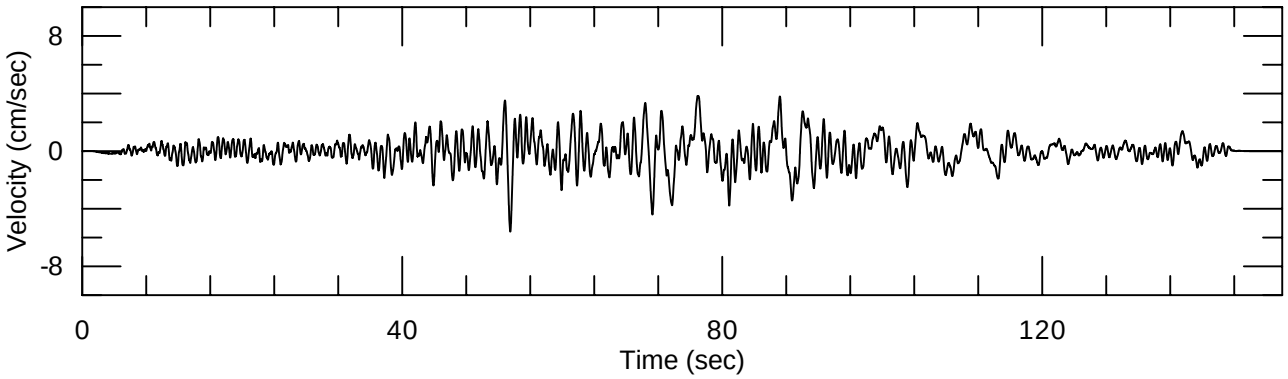
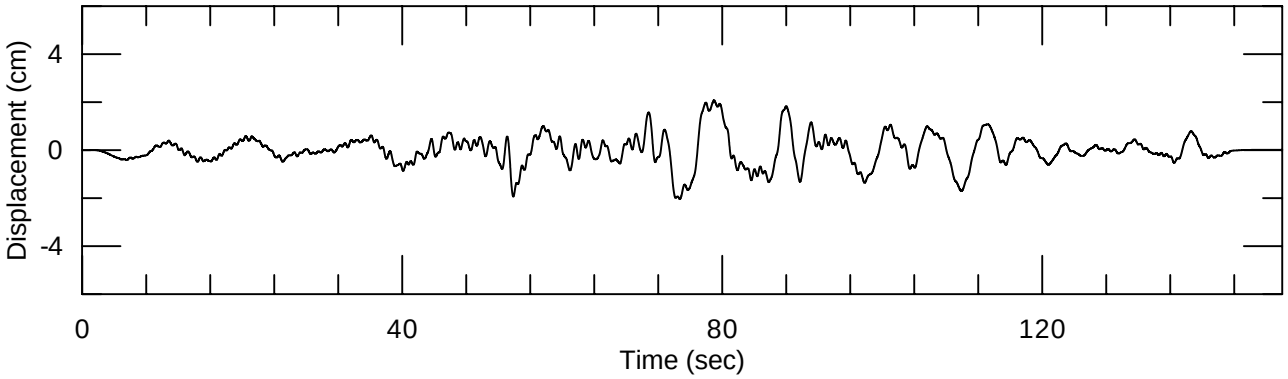
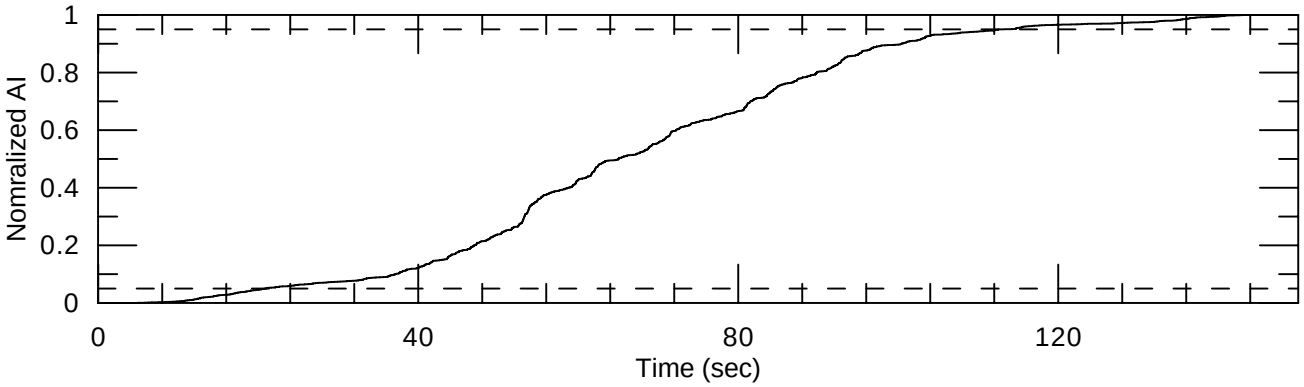
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>2002 DENALI - VALDEZ CITY HALL (090)<br>FOR PINTO VALLEY SITE | Figure<br>114 |

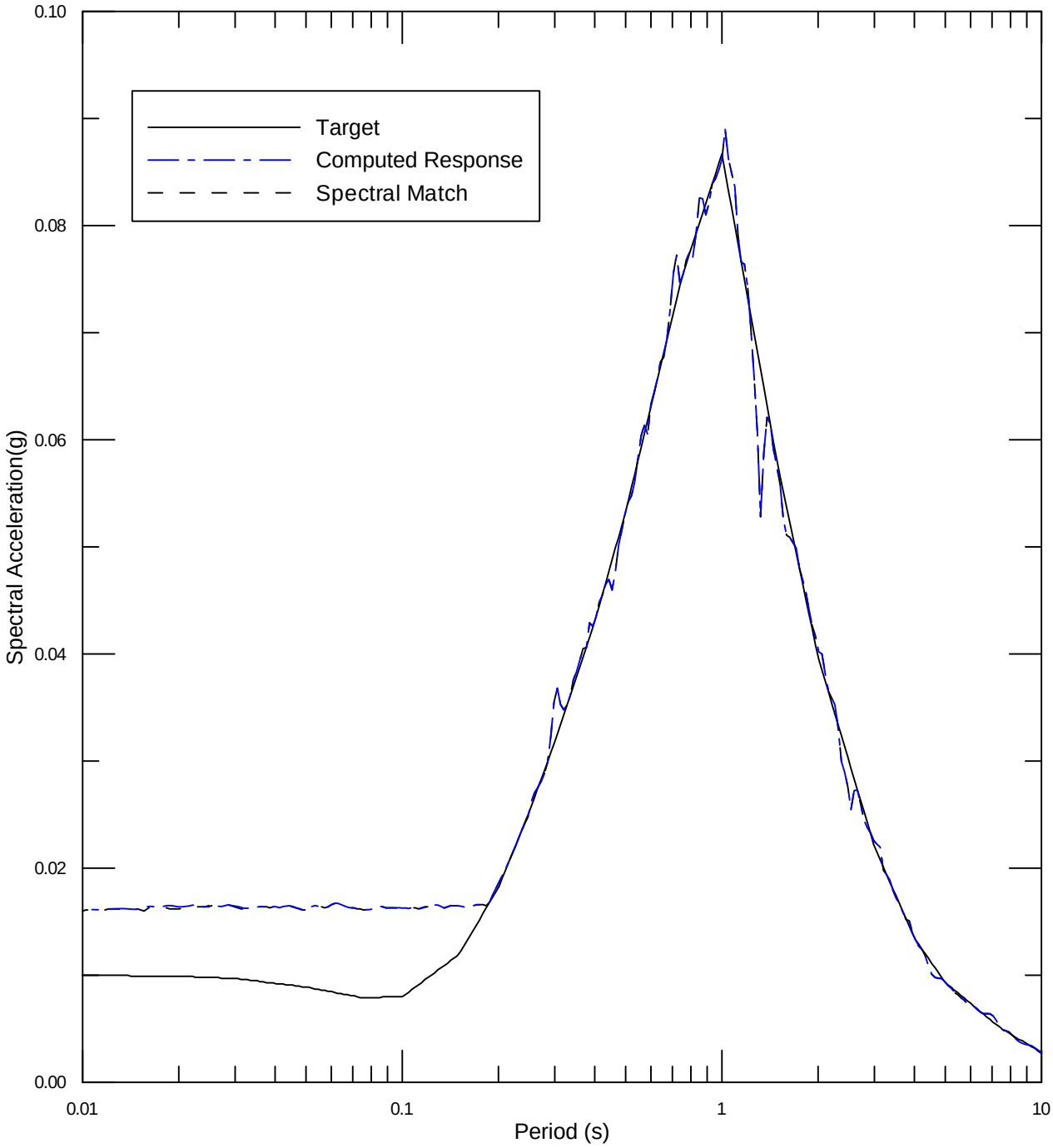


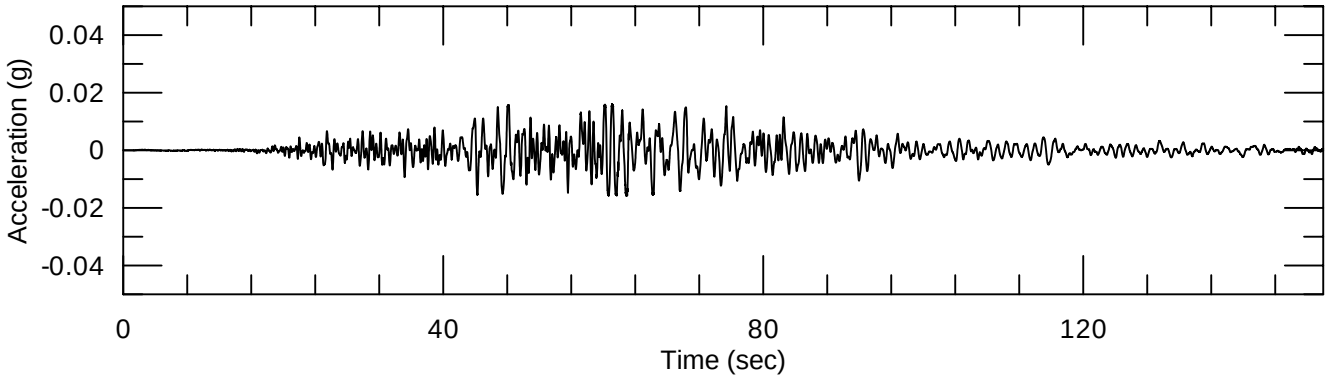



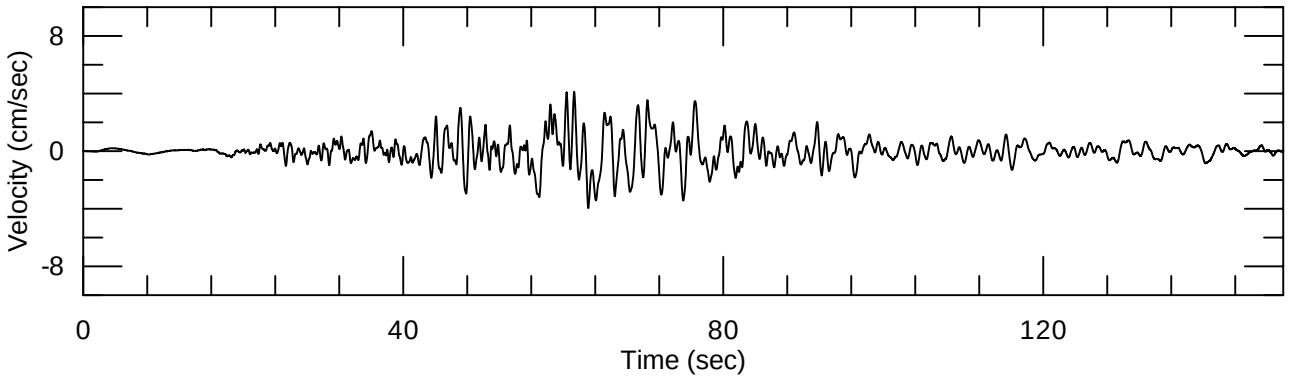



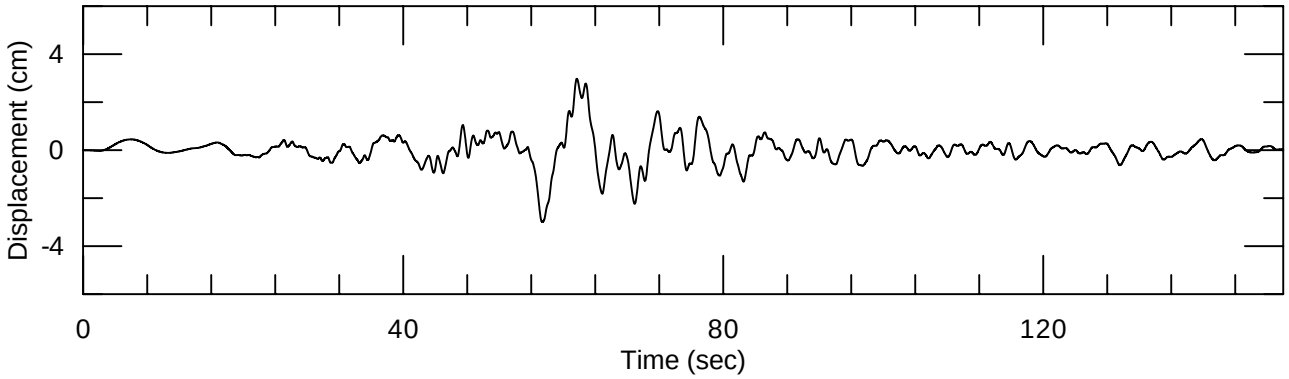

| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 2002 DENALI - VALDEZ CITY HALL (090) FOR PINTO VALLEY SITE | Figure 115 |

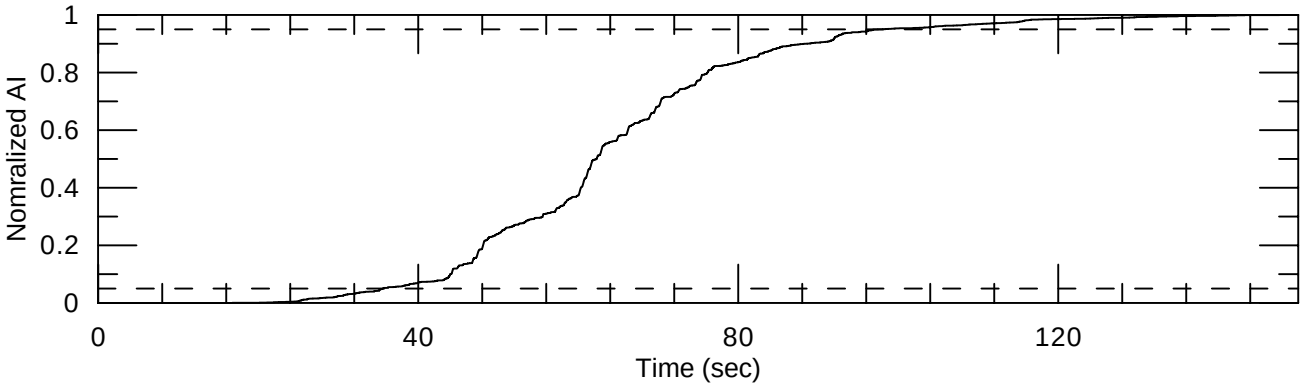



| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 KOCAELI - AFYON (000)<br>FOR PINTO VALLEY SITE | Figure<br>116 |

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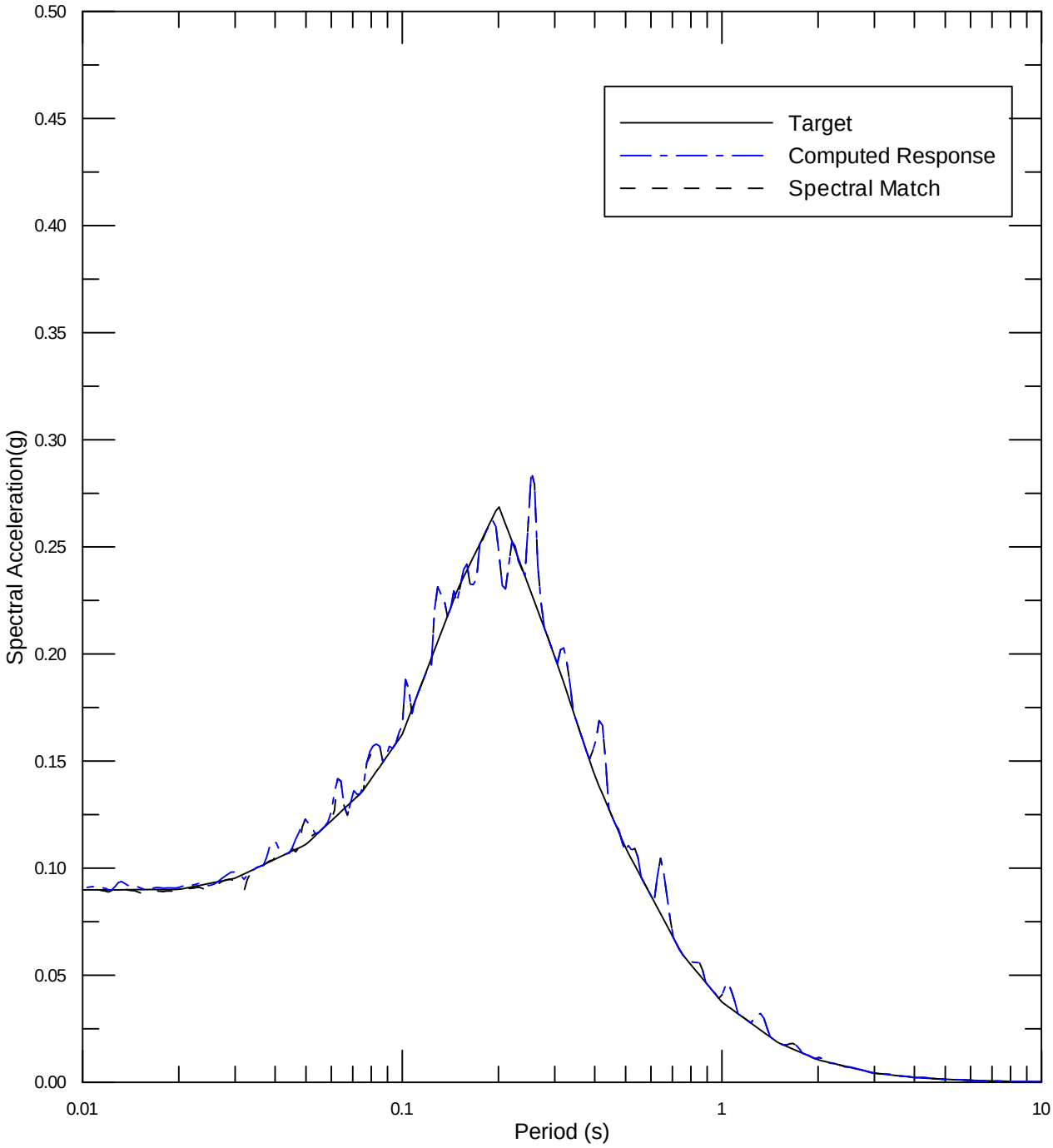
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 KOCAELI - AFYON (000) FOR PINTO VALLEY SITE | Figure 117 |

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|---|---|---|---|
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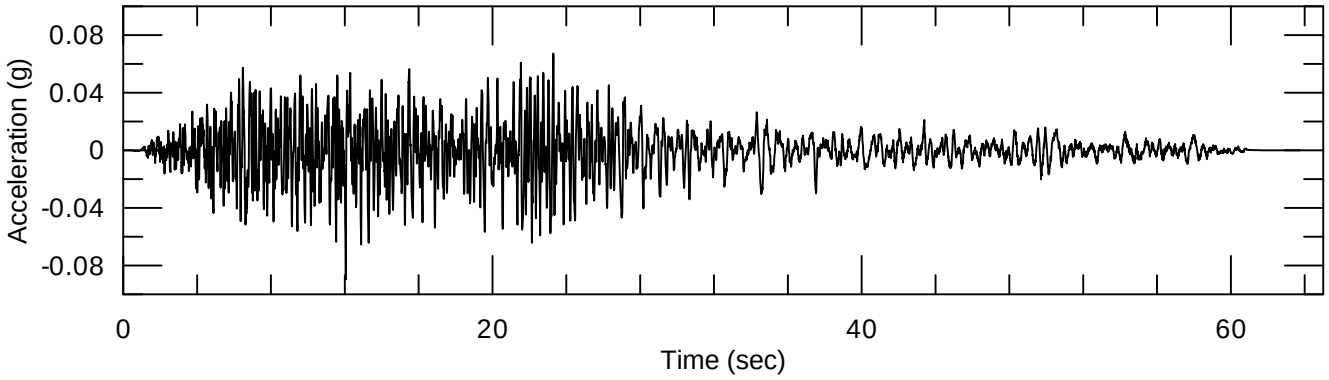


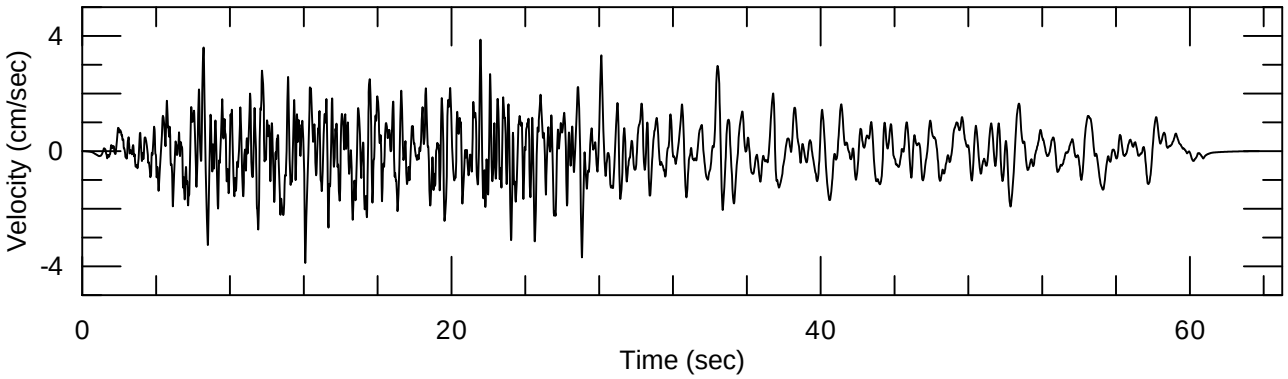


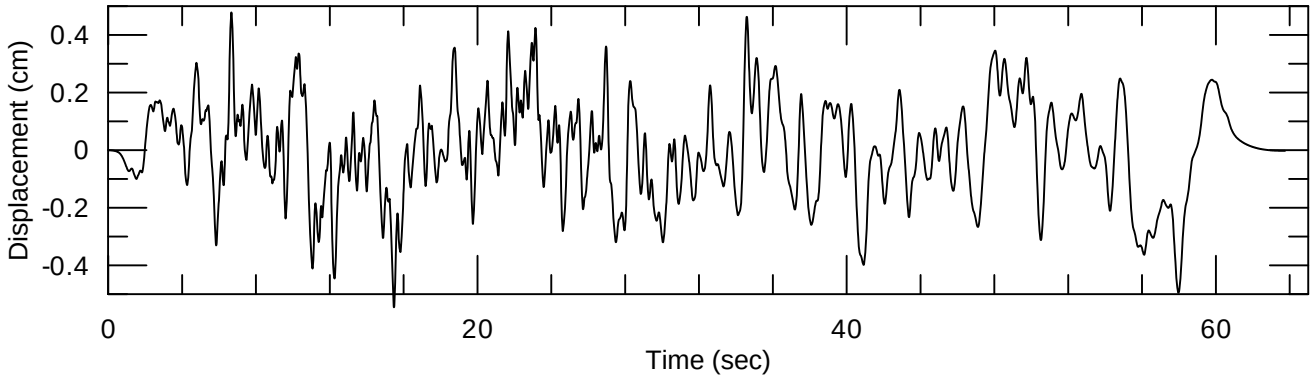


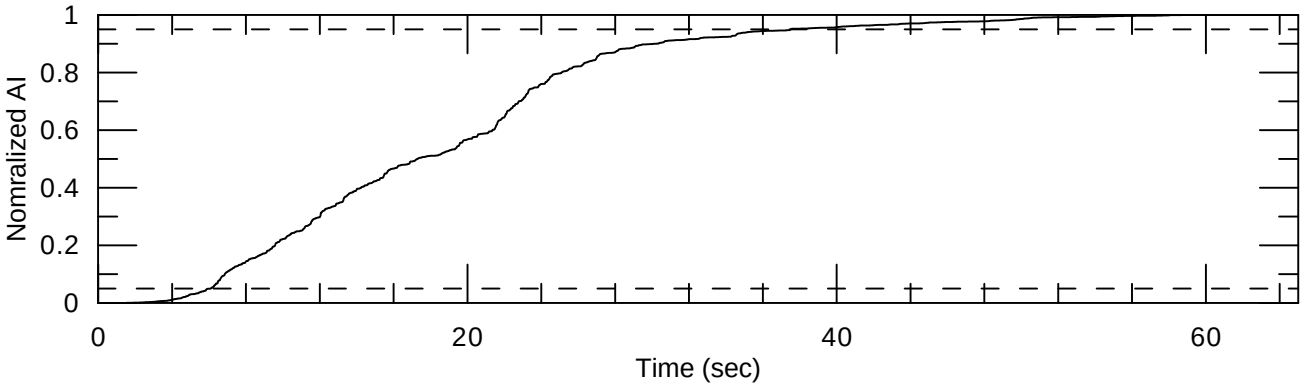


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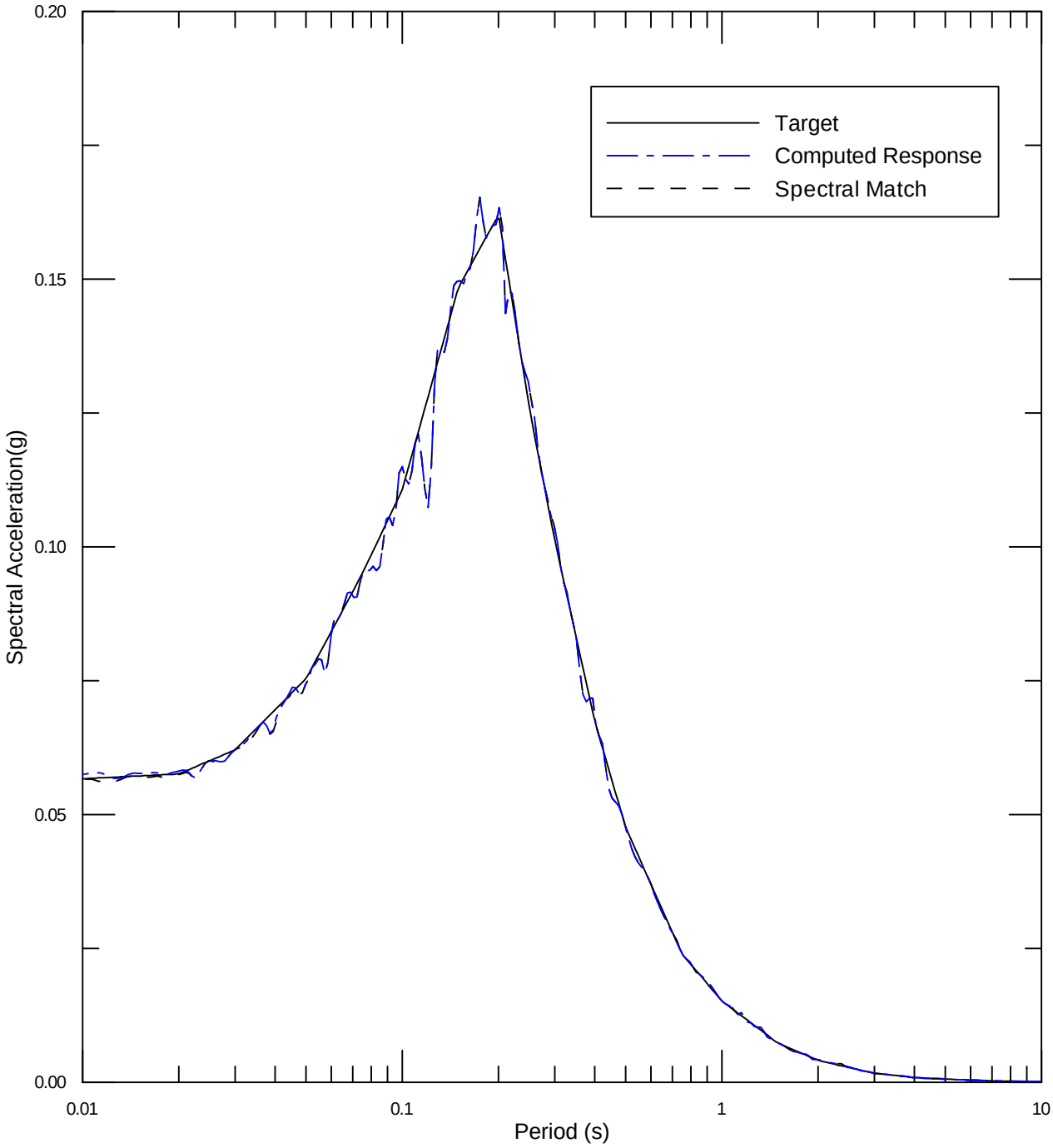
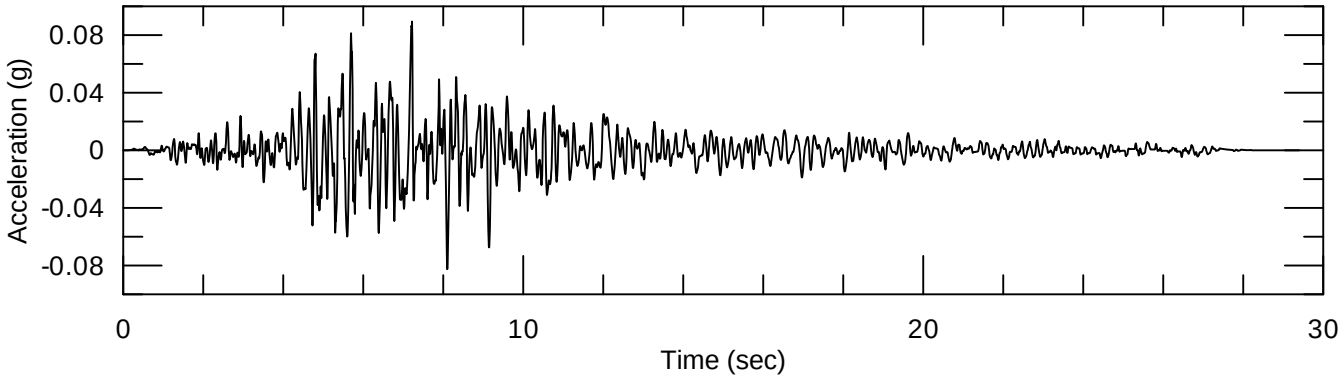
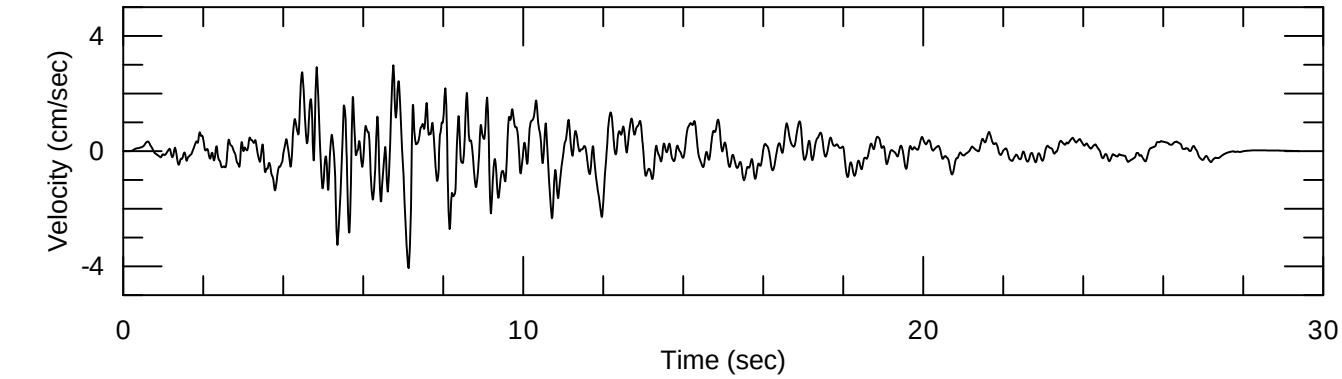
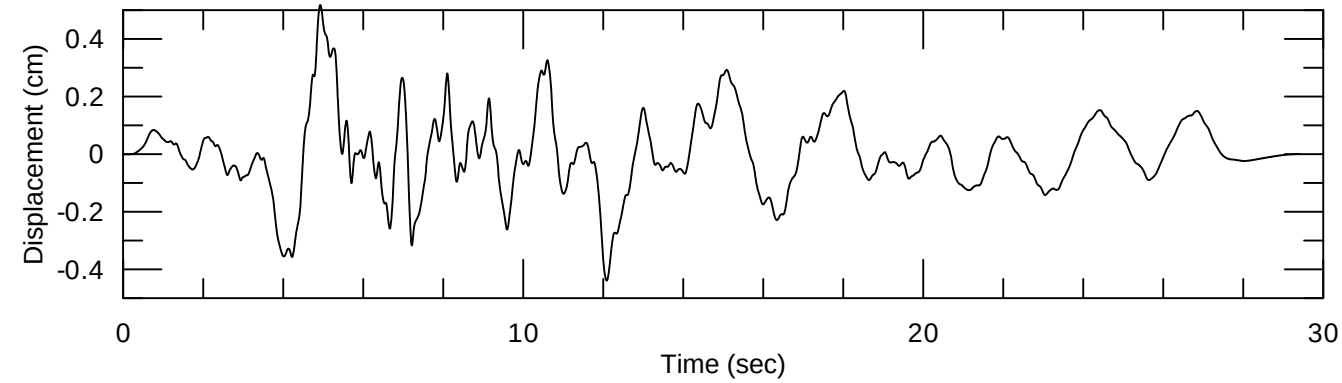
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM 1979 IMPERIAL VALLEY-CERRO PRIETO (147) FOR FAR WEST 1 SITE | Figure 119 |

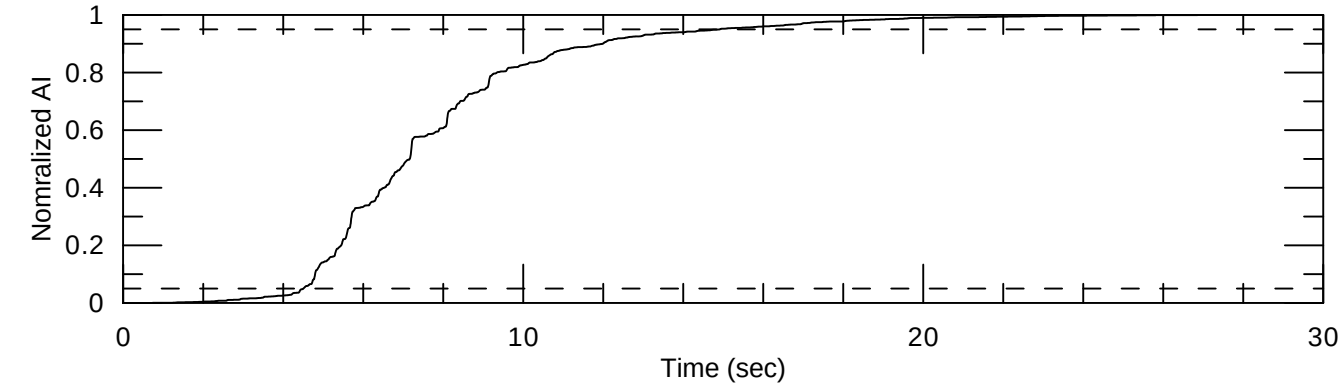



| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD0.2 SEC CMS SPECTRUM<br>1995 KOZANI - KOZANI (L)<br>FOR FAR WEST 1 SITE | Figure<br>120 |

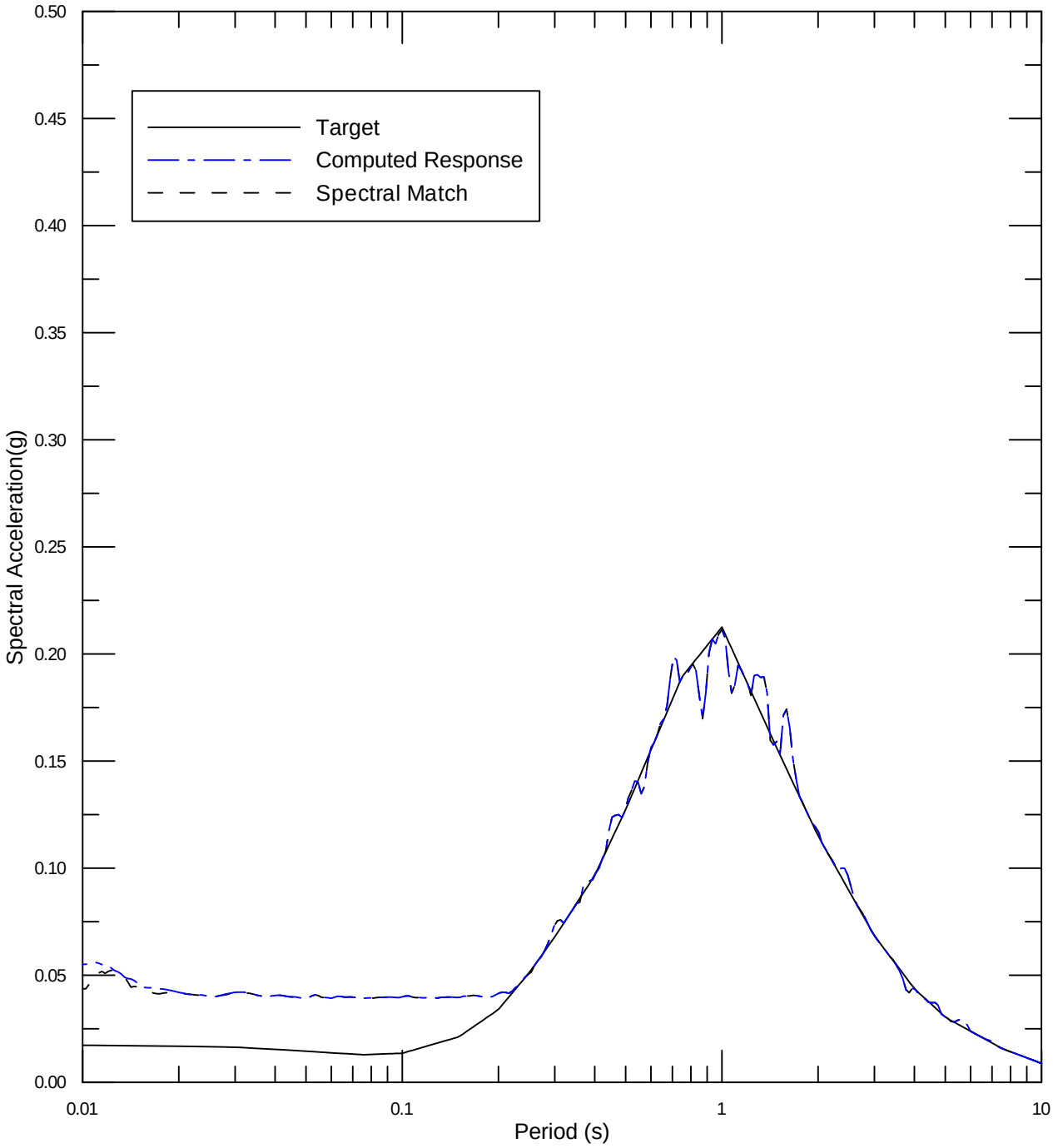



| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 0.2 SEC CMS SPECTRUM 1995 KOZANI- KOZANI (L) FOR FAR WEST 1 SITE | Figure 121 |

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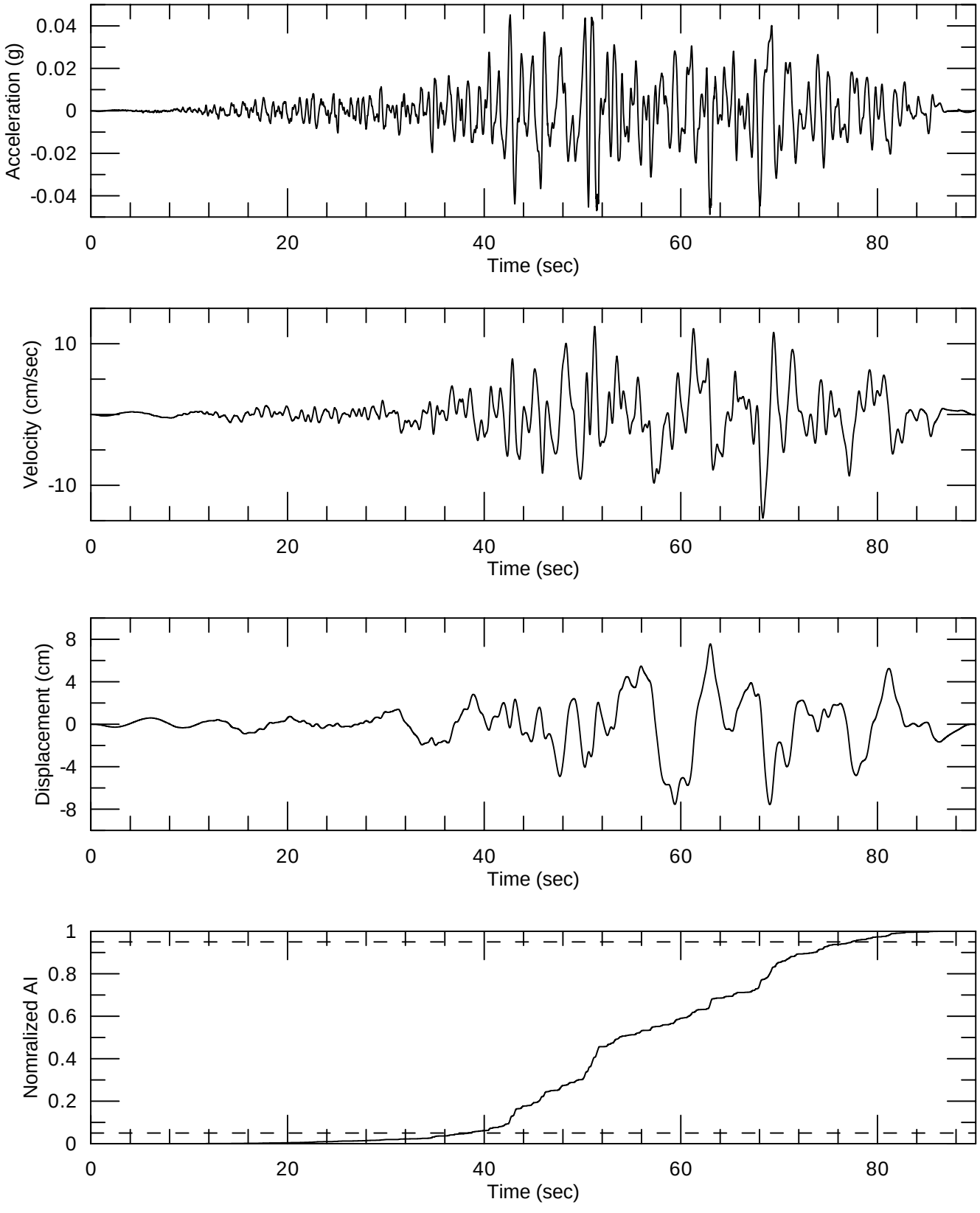
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 CHI-CHI - KAU046 (E)<br>FOR FAR WEST 1 SITE | Figure<br>122 |

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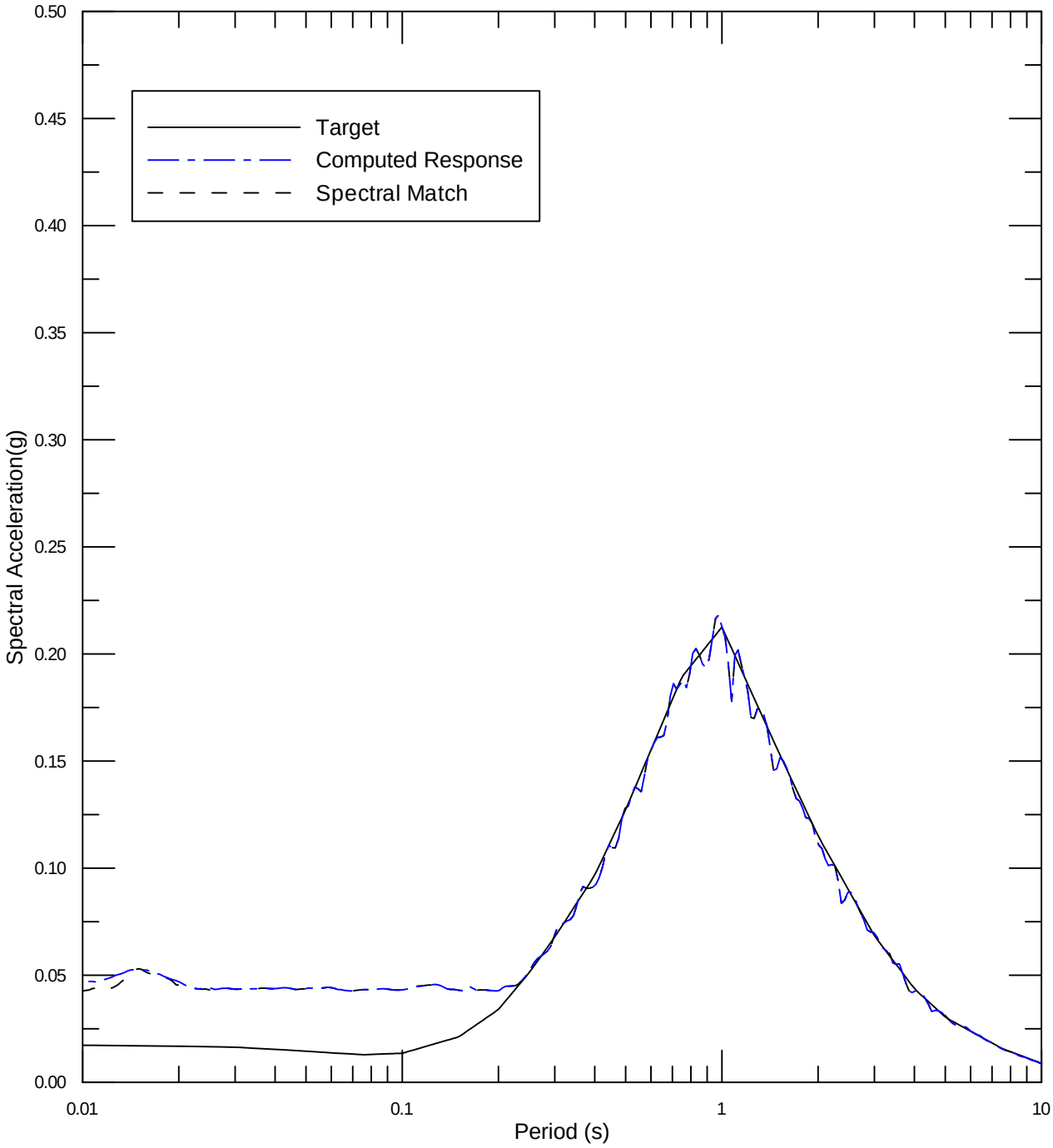
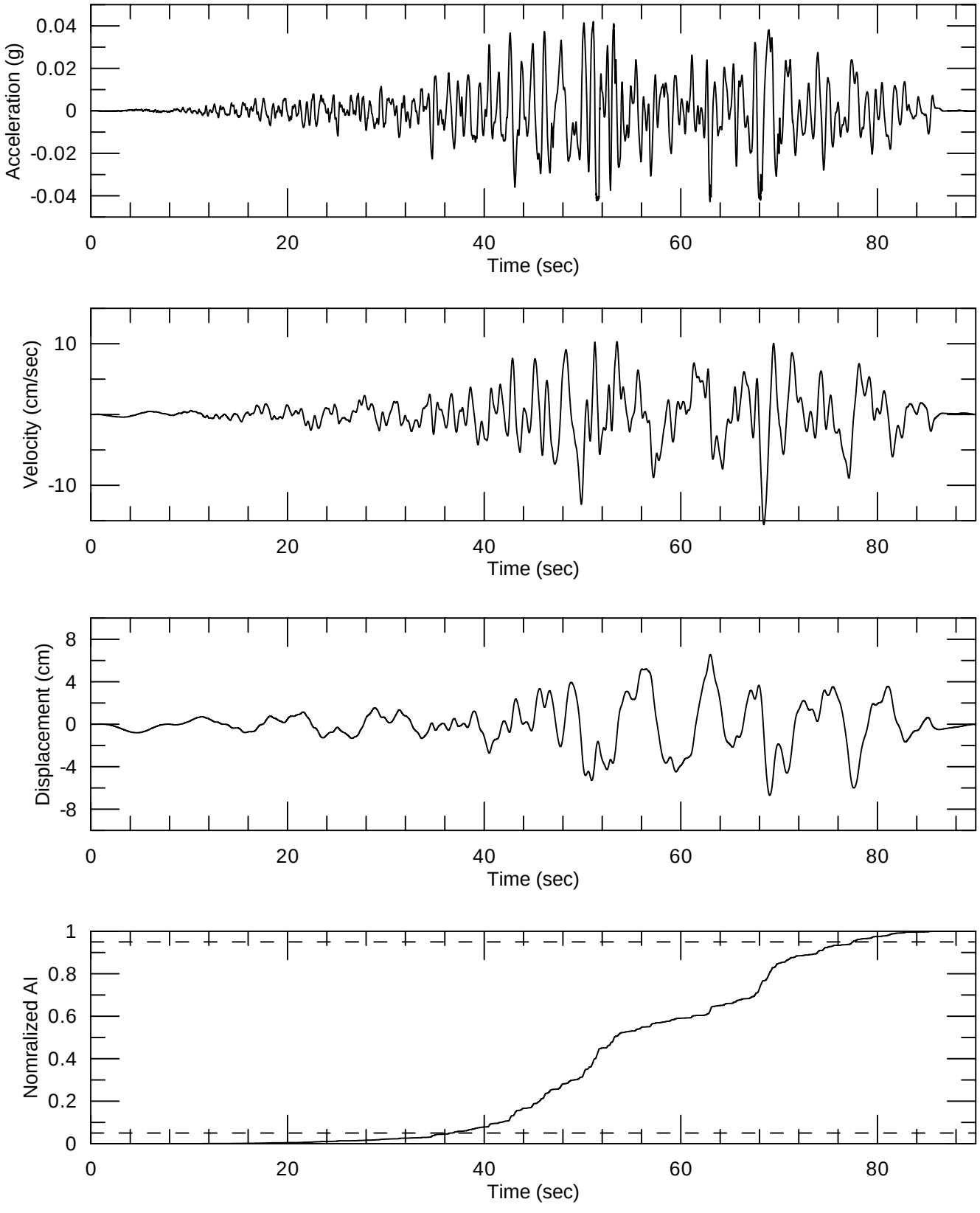
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 CHI-CHI - KAU081 (E) FOR FOR FAR WEST 1 SITE | Figure 125 |




| | | | |
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>1999 CHI-CHI - KAU081 (E)<br>FOR FAR WEST 1 SITE | Figure<br>124 |

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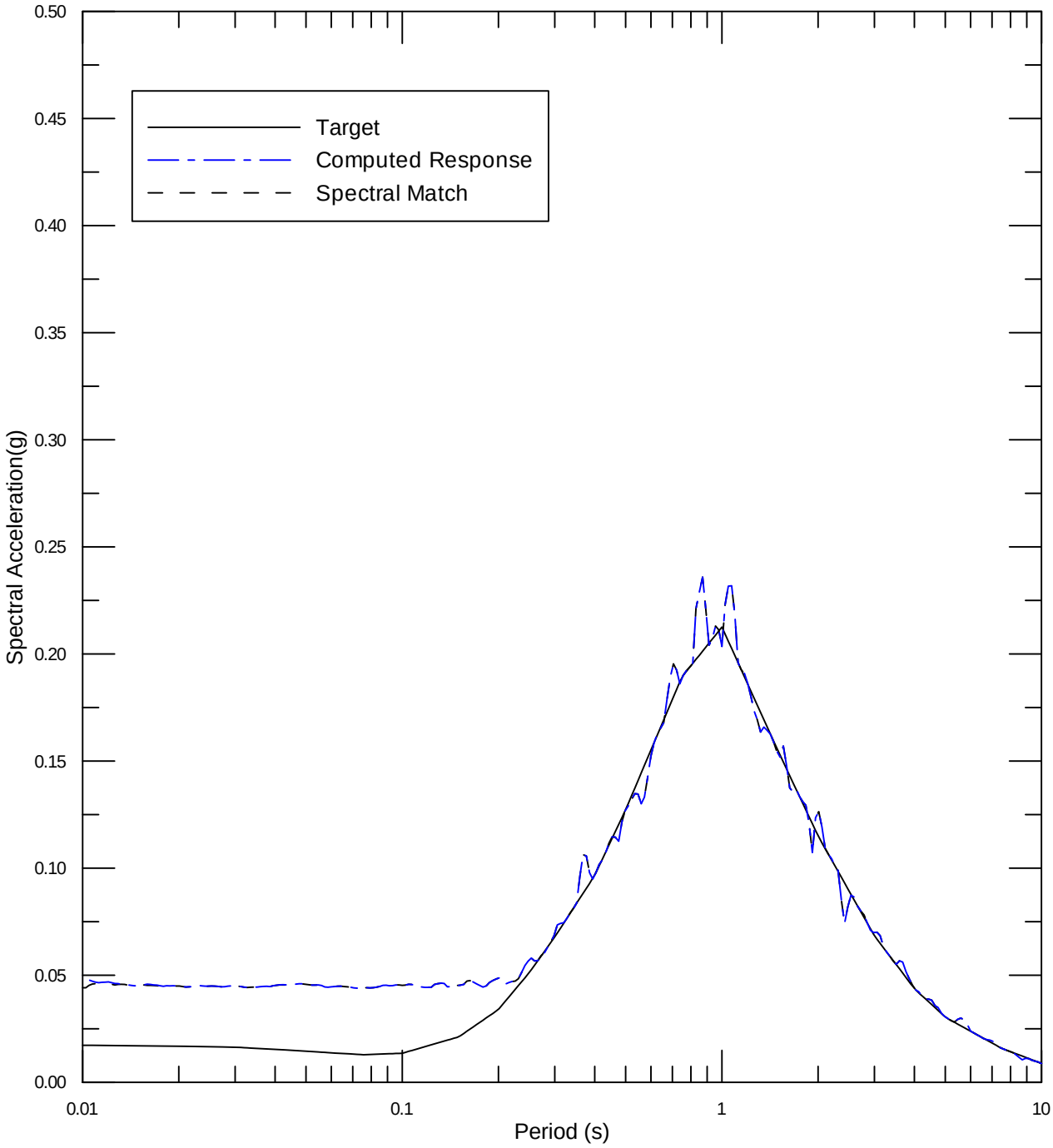
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 CHI-CHI - KAU081 (E) FOR FOR FAR WEST 1 SITE | Figure 125 |

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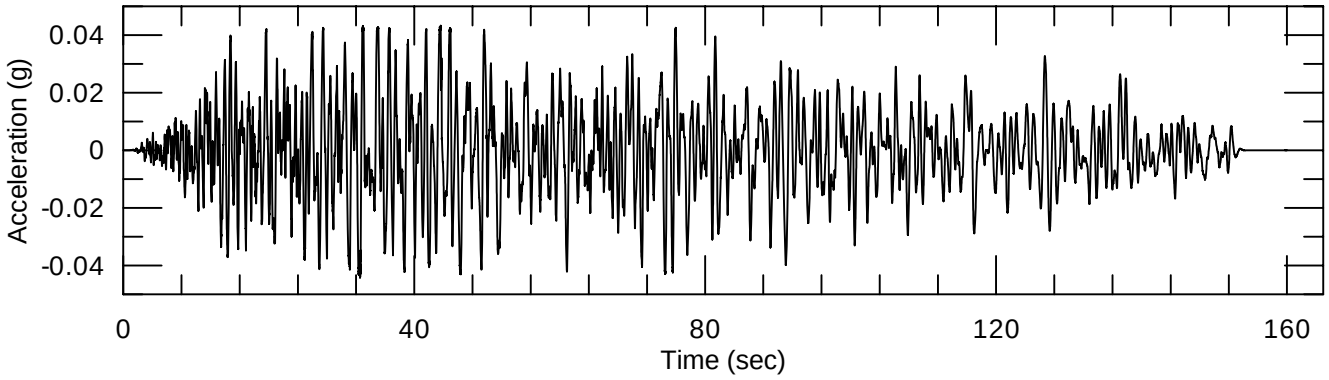
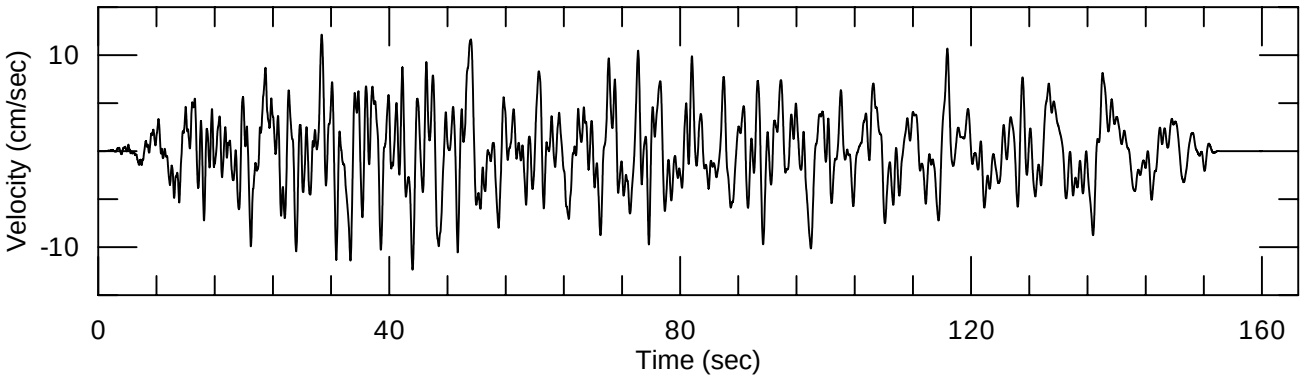
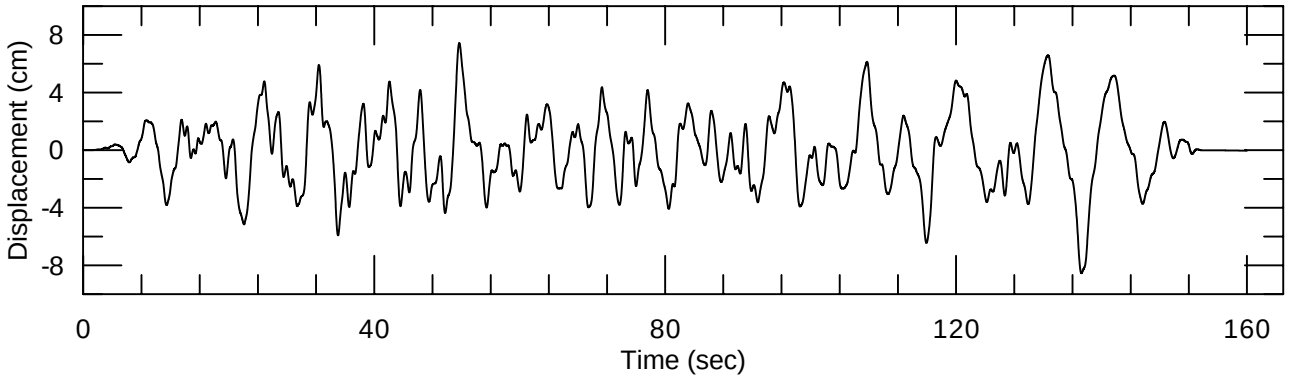
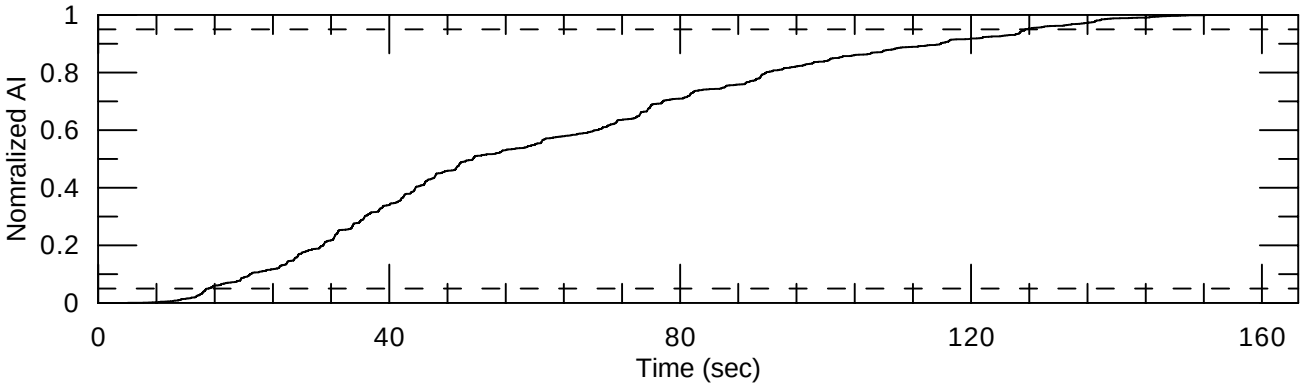
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>2002 DENALI - FIRE STATION 1 (090)<br>FOR FAR WEST 1 SITE | Figure<br>126 |

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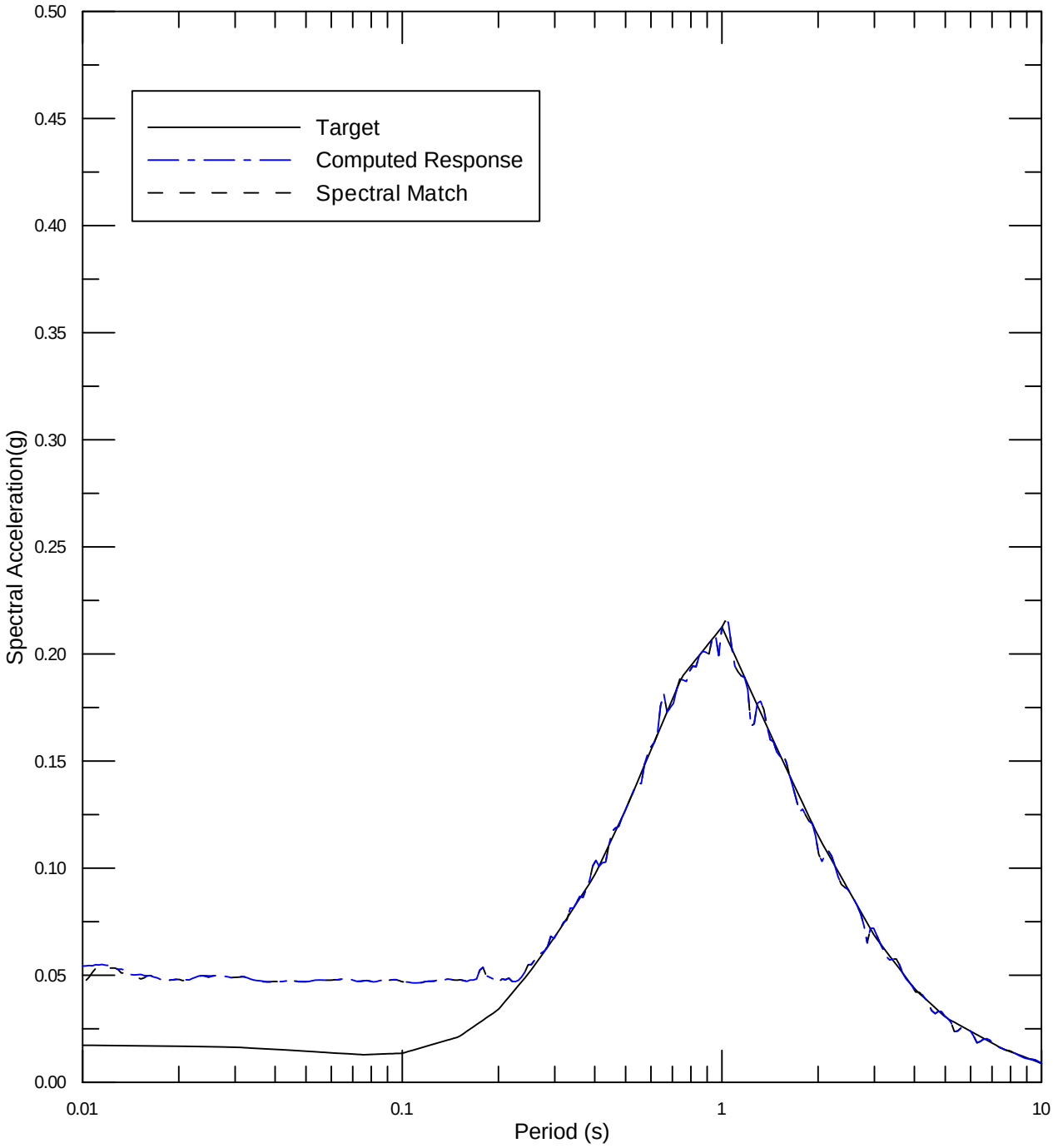
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 2002 DENALI - FIRE STATION 1 (090) FOR FAR WEST 1 SITE | Figure 127 |

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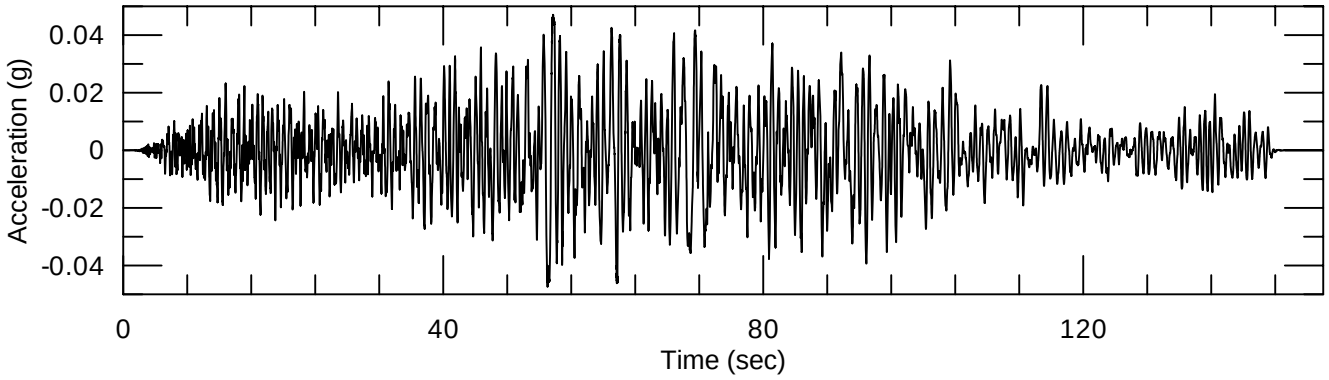
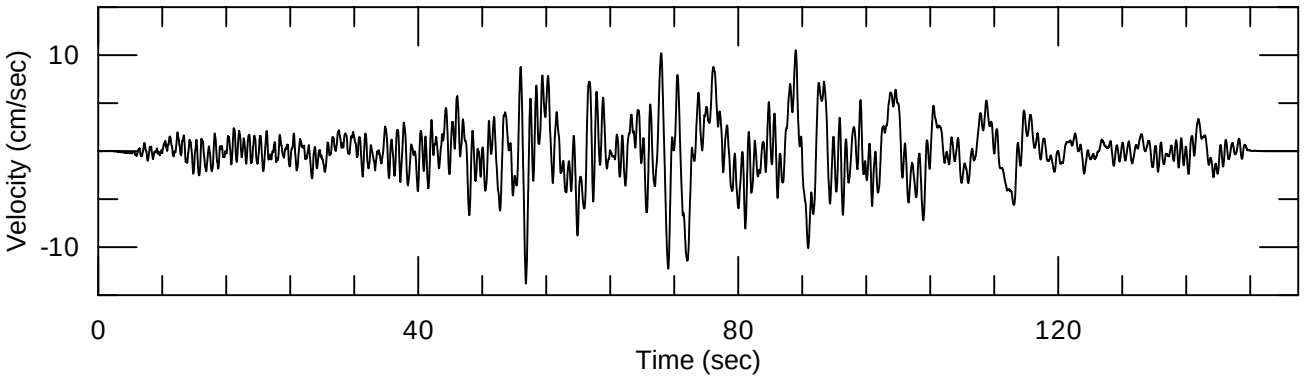
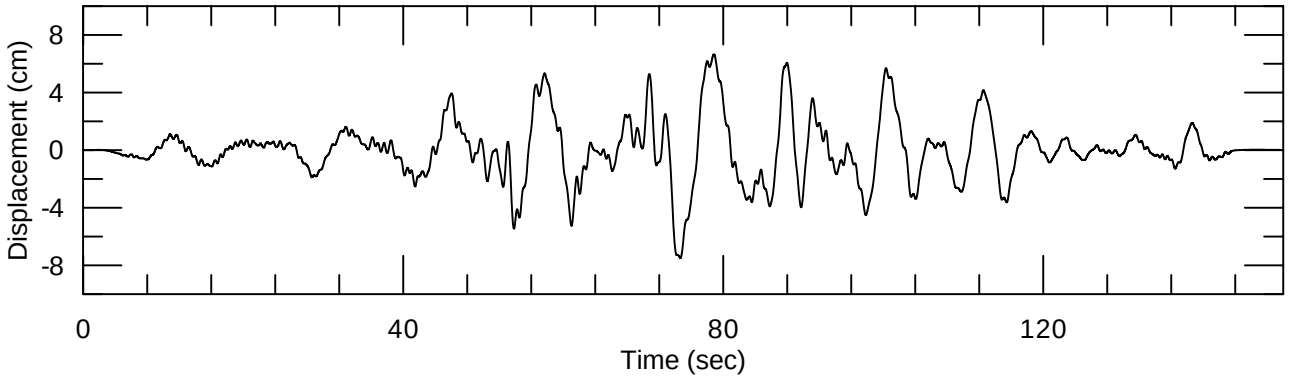
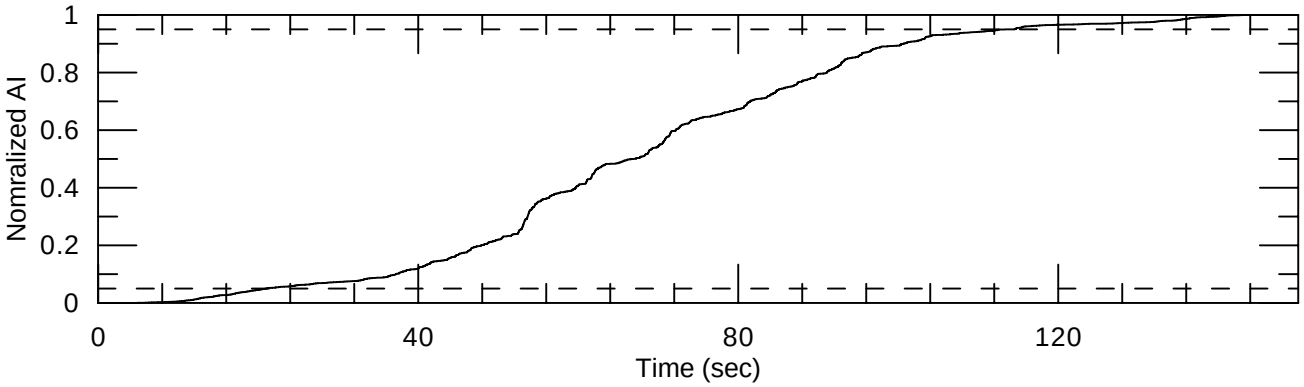
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | SPECTRAL MATCH TO HORIZONTAL<br>5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM<br>2002 DENALI - VALDEZ CITY HALL (090)<br>FOR FAR WEST 1 SITE | Figure<br>128 |

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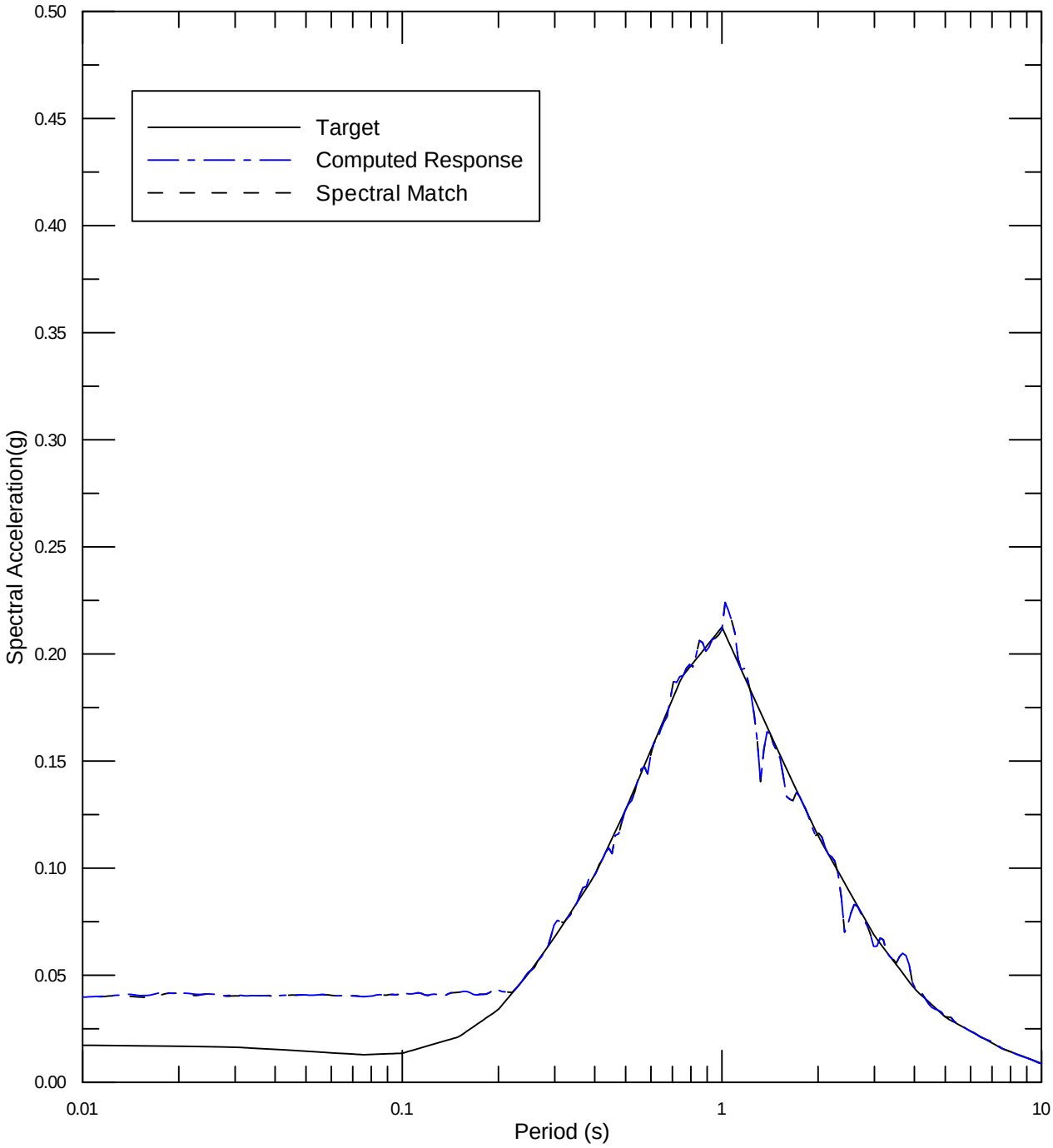
|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 2002 DENALI - VALDEZ CITY HALL (090) FOR FAR WEST 1 SITE | Figure 129 |

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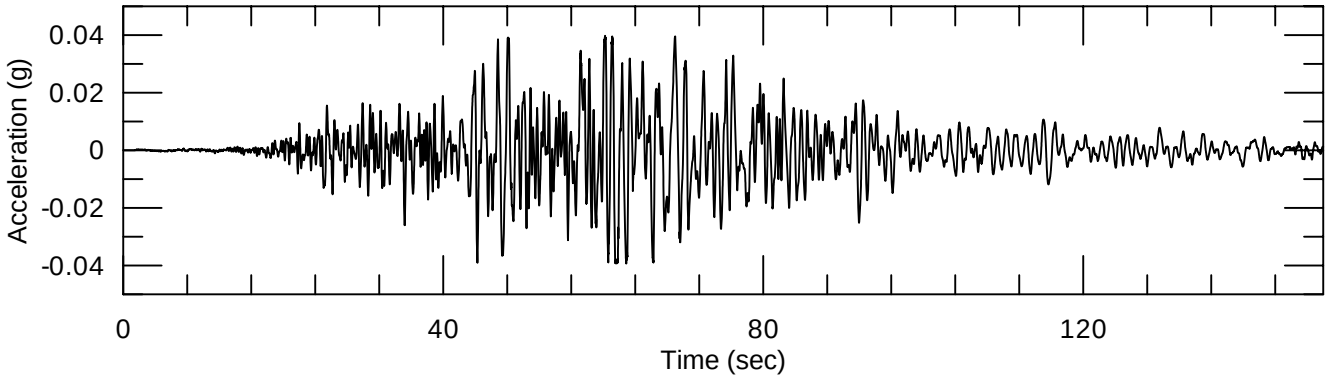


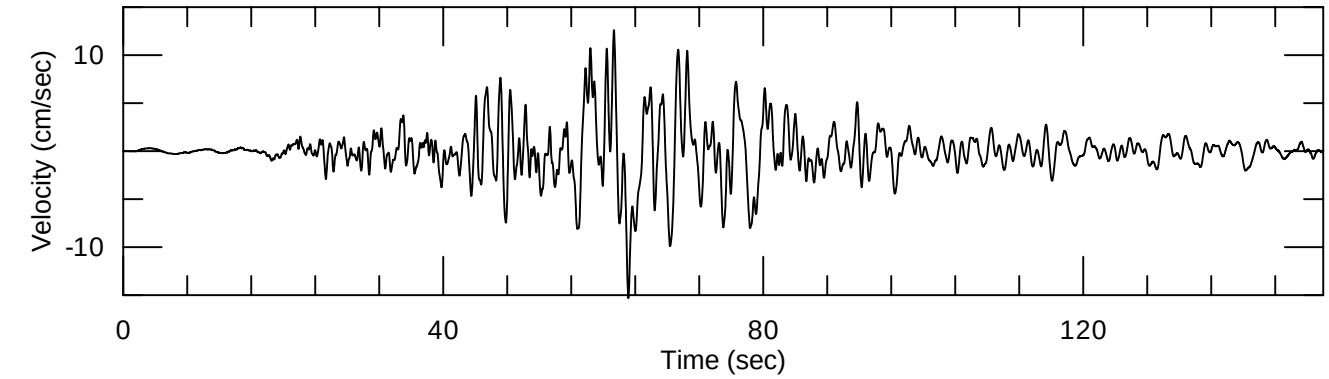


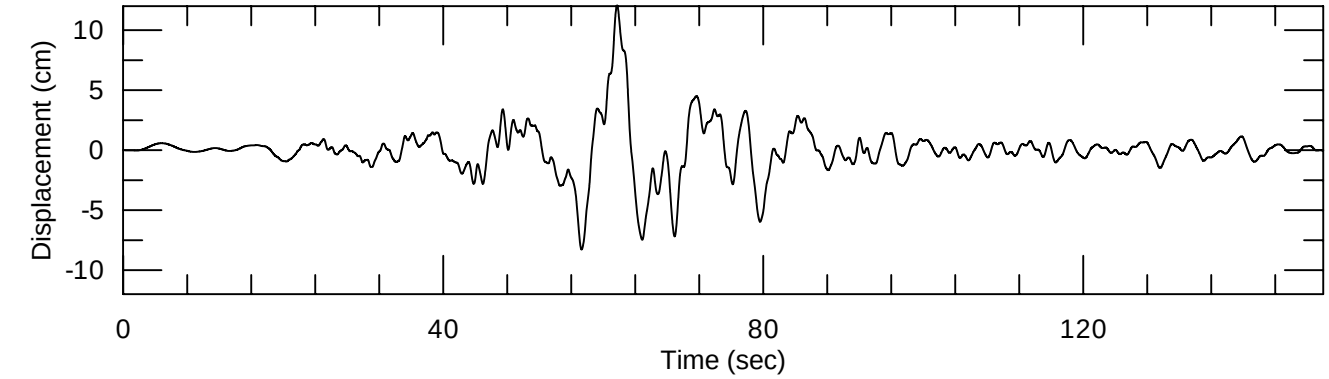


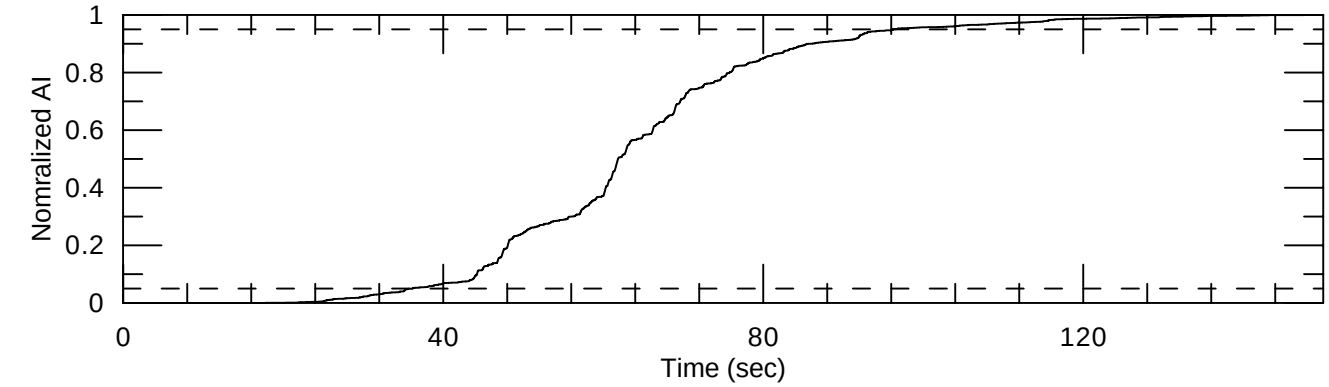


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|---|---|---|---|
| URS | Project No. 26818581<br>Resolution Copper<br>Arizona | TIME HISTORIES SPECTRALLY MATCHED TO HORIZONTAL 5,000-YEAR RETURN PERIOD 1.0 SEC CMS SPECTRUM 1999 KOCAELI - AFYON (000) FOR FAR WEST 1 SITE | Figure 131 |

# APPENDIX J

Groundwater Monitoring Well Identifiers

# APPENDIX J

Groundwater Monitoring Well Identifiers

| Resolution Hydrologic Monitoring Well Identifier | Plan of Operations Identifier | Land Owner/Resolution Plan of Operations Authorizing Agency* |
|---|---|---|
| A-06 | N/A | Arizona State Land Department (ASLD) |
| Corral Well | N/A | Resolution Copper |
| DHRES-01 | Drill Site M | Tonto National Forest (POO No. 01-12-02-002) |
| DHRES-02 | Drill Site A | Tonto National Forest (POO No. 01-12-02-002) |
| DHRES-03 | N/A | Resolution Copper |
| DHRES-04 | N/A | Resolution Copper |
| DHRES-05 | N/A | Resolution Copper |
| DHRES-06 | N/A | ASLD |
| DHRES-07 | N/A | ASLD |
| DHRES-08 | Drill Site F | Tonto National Forest (POO No. 01-12-02-002) |
| DHRES-09 | N/A | Resolution Copper |
| DHRES-10 | N/A | Resolution Copper |
| DHRES-11 | DHTW-02 | Tonto National Forest (POO No. 01-12-02-002) |
| DHRES-12 (abandoned) | N/A | Resolution Copper |
| DHRES-13 | N/A | Resolution Copper |
| DHRES-14 | DHTW-03 | Tonto National Forest (POO No. 01-12-02-002) |
| Hackberry Windmill | N/A | ASLD |
| HRES-01 | N/A | Resolution Copper |
| HRES-02 | Drill Site #2 | Tonto National Forest (POO No. 01-12-02-002) |
| HRES-03 | DOE Well Site | Tonto National Forest (POO No. 01-12-02-002) |
| HRES-04 | Drill Site M | Tonto National Forest (POO No. 01-12-02-002) |
| HRES-05 | Drill Site #3 | Tonto National Forest (POO No. 01-12-02-002) |
| HRES-06 | N/A | Resolution Copper |
| HRES-07 | Site A | ASLD (Permit #08-110148) |
| HRES-08 | Site D | ASLD (Permit #08-110148) |
| HRES-09 | N/A | ASLD |
| HRES-10 | N/A | Government Springs Ranch |
| HRES-11 | N/A | ASLD |
| HRES-12 | H-K | Tonto National Forest (POO No. 03-12-02-006) |
| HRES-13 | H-E | Tonto National Forest (POO No. 03-12-02-006) |
| HRES-14 | H-G | Tonto National Forest (POO No. 03-12-02-006) |
| HRES-15 | H-F | Tonto National Forest (POO No. 03-12-02-006) |
| HRES-16 | N/A | ASLD |
| HRES-17 | H-I | Tonto National Forest (POO No. 03-12-02-006) |
| HRES-18 | N/A | ASLD |
| Middle Well | N/A | Resolution Copper |
| MJ-11 | N/A | ASLD |
| Oak Flat Well | N/A | Tonto National Forest |
| PHRES-01 | N/A | ASLD |
| PHRES-02 | N/A | ASLD |
| PHRES-03 | N/A | ASLD |
| PHRES-04 | N/A | ASLD |
| RES-003 | Drill Site B | Tonto National Forest (POO No. 01-12-02-002) |

* Resolution Plan of Operations (Tonto National Forest POO No. 01-12-02-002 and POO No. 03-12-02-006) identifiers for wells located on lands controlled by Tonto National Forest or State Trust Lands administered by the ASLD

# APPENDIX K

Road Use Plan




# General Plan of Operations

# Road Use Plan

**September 2014**

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# 1. INTRODUCTION

Resolution Copper Mining, LLC (Resolution Copper or Applicant) submitted a General Plan of Operations (Plan), dated November 2013, to the Tonto National Forest (TNF) for authorization to construct an underground mine, ore processing operation, and associated facilities and infrastructure near Superior, Pinal County, Arizona. These components are collectively identified as the Resolution Copper Project (Resolution Project or Project). The proposed location for the Project is referred to as the General Project Area (GPA) as defined in the submitted Plan.

The main sites and associated primary project elements within the GPA that are located on or accessed from TNF lands include:

- East Plant Site (EPS) – Underground mine and attendant shafts and surface support facilities;
- West Plant Site (WPS) – Ore and development rock stockpiles, Concentrator (ore processing facilities), and administrative facilities;
- Tailings Storage Facility (TSF) – Tailings storage area and associated Tailings Corridor (distribution pipeline and access roads); and
- The Magma Arizona Railroad Company (MARRCO) Corridor (existing and future pipelines)

Development of project sites and elements would require the use of, maintenance, and/or reconstruction of existing Forest Service Roads (FRs) as well as construction of Proposed New Roads (PNRs). With the exception of the TSF, the Project will be conducted largely from underground and on previously disturbed areas.

Proposed access routes within and adjacent to the GPA are identified on an overview map index and associated figures (***Figures 1 through 7***). Details of the activities associated with the proposed access routes are provided in ***Tables 1 through 4***.

This Road Use Plan is intended to provide general guidance for minimizing impacts to areas, resources, and people adjoining, served by, or otherwise affected by FRs and PNRs proposed for use by Resolution Copper and its agents to access project sites throughout the duration of the Project. This Road Use Plan was prepared to be consistent with Forest Service (FS) regulations for travel management and motor vehicle use on National Forest System lands (36 CFR Parts 212,251,261, and 295). Specifically, this Road Use Plan identifies and describes the following:

1. The Applicant's proposed access within and adjacent to the GPA and anticipated use of routes;
2. The intended public use and access allowed on the existing system of open FRs in and adjacent to the GPA, and the proposed PNRs;
3. The design, construction, and/or maintenance standards for roads under the responsibility of Resolution Copper; and

4. The estimated disturbance area to TNF lands associated with the construction of PNRs and reconstruction of existing FRs required to complete the proposed activities.

# 2. EXISTING FOREST SERVICE ROADS

## 2.1. APPLICANT USE

All of the FRs proposed for use in, and in the vicinity of, the GPA are currently designated as open authorized, open unauthorized, or open authorized restricted to motorized vehicles. Existing FRs would be used for access to, from, and within the GPA. Some of the roads would require routine maintenance for the Project duration. Other existing FRs would require significant maintenance/reconstruction to allow access by drilling, excavation, hauling, and support equipment. Some existing FRs, as well as a number of unauthorized roads, not officially within the FS road system, will require decommissioning due to their location within the disturbance area of the EPS, the TSF, and the Tailings Corridor.

## 2.2. PUBLIC USE

Resolution Copper will maintain public access to the areas surrounding the GPA throughout all phases of the Project to the extent practicable. The plan for public access is described in the following sections which are organized by main project site and associated primary project elements.

### 2.2.1. MARRCO CORRIDOR

There are 17 proposed access points along the MARRCO Corridor for use in the Project for both construction and operation/maintenance purposes. Fifteen of these MARRCO Corridor Access Points (MCAs) will be accessed from existing FRs. These FRs include Hewitt Canyon Road (FR 357), FR 1933, FR 3454A, FR 3454C, FR 8, FR 2397, FR 2395, and FR 2400 (***Figures 2 and 3***). Two of the MCAs, MCA-16 and MCA-17, will be accessed from previously disturbed areas connecting off of FR 357 (***Figure 2***). For the purposes of accessing the MARRCO Corridor, none of the existing FRs or previously disturbed areas to be used as temporary access roads will require reconstruction, maintenance level changes, or restriction from public use. The main access road to the MARRCO Corridor is Hewitt Canyon Road (FR 357), which also provides public access to many connecting routes in this area. Similar to the water pipeline that was placed within the MARRCO Corridor in 2008 to deliver dewatering water to farmers at New Magma Irrigation District, additional pipeline infrastructure will be placed in the MARRCO during construction and operations. To maintain public access on FR 357, the additional pipeline infrastructure will be built to allow this road to bypass.

### 2.2.1. TAILINGS STORAGE FACILITY AND TAILINGS CORRIDOR

The construction of the TSF will restrict public access to unimproved existing FRs and other existing roads that traverse the proposed TSF area (***Figure 4***). These roads make up a total of approximately 32 acres of previously disturbed area within the footprint of the TSF and will be decommissioned. However, existing roads and trails outside of the footprint will accommodate continued recreational use in the

vicinity of the TSF and allow access to higher elevation recreational areas. Existing FRs (***Figure 3***) will be utilized for general access to the TSF area and/or haul routes from borrow areas to the TSF for the construction of the TSF starter dams. The FRs used for general access will not change maintenance level or require any reconstruction. Although the majority of borrow material for the tailings starter dam would come from within and directly adjacent to the TSF footprint (Borrow Areas 1 through 4), if additional material is needed for construction or reclamation, borrow areas well outside the footprint would be used (Borrow areas 5 and 6). To access Borrow Areas 1 through 4, the haul routes inside the TSF footprint will require widening of several existing FRs. If Borrow Areas well outside the TSF (5 and 6) are needed, the haul routes outside the TSF will also need widening. A PNR (PNR-02) will be constructed within the TSF footprint and is described in ***Section 3***.

The Tailings Corridor will cross several existing FRs between the TSF and WPS and will restrict public access across three FRs: FR 982, FR 2367, and a relatively small portion of FR 2371 immediately north of the tailings corridor where the road terminates (***Figures 3 and 5***). Public access will not be restricted across FR 650, except temporarily during haulage of material from Borrow Areas 5 and 6. Public access will not be restricted across FR 3152. To maintain access on these routes, the Tailings Corridor and associated infrastructure will be built so there are no at-grade crossings. The details of these crossings are presented in ***Section 2.4.1.2***. A PNR (PNR-03) will be constructed along the Tailings Corridor as an access road to the associated infrastructure along the route; the details of PNR-03 are described in ***Section 3***.

All reconstruction and access details are presented in ***Tables 1 and 4*** and cross sections showing construction details for each road are contained within ***Figures 8 and 9***.

### 2.2.1. WEST PLANT SITE

The WPS is primarily located on private lands, with only the Process Water Pond and Silver King Mine Road alternative entrance areas located on TNF lands (***Figure 5***). Silver King Mine Road (FR 229) serves as primary access to the region north of the WPS. The segment of FR 229 on TNF lands that passes through the WPS will be reconstructed to Mine Safety and Health Administration (MSHA) specifications and will be maintained by Resolution Copper. FR 229 is proposed to be used as the main access for construction and operations into the WPS (light and heavy duty/delivery vehicle traffic). Public access will be maintained along FR 229 but will be controlled at the security gate where the road then crosses onto private lands. However, it is recognized that FR 229 is a primary access road north of the WPS that leads into higher elevation areas; therefore, an alternative route will be provided to maintain public access to that portion of the TNF. The planned access route to bypass the section of FR 229 on private lands will be FR 8 to FR 3152, which will then connect back to FR 229 north of the WPS as shown on ***Figure 5*****.** The details of maintenance and reconstruction required for FR 8 and FR 3152 are presented in ***Tables 1 and 4*** and cross sections showing construction details for each road are contained within **Figures 8 and 9**.

### 2.2.2. EAST PLANT SITE

The EPS encompasses the proposed underground mine, associated shafts, and surface support facilities. The existing plant and related surface support facilities are currently located on private lands. During construction and operations of the Magma Copper Mine at the East Plant Site, between the late 1960's and through to 1996, the main mine access road was FR 469 or also called the "Magma Mine Road". For Resolution Copper, at full build out and production, the EPS will largely expand onto private lands with a smaller portion on TNF lands. Additional area encompassed by the EPS includes the land surface above the ore body, comprised of unpatented mining claims on lands administered by the TNF. This land surface area above the ore body is identified on ***Figure 6*** as the Disturbance Area and correlates with the limit of the fracture zone at the end of the mine life. Public access to roads within this disturbance area will be restricted, and the roads will be decommissioned. Roads within the EPS Boundary, which correlates to the ultimate limit of subsidence (continuous zone), will also be restricted from the public. ***Tables 1*** **and** ***4*** list all existing FRs impacted, their intended use, and access route descriptions for the Project. Public access to public lands in the vicinity of the EPS will be maintained via State Route (SR) 177 on the west side, US 60 on the north via FR 469 (although not the full extent), and FR 315 on the south, which all connect to other access roads in the area (***Figure 7)***.

To maintain access for Resolution Copper to the EPS surface support facilities, a new PNR (PNR-01) will be constructed and is described in ***Section 3***.

## 2.3. ROUTINE MAINTENANCE TO EXISTING FOREST SERVICE ROADS

### 2.3.1. MAINTENANCE LEVEL DESCRIPTIONS

Forest Service Road Maintenance Levels as defined by the Tonto National Forest Plan (TNF 1985) are:

- Level 1 (Basic Custodial Care) – Roads are not open to traffic; they are maintained to protect the road investment and its surrounding resources. These roads may be opened for a specific activity and returned to Level 1 upon completion of the activity.
- Level 2 (High-Clearance Vehicles) – Roads are maintained open for limited passage of traffic. Roads in this maintenance level are primitive type facilities intended for high clearance vehicles. Passenger car traffic is not a consideration.
- Level 3 (Suitable for Passenger Cars) – Roads are maintained open and safe for travel by a prudent driver in a passenger car. However, user comfort and convenience is not considered a priority.
- Level 4 (Moderate Degree of User Comfort) – Roads are maintained to provide a moderate degree of user comfort and convenience at moderate travel speeds.
- Level 5 (High Degree of User Comfort) – Roads are maintained to provide a high degree of user comfort and convenience. These roads are normally two lanes with aggregate or paved surface.

### 2.3.2. MAINTENANCE ACTIVITIES

A description of maintenance activities required for each FR to be used during the proposed Project is provided in ***Table 1***. Maintenance activity for roads requiring routine maintenance will be performed within the existing roadway width; therefore, maintenance is not considered as new disturbance.

## 2.4. RECONSTRUCTION OF EXISTING FOREST SERVICE ROADS

To enable access to the GPA, certain segments of the existing FRs will require significant maintenance and/or reconstruction. The methods of road reconstruction are described in ***Section 2.4.2***. Proposed improvements to the existing FRs are summarized in ***Table 1***.

All existing FRs will be maintained, repaired, or reconstructed to maintenance levels as designated by the TNF. Reconstructed roads will adhere to the design standards described below.

### 2.4.1. DESIGN STANDARDS

#### 2.4.1.1. *Traveled Way*

The reconstructed width of the traveled way of the existing FRs will depend on intended use. The majority of the existing FRs requiring reconstruction will be used as haul routes from Borrow Areas 5 and 6 to the TSF (***Figures 3 and 8***).

These borrow areas are outside of the footprint of the TSF and will only be excavated if required material is not available from within the footprint of the TSF. Similar to Borrow Areas 1 through 4, Borrow Areas 5 and 6 will be excavated for reclamation and/or for construction. The required width for these haul routes was calculated assuming two-way traffic for a 40 to 50-ton truck. The 40 to 50 ton truck is approximately 12 ft (3.9 m) wide. The assumed total traveled way width is 48-50 ft, assuming 24 ft for two-way traffic, an additional 6 ft of clearance to allow for truck passing and an additional 18 feet for berms. These roads will be used for mine activities throughout the life of the mine and will be maintained to MSHA specifications; therefore, these roads will require berms of a height equal to the axle height of the largest vehicle on the road. It is worth noting that the roads within the TSF footprint will be progressively covered through the life of mine as the footprint expands; although the perimeter road would be used to haul borrow material for reclamation once the starter dam construction has ended.

Other segments of existing FR roads to be reconstructed, which will not be used as haul routes, include Silver King Mine Road (FR 229) and FR 3152 (***Figure 5***). FR 229 will be reconstructed and realigned as the main entrance to the WPS for construction and larger scale delivery of materials during operations. Only a segment of this reconstruction will occur on TNF land (***Figure 5***). The typical section for the reconstruction of the Silver King Mine Road can be found on ***Figure 9***. It will consist of a 26.25 ft (8.0 m) traveled way with a safety berm and drainage ditches (as needed), cut slopes of 1:1, and fill slopes of 1.5:1.

FR 3152 will be reconstructed to provide public access around the WPS to FR 229 north of the WPS. The reconstruction of FR 3152 is needed due to restricted access to FR 229 on private land (***Figure 5***). FR 3152 will be widened to approximately 30 ft, which is the existing width of Silver King Mine Road. Access to FR 229 north of the WPS will be via FR8 connecting to FR 3152. No berms are required since the road will not be used for mine activities. The typical section for FR 3152 is shown in ***Figure 8***.

All reconstructed roadways will be cleared of vegetative cover as needed for planned traffic. The road prism will be maintained to provide for passage of the specified maintenance level vehicles. Slides and slumps will be removed or repaired, as needed, to control resource damage. The amount of new disturbance estimated for reconstruction of existing FRs is based on the applicable typical section. The new disturbance accounts for vegetation clearing and trimming on cuts and fills, out-sloping the road bed and clearing loose rock and soil from the road bed and the toe of the cut slope. The estimated disturbance is shown in ***Table 4***.

#### 2.4.1.2. *Crossing Existing Forest Service Roads*

The Tailings Corridor will intersect five existing FRs; FR 982, FR 2367, FR 2371, FR 650, and FR 3152 (***Figure 5***). A segment of the Tailings Corridor access road (PNR-03) runs along FR 982. In this area, FR 982 will be reconstructed to the typical section of PNR-03. Since FR 2367 is accessed from FR 982 it will no longer be accessible to the public. A segment of FR 2371 will also be restricted from public access where the Tailings Corridor crosses the road. Since FR 2371 is not a primary access to the region and is maintained at Level 1, it may not be necessary to preserve access to this FR north of the Tailings Corridor. FR 650 and FR 3152 either currently serve or will serve as primary access to recreational areas north of the GPA. To maintain access to the region, FR 650 will be reconstructed to bypass under the Tailings Corridor via a box culvert (or similar structure), and FR 3152 will be reconstructed to bypass over the pipeway of the Tailings Corridor. For the FR 3152 crossing, the pipeway will be buried and the access road will be routed around the pipeway to intersect with FR 3152, where there signage will be posted to warn private vehicles of potential cross traffic. The typical sections of these crossings are shown in ***Figure 9***.

Hewitt Canyon Road (FR 357) serves as an access route to areas west and north of the TSF (***Figures 2 and 3***). This road currently crosses the MARRCO Corridor. There is an existing 18-in dewatering line and an existing 12-in Arizona Water line along the corridor. A new 36-in steel pipe waterline and 2 to 8-in concentrate lines will be added to the corridor right-of-way and will be buried along with the existing lines at the current crossings. No other changes will occur to the current crossings and therefore no typical section/profile is provided.

#### 2.4.1.3. *Drainage Improvements*

Drainage improvements to reconstructed roads will be conducted only as needed. Roadways will be sloped for drainage to reduce erosion, water bars will be installed where necessary to prevent concentration of runoff. The creation of berms along the side of the road will only be implemented on

roads which must meet MSHA regulations. Breaks in the berms will be utilized to take water off the road and will be determined in the field based upon actual water flow patterns. Rolling-dip cross-drains will be constructed into the roadway on steep grades to help prevent erosion.

Rolling-dip cross-drains are designed to slow traffic and disperse surface water. Rolling dips require less maintenance and are less likely to plug and fail than culvert pipes. Spacing of rolling dips is a function of road grade and soil type. Recommended maximum distances between rolling dips is provided in ***Table 2***. Specific locations of rolling dips will be determined in the field based upon actual water flow patterns, rainfall intensity, road surface erosion characteristics, and available erosion resistant outlet areas. A typical rolling dip profile is provided in ***Figure 8***.

To the extent practicable, existing drainage crossings will be simple ford-style low water crossings. Where existing drainages that cross the roadway are deeply incised, temporary crossings may be constructed and armored using cobble-sized rocks to allow water to flow through the crossings to the extent possible. The use of culverts will be avoided to the extent practicable, although some temporary culverts may be installed under the provisions of Clean Water Act, Nationwide Permit No. 14, assuming potentially jurisdictional waters are encountered.

### 2.4.2. CONSTRUCTION METHODS

Roads will be reconstructed using some or all of the following; a Caterpillar D8, D9 or equivalent-sized dozer, a Caterpillar 140M to 14M size motor grader or equivalent, a tracked excavator, and a water truck. Reconstruction will include filling and leveling of heavily eroded areas, placement of temporary low water crossings, cut for placement of the box culvert crossing, and placement of leveling fill or aggregate surfacing in the roadway.

### 2.4.3. ENVIRONMENTAL PROTECTION MEASURES

During reconstruction of existing FRs Resolution Copper will minimize or eliminate erosion and subsequent downstream sedimentation through the implementation of erosion control Best Management Practices (BMPs). These BMPs include the following:

- To the extent practicable, vegetation will not be removed except from those areas to be directly affected by road reconstruction activities.
- To the extent practicable, removal of primary growth medium material will be scheduled for the dry months to reduce the potential for erosion and high soil losses.
- Cut and fill slopes for road reconstruction will be designed to prevent soil erosion. Drainage ditches with cross drains will be constructed where necessary. Disturbed slopes will be revegetated, mulched, or otherwise stabilized to minimize erosion as soon as practicable following construction.
- Road embankment slopes will be graded and stabilized with vegetation or rock as practicable to prevent erosion.

- Runoff from roads will be handled through BMPs, including sediment traps, settling ponds, berms, sediment filter fabric, wattles, etc. Design of these features will be based on an analysis of local hydrologic conditions. These will be designed as recommended in the Low-Volume Roads Engineering Best Management Practices Field Guide (Keller and Sherar 2003)
- Off-road vehicle travel will generally be avoided.
- During construction and operations, diversions will be constructed around affected areas to minimize erosion. A number of BMPs including check dams, dispersion terraces, and filter fences also will be used during construction and operations.
- Permanent diversion channels will be designed for long-term stability.
- Reclamation and revegetation will be implemented as soon as practicable for long-term stability.

# 3. PROPOSED NEW ROADS ON TNF LANDS

## 3.1. APPLICANT USE

Resolution Copper will construct new PNRs for the proposed EPS, TSF, and Tailings Corridor. These roads include the Magma Mine Road Realignment (PNR-01), the TSF Perimeter Road (PNR-02,) and the Tailings Corridor Access Road (PNR-03). These roads will be utilized for mine activities only, and typical sections for each PNR are depicted on ***Figure 8***. Closure of these roads will be addressed as part of the overall project closure plan.

## 3.2. PUBLIC USE

The current plan is that the newly constructed PNRs will not be open for public use as they are designated as mine roads.

## 3.3. DESIGN STANDARDS

PNRs will be designed to minimize land disturbance to the greatest extent practicable as described below.

### *PNR-01: Magma Mine Road Realignment*

PNR-01 is the realignment of a segment of the existing Magma Mine Road (FR 469, FR 315, and FR 2432; ***Figure 6***). This road will be built in approximately year 8 of the mine due to surface disturbance where the existing road is located and will be utilized as the main access to the EPS site from US 60. The EPS site entrance will have a security building and gate where Magma Mine Road ends at the EPS entrance to control public access to the site. Resolution Copper will be responsible for ongoing road and sign maintenance on both the existing Magma Mine Road and the realignment designated PNR-01. This road will require Level 4 maintenance; therefore, it will be paved, and maintained consistent with the current Magma Mine Road Repair, Maintenance and Care Plan contained with Appendix H of the Prefeasibility Plan of Operations (03-12-02-006).

#### *PNR-02: TSF Perimeter Road*

PNR-02 is a roadway that will provide access along the entire toe of the TSF and to surrounding facilities such as the diversion channels, Borrow Areas 1 and 4 and the seepage collection dams (***Figure 4***). It is within the TSF footprint.

#### *PNR-03: Tailings Corridor Access Road*

PNR-03 will be utilized as an access along the Tailings Corridor and will provide access to pipelines along the corridor as well as access from the WPS to the TSF (***Figure 5***). The roadway will be constructed of general fill and will be maintained to MSHA specifications.

### 3.3.1. TRAVELED WAY

Each PNR has a different design width. PNR-01 will have a traveled width of approximately 24 ft (7.32 m), PNR-02 will have a traveled width of approximately 50 ft (15 m), and PNR-03 will have a traveled width of approximately 26.25 ft (8 meters). PNR-02 and PNR-03 will be required to meet MSHA specifications; therefore, they will be constructed with berms to the required heights per design vehicle. PNR-01 is an access road into mine property; therefore it will not be under MSHA jurisdiction. All PNRs will have a maximum of 1:1 cut slopes and 1.5:1 fill slopes. However, where PNR-02 is adjacent to or on tailings the cut slopes will be 5:1.

Each roadway will be cleared of vegetative cover as needed for planned traffic, and the road prism will be maintained to provide for passage of the designated maintenance level vehicles in ***Table 3***. Typical roadway sections are provided on ***Figure 8***. The typical section for PNR-03 is for the Tailings Corridor Access Road only and does not show the entire section with the pipeway and transmission line. The total width of the Tailings Corridor varies along its length depending on the number and layout of pipes; however an average disturbance width of 180 ft was calculated and is incorporated in ***Table 4***. Each of the estimated disturbances associated with PNR construction are shown in ***Table 4***.

### 3.3.2. DRAINAGE IMPROVEMENTS

Drainage improvements to the PNRs will generally include sloped roadways to prevent erosion and ponding in the traveled way and culverts and/or ford-style low water crossings at existing drainage crossings. All culverts will be installed under the provisions of Clean Water Act, Nationwide Permit No. 14, assuming potentially jurisdictional waters are encountered. More specific drainage features that will be incorporated for each PNR are as follows.

#### *PNR-01*

The Magma Mine Road Realignment will be a paved roadway, crowned with two percent cross-slopes. The roadway will not have berms as it will not be an MSHA regulated road. This will generally allow all stormwater to runoff to the road shoulder over the embankments. The road fill slopes will be designed to prevent soil erosion. Disturbed slopes will be re-vegetated, mulched, stabilized with rock, or otherwise stabilized to minimize erosion. Culverts will be installed where the realignment crosses

existing drainages. Should there be a large concentration of runoff in cut sections, drainage ditches on either side of the road will be constructed and culvert take-offs installed. These culvert take-offs will only be installed where the potential exists for erosion to fill embankments is, otherwise the flow from the ditches will be allowed to run off over the embankment. Other erosion and stormwater control BMPs that may be incorporated will be detailed in the Project Stormwater Pollution Prevention Plan (SWPPP).

***PNR-02***

The TSF Perimeter Road will be located within the TSF project area. The roadway will be sloped to drain either off the road or into a drainage ditch along the road. Drainage ditch locations will be determined in the field based upon actual water flow patterns and road surface erosion characteristics. Culvert take-offs will direct the flow from the ditches off the roadway where overland flow may cause erosion on the fill embankments. Since this roadway will be used for mine operations it will require a berm. Breaks in the berm will be incorporated as necessary to prevent ponding on the roadway. Culverts or ford-style low water crossings will be constructed as needed at drainage crossings. However, any stormwater potentially impacted by the tailings must be directed to the seepage collection dams. This will prevent any impacted waters from going offsite. Runoff from PNR-02 in the northern section by diversion channels 1, 2, and 3 will not be impacted by tailings and therefore is allowed to be directed into these diversion channels. Other erosion and stormwater control BMPs that may be incorporated will be detailed in the Project SWPPP.

***PNR-03***

The Tailings Corridor Access Road will be a mine operations road only and therefore will incorporate many of the same drainage improvements as the TSF Perimeter Road. This includes breaks in the berm, diversion ditches, and culvert take-offs. However, unlike PNR-02, PNR-03 will not have any ford-style low water crossings, due to the required slope of the concrete pipelines that share the same corridor as PNR-03. PNR-03 crosses several existing ephemeral drainage ditches. Culverts will be installed at each of these crossings to allow water to pass through. Other erosion and stormwater control BMPs that may be incorporated will be detailed in the Project SWPPP.

## 3.4. CONSTRUCTION METHODS

New PNRs will be reconstructed using some or all of the following equipment: a Caterpillar D8, D9 or equivalent-sized dozer, a Caterpillar 140M to 14M size motor grader or equivalent, a tracked excavator, and a water truck. The tracked excavator may be used to reduce the size of large boulders as necessary. Drilling or blasting may be required for PNR construction if non-rippable material is encountered. Prior to construction, surveys will be conducted for exact placement of PNRs and related infrastructure.

## 3.5. ENVIRONMENTAL PROTECTION MEASURES

The erosion control BMPs to be implemented in the construction of the PNRs are the same as described in ***Section 2.4.3*** for the existing FR reconstruction.

# 4. REFERENCES

USDA Forest Service. 1985. Tonto National Forest Plan. October 1985.

USDA Forest Service. 2001. Road Management Policy. January 2001.

Keller, G and Sherar, J. 2003. Low-Volume Roads Engineering Best Management Practices Field Guide. July 2003.

Resolution Copper Mining. 2013. General Plan of Operations. November 2013.

# TABLES

**Table 1. Proposed Improvements to Existing Forest Service Roads**

| Roadway ID | Forest Service Road Maintenance Level | Planned Road Condition During Plan of Operations Improvements |
|---|---|---|
| FR 8 | Level 2 - High Clearance Vehicles | Segment reconstructed as haul route from borrow areas to the TSF. Segment from FR 229 to FR 3152 will be upgraded to maintenance Level 3 |
| FR 172 | Level 2 - High Clearance Vehicles | A segment will be used to access Seepage Collection Dams.<br><br>Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities |
| FR 229 | Level 3 - Suitable for Passenger Cars | Will be reconstructed for alternative entrance to the WPS. Segment to be restricted from public access within the boundaries of the WPS. |
| FR 252 | Level 2 - High Clearance Vehicles | A segment will be decommissioned upon the completion of the TSF. A segment will be used to access Seepage Collection Dams.<br><br>Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities |
| FR 293 | Level 2 - High Clearance Vehicles | To be reconstructed as haul route from borrow areas to the TSF |
| FR 315 | Level 2 - High Clearance Vehicles | Segments to be decommissioned in the Disturbance Area of the EPS and restricted from public access within the vicinity of the GPA. |
| FR 469 | Level 3 - Suitable for Passenger Cars | Segments to be decommissioned in the Disturbance Area of the EPS or restricted from public access within the vicinity of the GPA. |
| FR 518 | Level 2 - High Clearance Vehicles | To be decommissioned with the construction of the TSF |
| FR 650 | Level 2 - High Clearance Vehicles | Segment reconstructed as haul route from borrow areas to the TSF. Segment will be disturbed for block culvert installation at the Tailings Corridor crossing |
| FR 982 | Level 2 - High Clearance Vehicles | Segments to be reconstructed, decommissioned and restricted from public access with the construction of the TSF and Tailings Corridor |
| FR 1010 | Level 1 - Basic Custodial Care | Segment on TNF land to be decommissioned within WPS. Segment on private land to be restricted from public access |
| FR 1903 | Level 2 - High Clearance Vehicles | Segment to be decommissioned with the construction of the TSF |
| FR 1904 | Level 2 - High Clearance Vehicles | A segment will be used to access Seepage Collection Dams<br><br>Repair and maintain road segments at the Level 2 maintenance standard. Improve road segments where current conditions do not meet this standard. Generally achieve a Level 2 maintenance standard suitable to provide access for the equipment required to accomplish planned activities |
| FR 1907 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1908 | Level 1 - Basic Custodial Care | To be restricted from public access due to location at toe of the TSF |

**Table 1. Proposed Improvements to Existing Forest Service Roads**

| Roadway ID | Forest Service Road Maintenance Level | Planned Road Condition During Plan of Operations Improvements |
|---|---|---|
| FR 1909 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1910 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1912 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1913 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1914 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1915 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1916 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1917 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1918 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1918A | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1919 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 1933 | Level 1 - Basic Custodial Care | To be used to access MARRCO Corridor Access Points 19, 22, and 23 |
| FR 2359 | Level 2 - High Clearance Vehicles | To be decommissioned with the construction of the TSF |
| FR 2360 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 2361 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 2362 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 2363 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 2364 | Level 2 - High Clearance Vehicles | To be decommissioned with the construction of the TSF |
| FR 2366 | Level 1 - Basic Custodial Care | To be decommissioned with the construction of the TSF |
| FR 2367 | Level 1 - Basic Custodial Care | To be restricted from public access due to its confluence with the Tailings Corridor |
| FR 2371 | Level 1 - Basic Custodial Care | Will be maintained at Level 1. Segment will be restricted from public access where the existing FR crosses the Tailings Corridor. |
| FR 2380 | Level 2 - High Clearance Vehicles | To be decommissioned with the construction of the TSF |
| FR 2381 | Level 1 - Basic Custodial Care | To be reconstructed for haul route from Borrow Area 5 to the TSF |
| FR 2383 | Level 1 - Basic Custodial Case | To be reconstructed for haul route from Borrow Area 5 to the TSF |
| FR 2386 | Level 1 - Basic Custodial Care | To be reconstructed for haul route from Borrow Area 6 to the TSF |
| FR 2395 | Level 1 - Basic Custodial Care | To be used to access MARRCO Corridor Access Points 2, 4, and 5 |
| FR 2397 | Level 1 - Basic Custodial Care | To be used to access MARRCO Corridor Access Points 2, 4, and 5 |
| FR 2400 | Level 1 - Basic Custodial Care | To be used to access MARRCO Corridor Access Point 1 |
| FR 2432 | Level 3 - Suitable for Passenger Cars | To be restricted from public access within the vicinity of the GPA. |
| FR 2433 | Level 1 - Basic Custodial Care | On private property, will be restricted from public access |
| FR 2434 | Level 1 - Basic Custodial Care | On private property, will be restricted from public access |
| FR 2435 | Level 1 - Basic Custodial Care | To be decommissioned due to location within Disturbance Area of the EPS |
| FR 2438 | Level 2 - High Clearance Vehicles | Segments to be decommissioned in the Disturbance Area of the EPS and restricted from public access within the vicinity of the GPA. |
| FR 3152 | Level 1 - Basic Custodial Care | Upgrade to maintenance Level 3, segment will be disturbed for block culvert installation at the Tailings Corridor crossing |
| FR 3153 | Level 1 - Basic Custodial Care | To be decommissioned due to access cut off within Disturbance Area of the EPS |
| FR 3454A | Level 1 - Basic Custodial Care | To be used to access MARRCO Corridor Access Point 18 |
| FR 3454C | Level 1 - Basic Custodial Care | To be used to access MARRCO Corridor Access Point 13 |

**Table 1. Proposed Improvements to Existing Forest Service Roads**

| Roadway ID | Forest Service Road Maintenance Level | Planned Road Condition During Plan of Operations Improvements |
|---|---|---|
| FR 3791 | Level 1 - Basic Custodial Care | Segment to be restricted from public access within the vicinity of the GPA. |

Notes:

1. All Forest Service Roads proposed for use in this Road Use Plan can be seen in detail in ***Figures 1 and 4 through 7***.
2. Detailed descriptions of purpose of, use of, improvements, and new disturbance area to FRs can be found in ***Table 4***.

**Table 2. Recommended Maximum Distance between Rolling Dips[1]**

| Road Grade % | Low to Non-Erosive Soils | Erosive Soils |
|---|---|---|
| 0-3 | 120 ft | 75 ft |
| 4-6 | 90 ft | 50 ft |
| 7-9 | 75 ft | 40 ft |
| 10-12 | 60 ft | 35 ft |
| 12+ | 50 ft | 30 ft |

[1] Keller, G and Sherar, J. 2003. Low-Volume Roads Engineering Best Management Practices Field Guide. July 2003. Table 7.1, Page 55

**Table 3. Proposed New Roads**

| Roadway ID | Road Management Classification | Planned Road Condition During Plan of Operations Implementation |
|---|---|---|
| PNR-01 | Level 4 | Re-alignment of Magma Mine Road to provide access road to EPS facilities. Will be maintained to generally achieve the Level 4 management designation |
| PNR-02 | No Classification | Perimeter road along the toe of the TSF |
| PNR-03 | No Classification | New access road along Tailings Corridor to provide access from the WPS to the TSF and to maintain facilities along the Tailings Corridor. Will be maintained to generally achieve the High-Clearance Vehicles management designation |

Notes:

1. Proposed New Roads are shown in detail in Figures 4 through 7.
2. Detailed descriptions of purpose of, use of, and improvements to PNRs can be found in Table 4

**Table 4 - Access Route Descriptions**

| Road ID | Purpose and Use | Road Length[1] | Improvement Description | Length (Ft)[2] | | New Disturbance Area (Acres) | |
|---|---|---|---|---|---|---|---|
| | | Linear Feet | | Forest Service Land | Private Land | Forest Service Land | Private Land |
| FR 8 | East Happy Camp Road. Provides access to FR 650 and MARRCO Corridor. Haul route to the TSF | 19,155 | Reconstruction of 1.78 miles of roadway; 40 ft disturbance width<br>0.44 miles of roadway upgraded to maintenance Level 3; no new disturbance planned | 11,732 | 0 | 8.6 | 0 |
| FR 172 | Provides access to FR 1904 | 55,752 | Maintain approximately 1.65 miles of roadway; No new disturbance planned | 8,706 | 0 | 0 | 0 |
| FR 229 | Silver King Mine Road, provides access to the WPS | 27,881 | Reconstruct 1.34 miles of roadway. 100 ft disturbance width<br>1.13 miles of roadway restricted from public access | 7,054 | 5,964 | 16.2 | 0 |
| FR 252 | Bomboy Mine Road, haul route to the TSF | 26,893 | Reconstruction of 0.16 miles of roadway; 48 ft disturbance width<br>3.09 miles of roadway to be decommissioned<br>Maintain approximately 0.86 miles of roadway | 26,893 | 0 | 0.95 | 0 |
| FR 293 | Provides access to FR 2381, haul route to the TSF | 9,848 | Reconstruction of 1.46 miles of roadway; 48 ft disturbance width | 7,720 | 0 | 8.5 | 0 |
| FR 315 | Accessed by FR 469 | 14,052 | 1.55 miles of roadway to be decommissioned/ restricted from public access | 14,052 | 0 | 0 | 0 |
| FR 357 | Provides access to the MARRCO Corridor and Queen Valley Pump Station | 51,894 | Maintain approximately 7.21 miles of roadway; No new disturbance planned | 33,965 | 4,072 | 0 | 0 |
| FR 469 | Provides access to FR 315 and FR 2438 | 2,440 | 1.71 miles of roadway restricted from public access<br>Maintain approximately 0.36 miles of roadway; No new disturbance planned | 2,440 | 0 | 0 | 0 |
| FR 518 | Provides access to FR 2380 | 13,735 | To be decommissioned | 13,735 | 0 | 0 | 0 |
| FR 650 | North Happy Camp Canyon Road. Provides access to FR 2386, FR 982, and PNR 1. Haul route and access to the TSF | 78,595 | Reconstruction of 1.52 miles of roadway; 40 ft disturbance width<br>Disturbance area at Tailings Corridor Crossing included in PNR-01 disturbance calculation | 8,048 | 0 | 7.4 | 0 |

| Road ID | Purpose and Use | Road Length[1] | Improvement Description | Length (Ft)[2] | | New Disturbance Area (Acres) | |
|---|---|---|---|---|---|---|---|
| | | Linear Feet | | Forest Service Land | Private Land | Forest Service Land | Private Land |
| FR 982 | Haul route from Borrow Areas 1to TSF | 38,579 | 1.54 miles of roadway to be decommissioned<br>Reconstruction of 1.90 miles of roadway; 48 ft disturbance width | 18,152 | 0 | 11.0 | 0 |
| FR 1010 | Accessed by FR 2445 | 7,218 | 0.03 miles of roadway to be decommissioned<br>0.37 miles of roadway restricted from public access | 162 | 1,971 | 0 | 0 |
| FR 1903 | Accessed by FR 252 | 26,432 | 2.92 miles of roadway to be decommissioned | 15,393 | 0 | 0 | 0 |
| FR 1904 | Provides access to FR 252 and TSF | 32,115 | Maintain approximately 1.68 miles of roadway; No new disturbance planned | 8,856 | 0 | 0 | 0 |
| FR 1907 | Provides access to FR 1910 and FR 1913 | 9,619 | To be decommissioned | 9,619 | 0 | 0 | 0 |
| FR 1908 | Provides access to FR 1909 | 1,426 | To be restricted from public access | 1,426 | 0 | 0 | 0 |
| FR 1909 | Accessed by FR 1908 | 3,208 | To be decommissioned | 3,208 | 0 | 0 | 0 |
| FR 1910 | Accessed by FR 1907 | 2,170 | To be decommissioned | 2,170 | 0 | 0 | 0 |
| FR 1912 | Accessed by FR 1903 | 5,030 | To be decommissioned | 5,030 | 0 | 0 | 0 |
| FR 1913 | Accessed by FR 1907 | 1,542 | To be decommissioned | 1,542 | 0 | 0 | 0 |
| FR 1914 | Accessed by FR 252 | 1,608 | To be decommissioned | 1,608 | 0 | 0 | 0 |
| FR 1915 | Accessed by FR 252 | 2,067 | To be decommissioned | 2,067 | 0 | 0 | 0 |
| FR 1916 | Accessed by FR 252 | 1,179 | To be decommissioned | 1,179 | 0 | 0 | 0 |
| FR 1917 | Accessed by FR 252 | 2,106 | To be decommissioned | 2,106 | 0 | 0 | 0 |
| FR 1918 | Accessed by FR 252 | 1,187 | To be decommissioned | 1,187 | 0 | 0 | 0 |
| FR 1918A | Accessed by FR 1918 | 826 | To be decommissioned | 826 | 0 | 0 | 0 |
| FR 1933 | Access to MCA-19, 22, and 23 | 5,177 | Maintain approximately 0.98 miles of roadway; No new disturbance planned | 5,177 | 0 | 0 | 0 |
| FR 2359 | Accessed by FR 1903 and FR 2364 | 12,121 | To be decommissioned | 12,121 | 0 | 0 | 0 |
| FR 2360 | Accessed by FR 518 | 6,197 | To be decommissioned | 6,197 | 0 | 0 | 0 |
| FR 2361 | Accessed by FR 2360 | 2,030 | To be decommissioned | 2,030 | 0 | 0 | 0 |
| FR 2362 | Accessed by FR 2361 | 1,591 | To be decommissioned | 1,591 | 0 | 0 | 0 |
| FR 2363 | Accessed by FR 518 and FR 2360 | 1,959 | To be decommissioned | 1,959 | 0 | 0 | 0 |
| FR 2364 | Provides access to FR 2359 | 3,302 | To be decommissioned | 3,302 | 0 | 0 | 0 |
| FR 2366 | Accessed by FR 518 | 1,766 | To be decommissioned | 1,766 | 0 | 0 | 0 |
| FR 2367 | Accessed by FR 982 | 1,093 | 0.29 miles of roadway restricted from public access | 1,093 | 0 | 0 | 0 |

| Road ID | Purpose and Use | Road Length[1] | Improvement Description | Length (Ft)[2] | | New Disturbance Area (Acres) | |
|---|---|---|---|---|---|---|---|
| | | Linear Feet | | Forest Service Land | Private Land | Forest Service Land | Private Land |
| FR 2371 | Crosses Tailings Corridor | 3,732 | 0.17 miles of roadway restricted from public access | 861 | 0 | 0 | 0 |
| FR 2380 | Provides access to FR 2360, FR 2363, FR 2366 | 5,292 | To be decommissioned | 5,292 | 0 | 0 | 0 |
| FR 2381 | Main access to Borrow Area 5 | 7,196 | Reconstruction of 1.36 miles of roadway; 51 ft disturbance width | 7,196 | 0 | 8.4 | 0 |
| FR 2383 | Provides access to FR 252, haul route to the TSF | 1,550 | Reconstruction of 0.41 miles of roadway; 48 ft disturbance width | 1,550 | 0 | 1.7 | 0 |
| FR 2386 | Main access to Borrow Area 6 | 2,063 | Reconstruction of 0.39 miles of roadway; 48 ft disturbance width | 2,063 | 0 | 2.3 | 0 |
| FR 2395 | Access to MCA-2, 4, and 5 | 6,352 | Maintain approximately 1.21 miles of roadway; No new disturbance planned | 6,352 | 0 | 0 | 0 |
| FR 2397 | Access to MCA-2, 4, and 5 | 2,088 | Maintain approximately 0.40 miles of roadway; No new disturbance planned | 2,088 | 0 | 0 | 0 |
| FR 2400 | Access to MCA-1 | 1,618 | Maintain approximately 0.31 miles of roadway; No new disturbance planned | 1,618 | 0 | 0 | 0 |
| FR 2432 | Accessed by FR 315 | 4,098 | 0.64 miles of roadway restricted from public access | 2,871 | 1,227 | 0 | 0 |
| FR 2433 | Accessed by FR 2432 | 1,570 | On private property; restricted from public access | 0 | 1,570 | 0 | 0 |
| FR 2434 | Accessed by FR 2432 | 2,091 | On private property; restricted from public access | 0 | 2,091 | 0 | 0 |
| FR 2435 | Accessed by FR 315 | 1,866 | To be decommissioned | 1,866 | 0 | 0 | 0 |
| FR 2438 | Provides access to FR 3153, accessed by FR 469 | 15,504 | 0.93 miles of roadway to be decommissioned/restricted from public access | 4,889 | 0 | 0 | 0 |
| FR 3152 | Provides access to FR 229, north of Project Area | 8,981 | Reconstruction of 1.70 miles of roadway; 28 ft disturbance width<br>Disturbance area at Tailings Corridor Crossing included in PNR-01 disturbance calculation | 6,295 | 2,686 | 4.0 | 1.73 |
| FR 3153 | Provides access to FR 3791 | 6,925 | To be decommissioned | 6,925 | 0 | 0 | 0 |
| FR 3454A | Access to MCA-18 | 1,439 | Maintain approximately 0.27 miles of roadway; No new disturbance planned | 1,439 | 0 | 0 | 0 |
| FR 3454C | Access to MCA-13 | 2,455 | Maintain approximately 0.17 miles of roadway; No new disturbance planned | 910 | 0 | 0 | 0 |
| FR 3791 | Accessed by FR 3153 | 1,641 | 0.10 miles of roadway to be decommissioned | 551 | 0 | 0 | 0 |
| PNR-01 | Re-alignment of Magma Mine Road | 5,098 | New Road Construction; 150 ft disturbance width | 5,098 | 0 | 17.6 | 0 |

| Road ID | Purpose and Use | Road Length[1] | Improvement Description | Length (Ft)[2] | | New Disturbance Area (Acres) | |
|---|---|---|---|---|---|---|---|
| | | Linear Feet | | Forest Service Land | Private Land | Forest Service Land | Private Land |
| PNR-02 | TSF perimeter road; Main access to Borrow Area 4 | 89,283 | New Road Construction. Disturbance area is within the TSF footprint disturbance area accounted for in the Plan; 150 ft disturbance width | 89,283 | 0 | 307.4 | 0 |
| PNR-03 | New access road along the Tailings Corridor | 28,669 | New Road Construction; 180 ft disturbance width | 28,669 | 0 | 118.5 | 0 |

[1] Total road length for both Forest Service land, Private land, and State Trust land

[2] Length of road to be used within the GPA or as access to the GPA

# FIGURES

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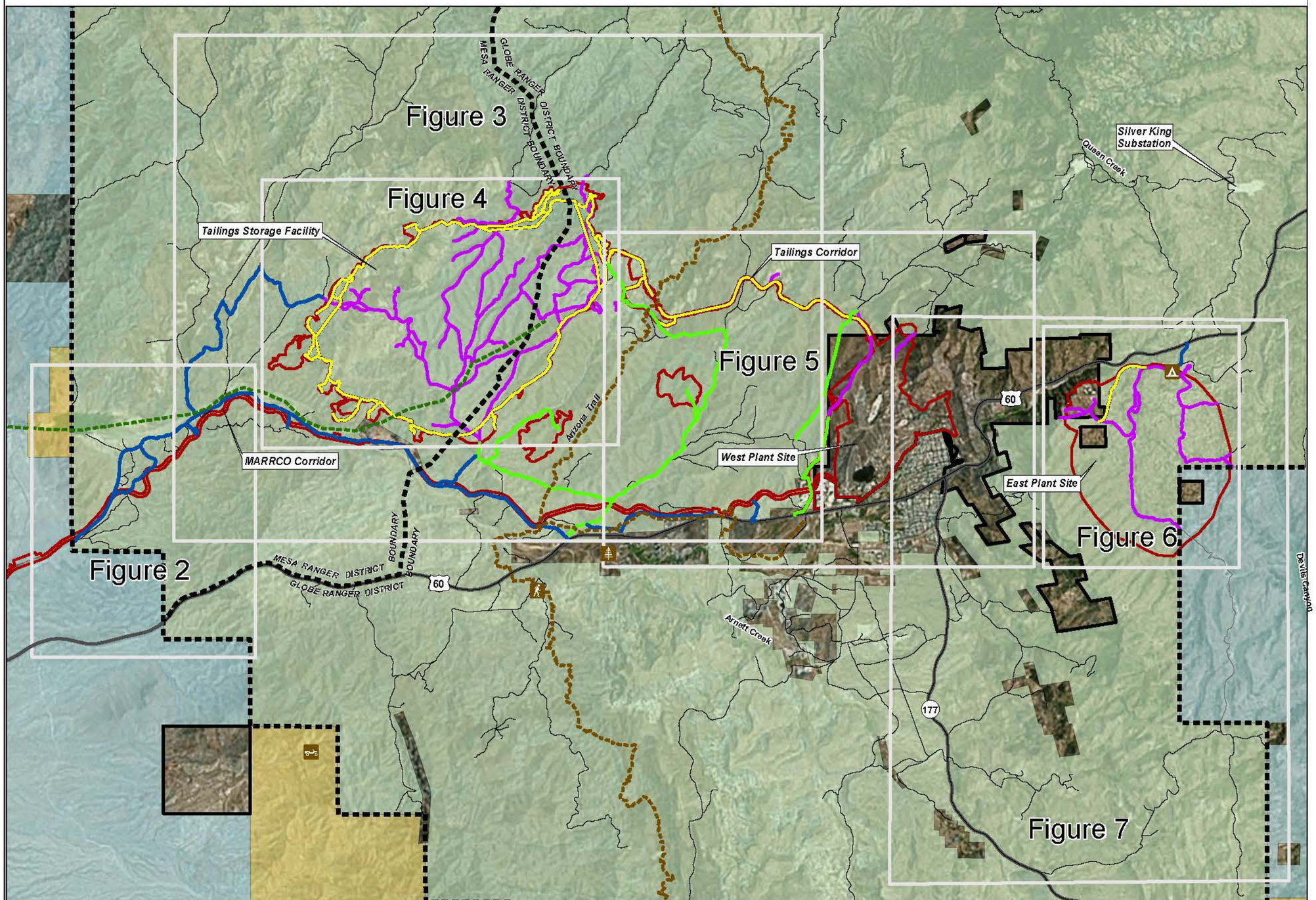



**Legend**

- Resolution Holdings
- Project Area
- Existing Forest Service Road (FR)
- Existing FR To Be Used For Project Access
- Existing FR To Be Decommissioned/ Restricted from Public Access
- Existing FR With Reconstruction Required
- Proposed New Road (PNR)
- Tonto National Forest Ranger District Boundary
- Trail
- Proposed Drainage Trail
- Offroad
- Campground
- Arboretum
- Trailhead

Surface Management (BLM 2011)

- Bureau of Land Management (BLM)
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Data Source:
Pinal County Open Space and Trails Master Plan
2007
ALRIS
2000
USFS Forest Maps and AZ Recreation Map
Arizona Trail Provided by Arizona Trail Association
Aquired September 2012

Image Source: ESRI Online Microsoft November 2010

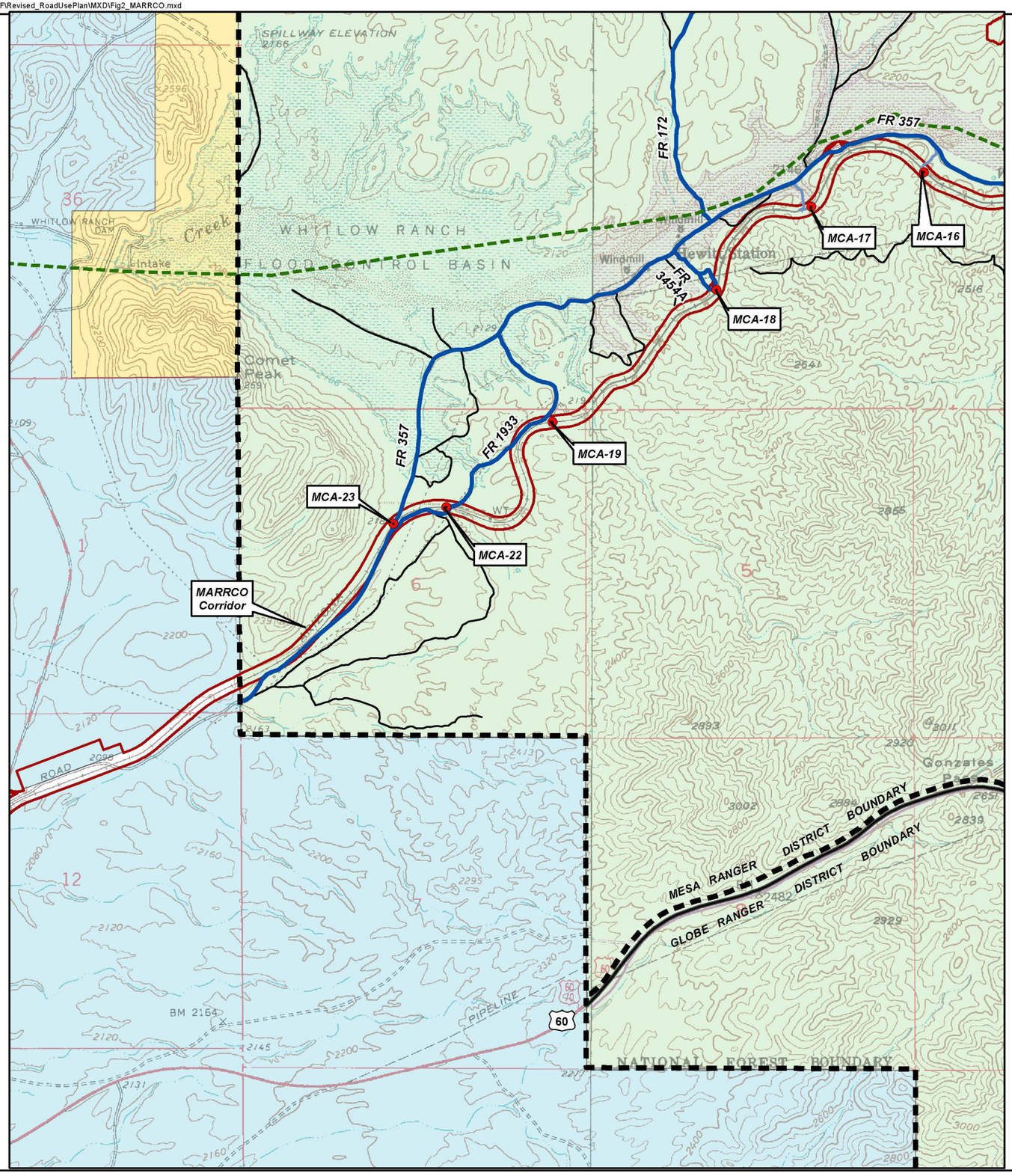
N

0 3,000 6,000 Feet

RESOLUTION COPPER
General Plan of Operations

ROAD USE PLAN
OVERVIEW
Figure 1

Path: M:\Jobs\800's\807.94\ENV\GPO_Responce2TNF\Revised_RoadUsePlan\MXD\Fig2_MARRCO.mxd




## Legend

- Resolution Holdings
- Project Area
- MARRCO Corridor Access Point (MCA)
- Existing Forest Service Road (FR)
- Existing FR To Be Used For Project Access
- Previously Disturbed Area To Be Used As Temporary Access Road
- Tonto National Forest Ranger District Boundary
- Proposed Drainage Trail

Surface Management (BLM 2011)

- Bureau of Land Management (BLM)
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Data Source:
Pinal County Open Space and Trails Master Plan 2007

Image Source: Florence Junction & Picketpost Mountain USGS 7.5 Minute Quadrangles

N

0 900 1,800 Feet

# RESOLUTION COPPER
## General Plan of Operations

ROAD USE PLAN
Figure 2

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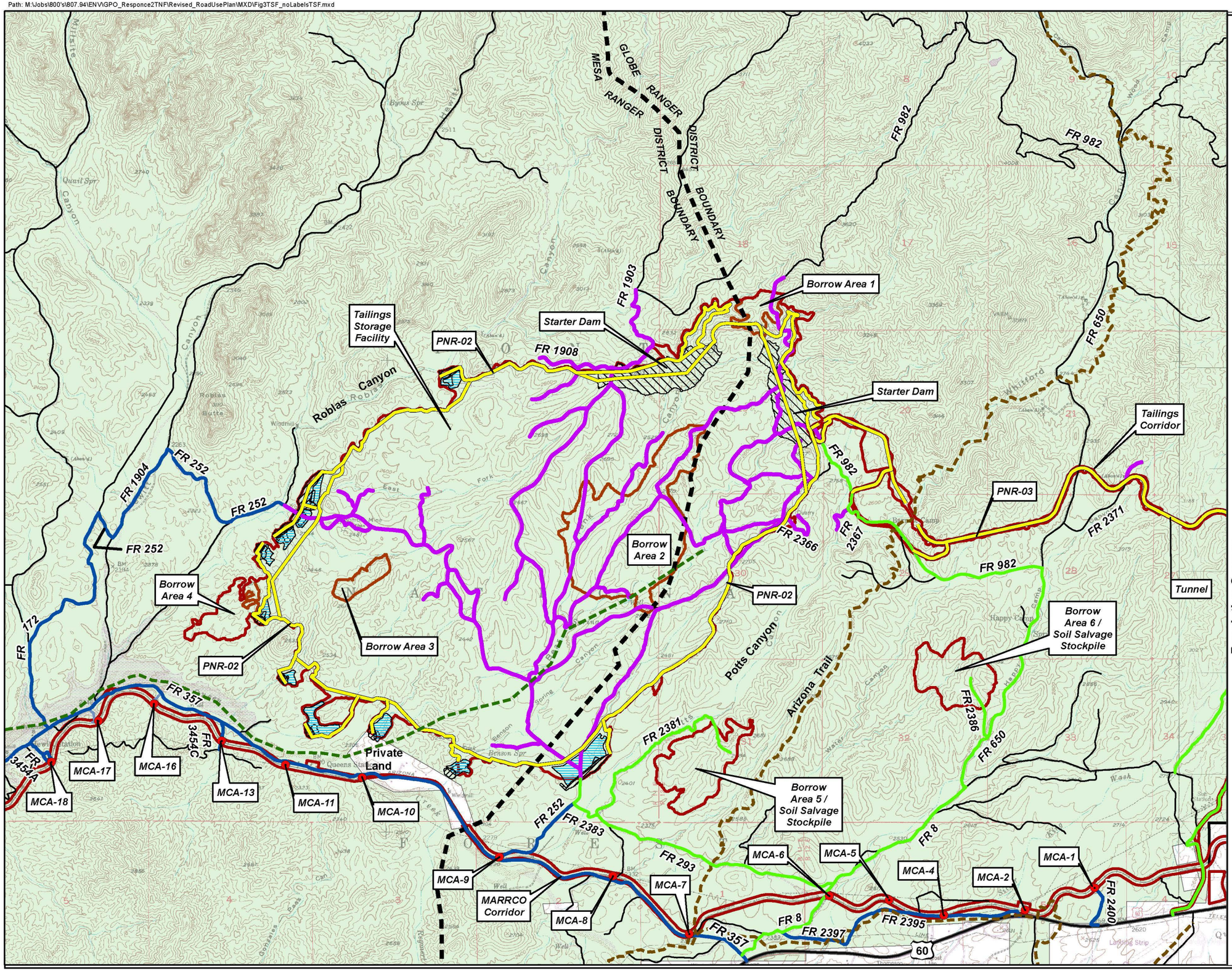


**Legend**

- Resolution Holdings
- Project Area
- Seepage Collection Dam
- Seepage Collection Pond
- Starter Dam
- MARRCO Corridor Access Point (MCA)
- Existing Forest Service Road (FR)
- Previously Disturbed Area To Be Used As Temporary Access Road
- Existing FR To Be Used For Project Access
- Existing FR To Be Decommissioned/ Restricted from Public Access
- Existing FR With Reconstruction Required
- Proposed New Road (PNR)
- Tonto National Forest Ranger District Boundary
- Trail
- Proposed Drainage Trail

Surface Management (BLM 2011)

- Bureau of Land Management (BLM)
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Data Source: Tailings Corridor Facilities
Provided by M3 Engineering
July 10, 2013

Borrow Areas, Starter and Seepage Dams. Ponds, and Tailings Storage Facility Footprint
Provided by Klohn Crippen Berger
2013

Pinal County Open Space and Trails Master Plan
2007

Arizona Trail Provided by Arizona Trail Association
Aquired September 2012

Image Source: Picketpost Mountain & Superior
USGS 7.5 Minute Quadrangles

N

0 1,500 3,000 Feet

Resolution Copper

# RESOLUTION COPPER
## General Plan of Operations

ROAD USE PLAN
Figure 3

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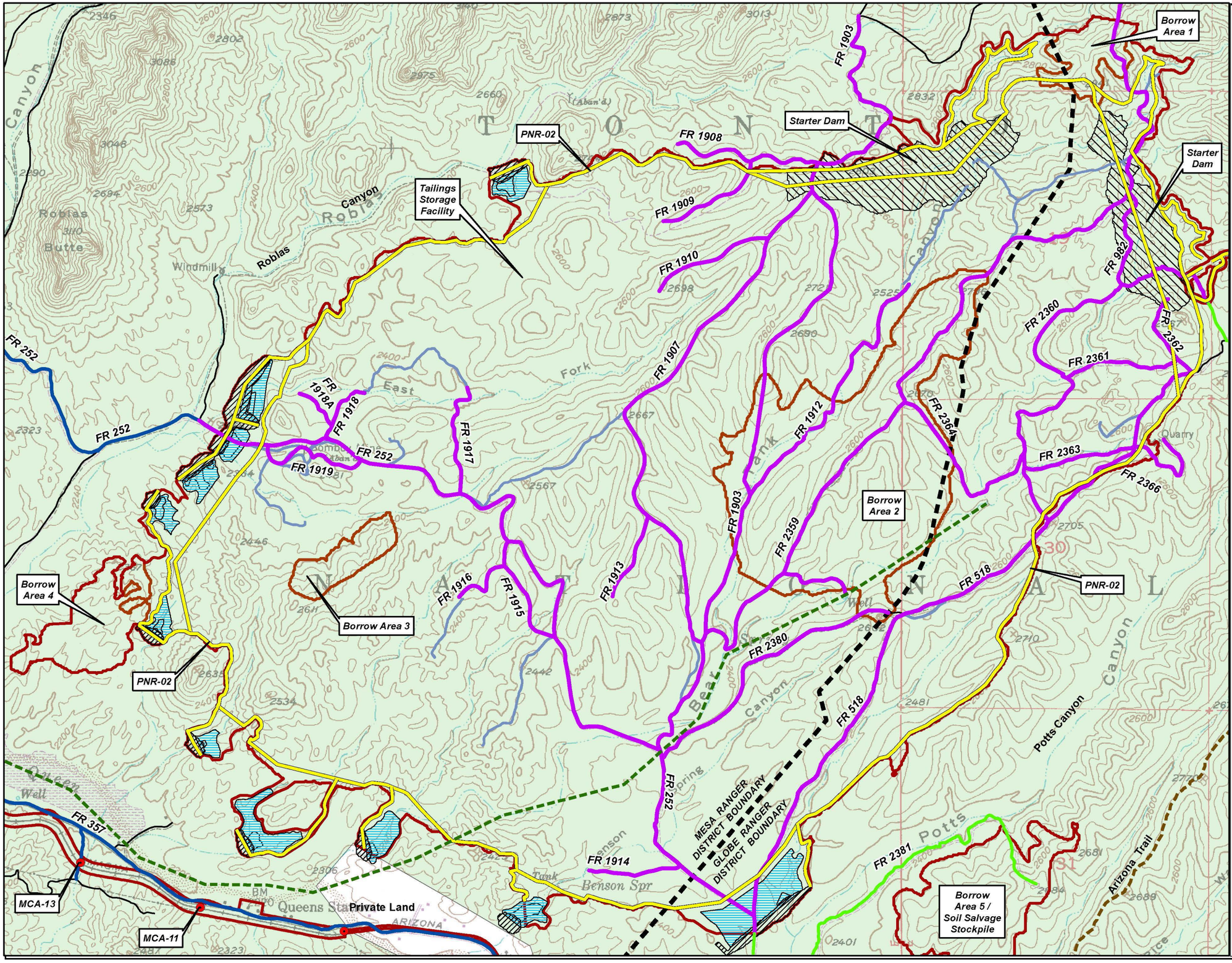


## Legend

- Resolution Holdings
- Project Area
- Seepage Collection Dam
- Seepage Collection Pond
- Starter Dam
- MARRCO Corridor Access Point (MCA)
- Existing Forest Service Road (FR)
- Previously Disturbed Area To Be Used As Temporary Access Road
- Existing FR To Be Used For Project Access
- Existing FR To Be Decommissioned/ Restricted from Public Access
- Existing FR With Reconstruction Required
- Proposed New Road (PNR)
- Tonto National Forest Ranger District Boundary
- Trail
- Proposed Drainage Trail

Surface Management (BLM 2011)

- Bureau of Land Management (BLM)
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Data Source: Tailings Corridor Facilities
Provided by M3 Engineering
July 10, 2013

Borrow Areas, Starter and Seepage Dams. Ponds, and Tailings Storage Facility Footprint
Provided by Klohn Crippen Berger
2013

Pinal County Open Space and Trails Master Plan
2007

Arizona Trail Provided by Arizona Trail Association
Aquired September 2012

Image Source: Picketpost Mountain & Superior
USGS 7.5 Minute Quadrangles

N

0 800 1,600 Feet

# RESOLUTION COPPER
## General Plan of Operations

ROAD USE PLAN
Figure 4

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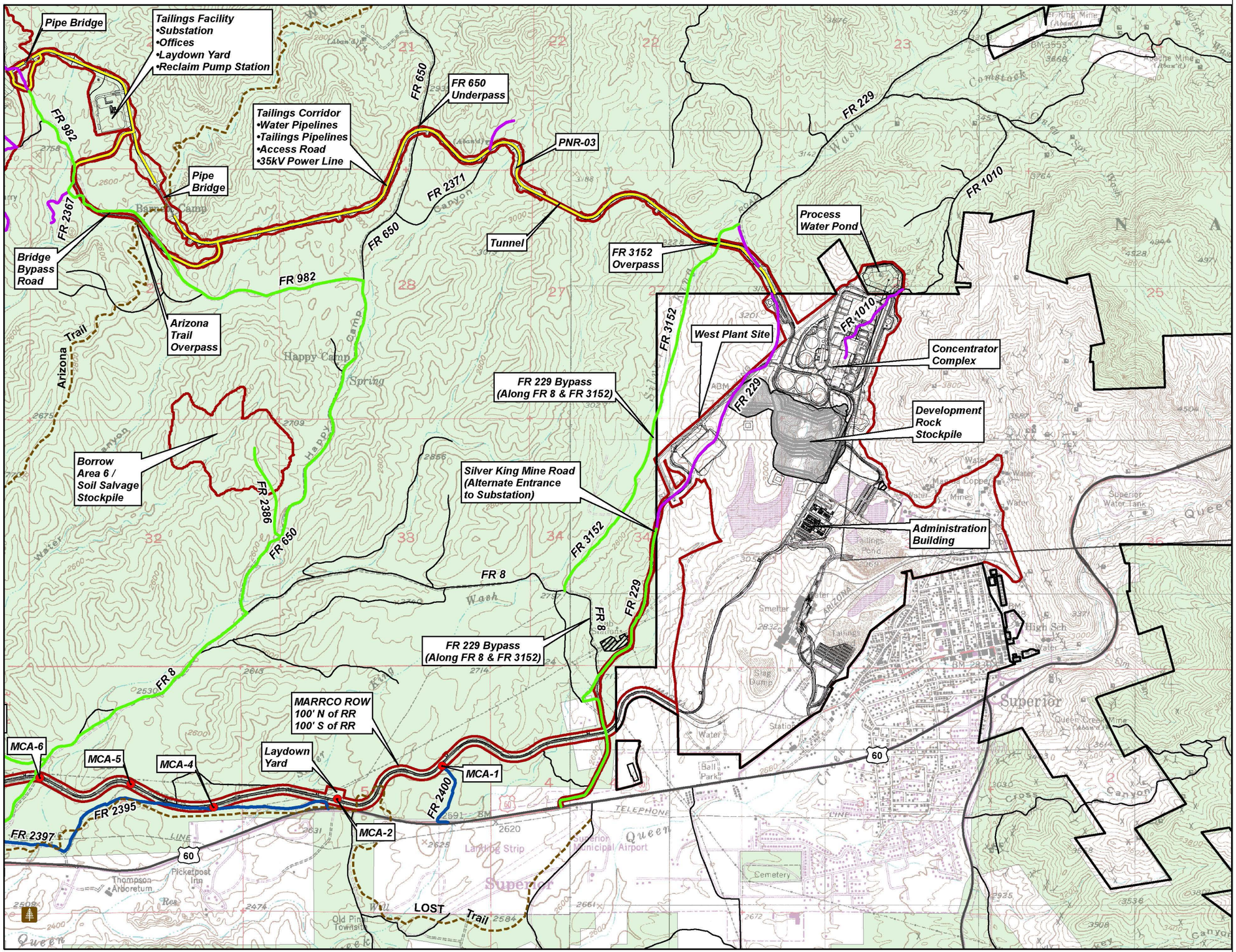



## Legend

- Resolution Holdings
- Project Area
- MARRCO Corridor Access Point (MCA)
- Arizona Trail (ESRI Online Data)
- Existing Forest Service Road (FR)
- Existing FR To Be Used For Project Access
- Existing FR To Be Decommissioned/ Restricted from Public Access
- Existing FR With Reconstruction Required
- Proposed New Road (PNR)
- Trail
- Arboretum

Surface Management (BLM 2011)

- Bureau of Land Management (BLM)
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Data Source: Tailings Corridor Facilities
Provided by M3 Engineering
July 10, 2013

Borrow Areas & Tailings Storage Facility Footprint
Provided by Klohn Crippen Berger
2013

West Plant Facilities
Provided by M3 Engineering
July 10, 2013

Pinal County Open Space and Trails Master Plan
2007

USFS Forest Maps and AZ Recreation Map

Arizona Trail Provided by Arizona Trail Association
Aquired September 2012

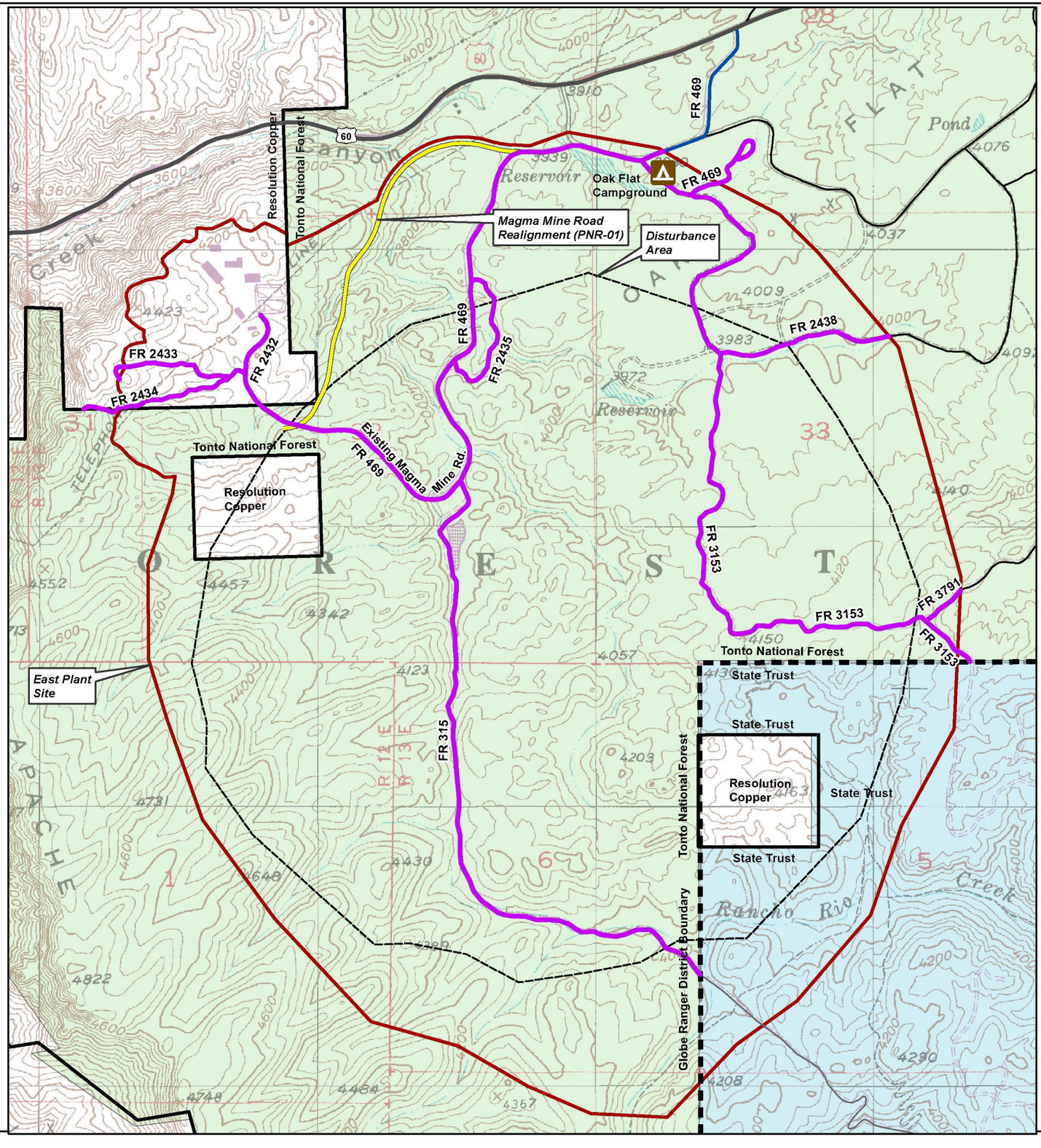
Image Source: Picketpost Mountain & Superior
USGS 7.5 Minute Quadrangles

N

0 1,000 2,000 Feet

RESOLUTION COPPER
General Plan of Operations

ROAD USE PLAN
Figure 5




**Legend**

- Resolution Holdings
- Project Area
- Existing Forest Service Road (FR)
- Existing FR To Be Used For Project Access
- Existing FR To Be Decommissioned/ Restricted from Public Access
- Proposed New Road (PNR)
- Tonto National Forest Ranger District Boundary
- Campground

Surface Management (BLM 2011)

- Bureau of Land Management (BLM)
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Note: Project area around disturbance area defined by modeled zone of continuous subsidence.

Data Source:
USFS Forest Maps and AZ Recreation Map

Image Source: Superior USGS 7.5 Minute Quadrangle

N

0 650 1,300 Feet

# RESOLUTION COPPER
## General Plan of Operations

ROAD USE PLAN
Figure 6

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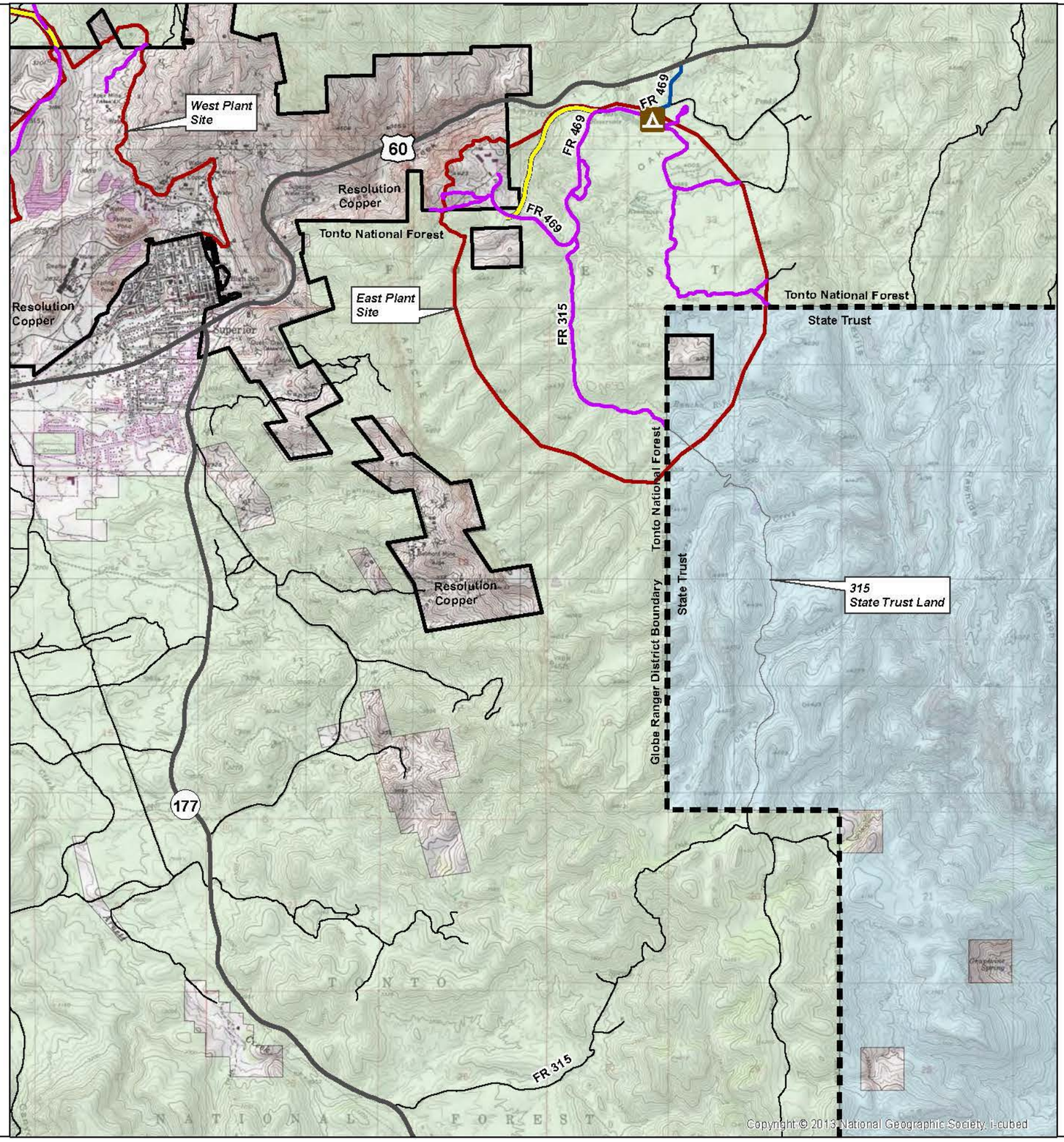



**Legend**

- Resolution Holdings
- Project Area
- Existing Forest Service Road (FR)
- Existing FR To Be Used For Project Access
- Existing FR To Be Decommissioned/ Restricted from Public Access
- Proposed New Road (PNR)
- Tonto National Forest Ranger District Boundary
- Campground

Surface Management (BLM 2011)

- Bureau of Land Management (BLM)
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Data Source:
USFS Forest Maps and AZ Recreation Map

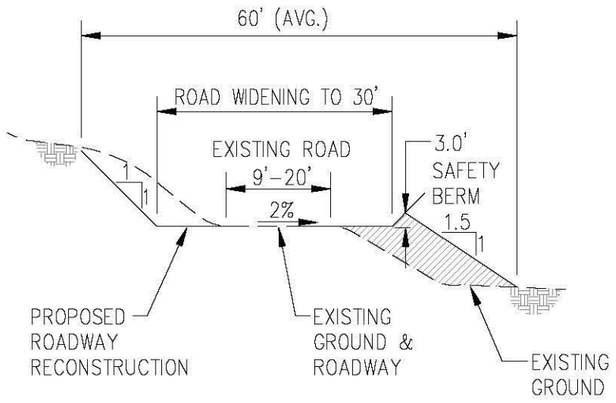
Image Source: Superior & Teapot Mountain USGS 7.5 Minute Quadrangles (ESRI Online USA Topo Maps)

N

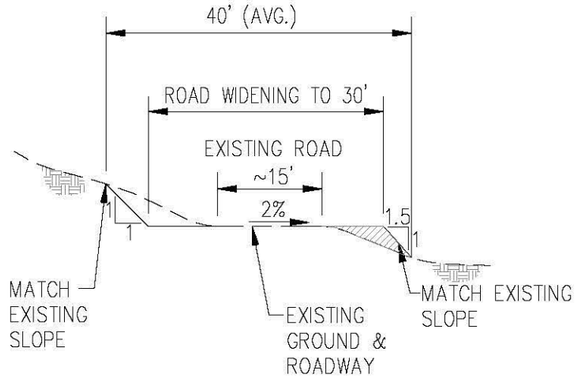
0 1,700 3,400 Feet

RESOLUTION COPPER
General Plan of Operations

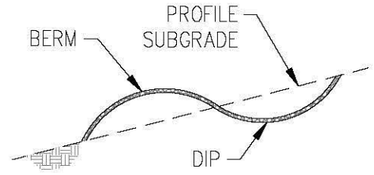
ROAD USE PLAN
Figure 7



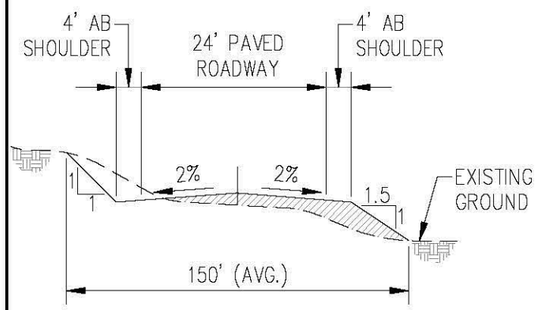

**ROADWAY RECONSTRUCTION FOR HAUL ROUTES**



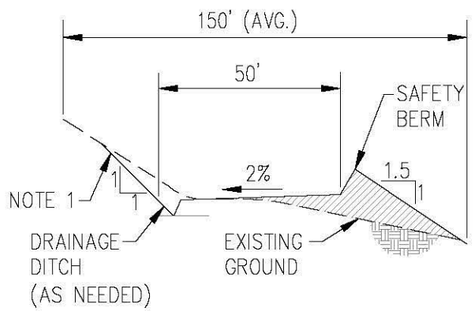

**FR 3152 ROADWAY RECONSTRUCTION**




**TYPICAL ROLLING DIP PROFILE**




**PNR 01 TYPICAL SECTION**

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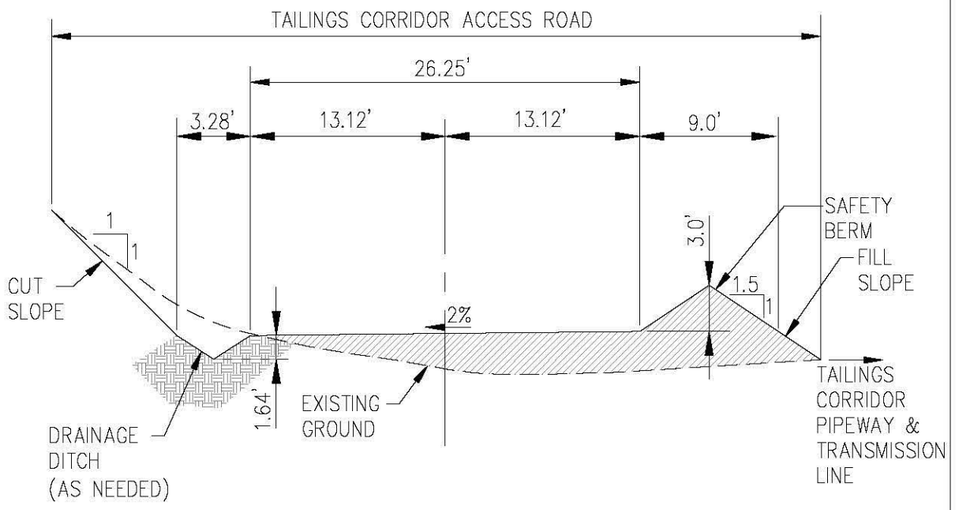


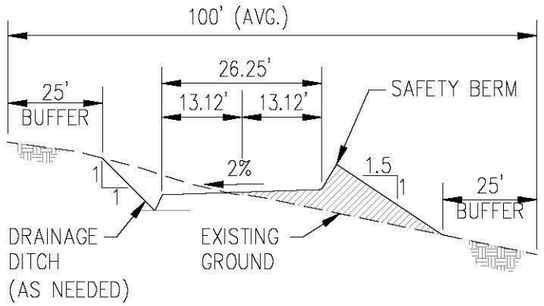

**PNR 03 TYPICAL SECTION**

Notes:

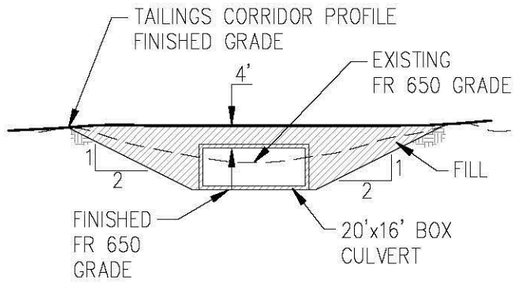
1. Maximum cut slope is 1:1. Where PNR-02 is adjacent to or on tailings the cut slope shall be 5:1.

RESOLUTION COPPER
General Plan of Operations

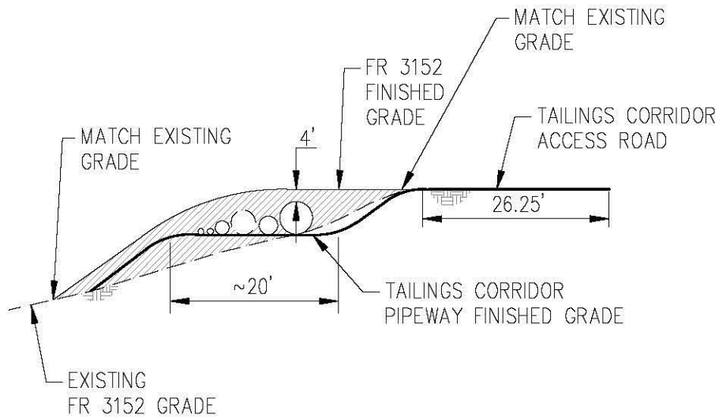
ROAD USE PLAN
TYPICAL CROSS SECTIONS
Figure 8




**SILVER KING MINE ROAD (FR 229)**
**ROADWAY RECONSTRUCTION**




**FR 650 TYPICAL SECTION**
**TAILINGS CORRIDOR CROSSING**




**FR 3152 PROFILE**
**TAILINGS CORRIDOR CROSSING**

RESOLUTION COPPER
General Plan of Operations

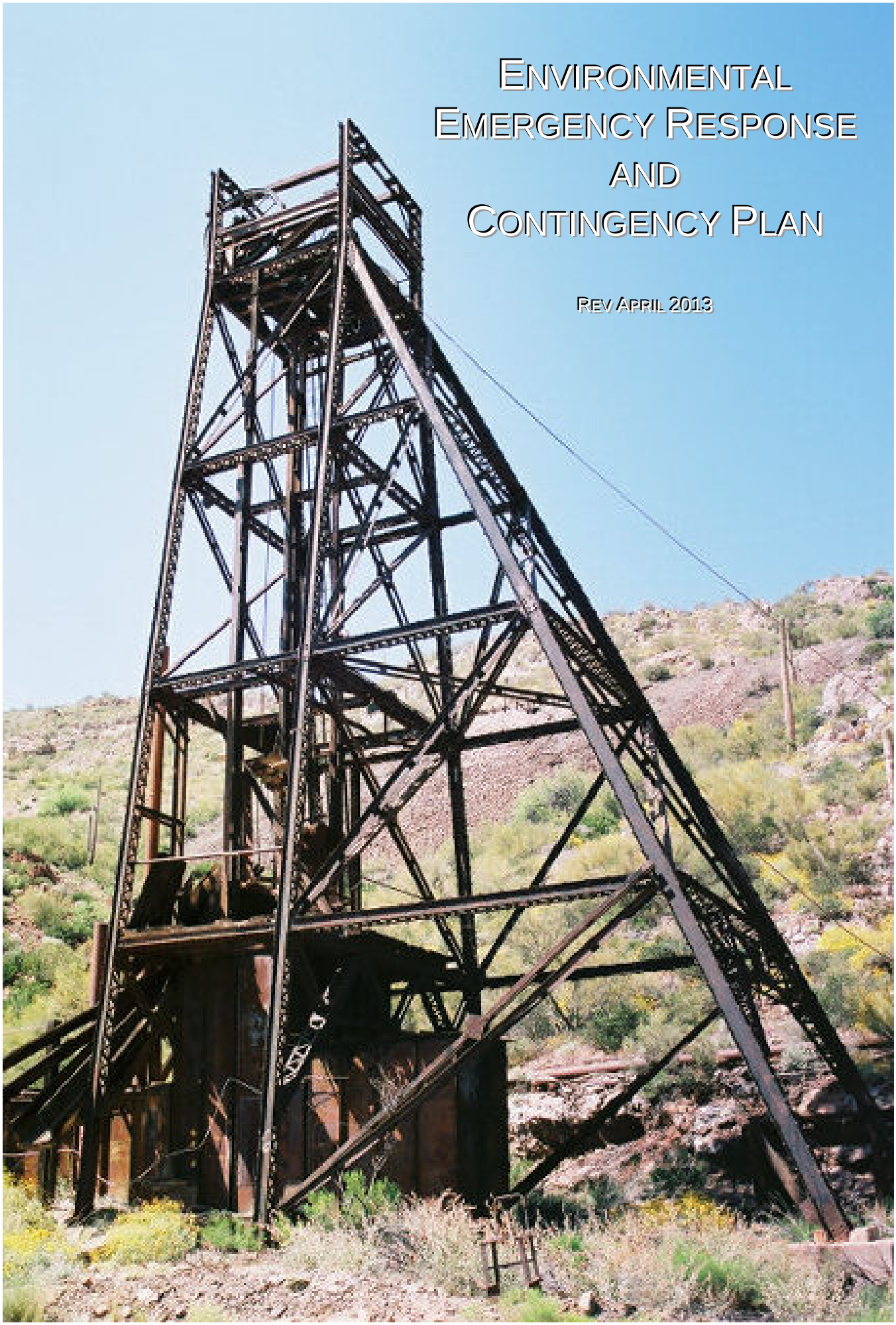
ROAD USE PLAN
TYPICAL CROSS SECTIONS
Figure 9

# APPENDIX L

Environmental Emergency
Response and Contingency Plan

# Environmental Emergency Response and Contingency Plan

Rev April 2013



# RESOLUTION COPPER MINING

# ENVIRONMENTAL EMERGENCY RESPONSE AND CONTINGENCY PLAN



Resolution Copper Mining
102 Magma Heights
Superior, AZ 85173

*Rev: April 2013*

# Introduction

The Resolution Copper Mining (RCM) Emergency Response and Contingency Plan is designed as a tool to assist the facility and external emergency response agencies and organizations in their response to an emergency at the facility located in Superior, Arizona. This Plan identifies roles and responsibilities, procedures, and equipment to be used by RCM to respond to an emergency. The types of emergencies may include but not be limited to natural disasters, chemical and hazardous waste spills, fires and explosions. The Plan is maintained at the RCM facility.

RCM manages its hazardous waste activities at the site based upon large quantity hazardous waste requirements. The facility may be an episodic generator; however, out of an abundance of caution, it generally manages its hazardous waste as if it were a large quantity hazardous waste generator. This Plan is designed to meet hazardous waste requirements for emergency preparedness and contingency plans. It is designed to minimize hazards to human health or the environment from a fire, explosion, or releases of hazardous waste or hazardous waste constituent to air, soil, or surface water

The facility maintains a mine rescue team and has assigned emergency coordinators. Designated personnel are trained to meet OSHA Hazardous Waste Site Operations and Emergency Response (HAZWOPER) training requirements. Some emergency coordinators and personnel are trained to meet 40 hour HAZWOPER requirements for site clean-up and others are trained to meet First Responder Operations Level Training. In addition, RCM maintains contracts and agreements with outside emergency response contractors to provide emergency response support services on a 24/7 hour basis.

External emergency services are also available at the facility, based upon local community and area emergency response resources including fire, police ambulance and medical services as called upon. RCM has an Agreement with the Town of Superior (April 2008) for many of these services. Other external providers are used as required.

In addition to this Plan, RCM maintains a stand-alone Spill Prevention Control and Countermeasures (SPCC) Plan as required under the Clean Water Act for petroleum products. The procedure for responding to oil spills is basically the same as the response for responding to other chemicals or hazardous substances at RCM. The facility also maintains a separate Storm Water Pollution Prevention Plan (SWPPP) as required by State and Federal requirements. Spills into navigable waters are basically handled similar to the way in which spills from other chemicals and hazardous substances are handled at the RCM facility.

RCM also has permits and permit conditions that are issued under State Aquifer Protection Permits, a Pinal County Air Quality Permit, and other government agencies. All of these have requirements for spill control or releases, response to emergencies, reporting and notification. This Emergency Response and Contingency Plan does not duplicate any of those provisions; however, it may cross reference those requirements as applicable in this Plan.

This Plan also contains a Quick Reference Guide which has information on emergency contacts and reporting and a general flow chart for response. For any questions regarding this Plan, please contact the Environmental Department.

# Quick Reference

# Response Procedures – Quick Reference

The following steps are a quick reference guide for response to emergency situations. This quick reference is a generic guide and does not provide information specific to a given emergency situation. Use this guide as a reference for initial response. It is important to recognize that environmental issues could be a component of any emergency. It is for this reason the Environmental Emergency Response and Contingency Plan was written. For detailed response information with respect to environmental emergencies, consult the appropriate section(s) of this manual.

The major concern in any emergency situation is first and foremost the safety of personnel and surrounding populations. When confronted with an emergency situation, perform the following actions:

1. **Recognize** an emergency situation exists
2. Quickly **evaluate** the situation and determine the need for additional personnel and equipment.
3. **Isolate** the area. Immediately move all unnecessary personnel to a safe distance. The absence of injury and the protection of the environment measure a successful response to an emergency.
4. **For ALL emergencies, dial 3999 from a Cisco desk phone. If you are calling from a mobile or non-desk phone, you will dial 520-689-3999. Both of these numbers ring to a special 'Emergency Only' phone at East Plant Security. If site desk phone are not working call 520-689-2617. This line is the regular East Plant Security Number POTS (plain old telephone) number.** Security will notify Safety and Environmental, when applicable.
5. **Control** the situation to the best of your ability without endangering yourself or nearby personnel and property. Do not proceed if you are not familiar with or do not know how to protect yourself from the potential dangers.
6. If the situation cannot be mitigated with the personnel and equipment on hand, call the emergency phone numbers referenced in #4 of this Guide to initiate the Emergency Notification Procedure. Move to a safe area and wait for help. Be available to meet response personnel to guide them to the location of the emergency.
7. If the situation is manageable utilizing personnel and equipment on hand, proceed carefully. Always take the following precautions:

    - Move all unnecessary personnel to a safe area.
    - Isolate the area to prevent unauthorized personnel from inadvertently entering the area.
    - Remedy the situation in the safest, most appropriate manner paying close attention to protection of the environment.

**REMEMBER: Only respond to incidents that you are confident can be handled with appropriately trained personnel and equipment on hand. For ALL emergencies, call the phone numbers listed in #4 of this Guide. Move to a safe area and wait for help.**

# CHART 1

## Quick Reference Emergency Procedures Flowchart

Realize an emergency situation exists (injury, fire, explosion, chemical spill/release, etc.)

↓

Evaluate the situation and determine then need for additional personnel and equipment

↓

Isolate the area

↓

**For ALL emergencies, dial 3999 from a Cisco desk phone. If you are calling from a mobile or non-desk phone, you will dial 520-689-3999. Both of these numbers ring to a special 'Emergency Only' phone at East Plant Security. If site desk phone are not working call 520-689-2617. This line is the regular East Plant Security Number POTS (plain old telephone)**

↓

Control the situation to the best of your ability without endangering yourself or nearby personnel and property

↓

If the situation is manageable utilizing personnel and equipment on hand, conduct the following procedures:

1. Continue to assess the situation and determine what appropriately trained personnel and equipment are required to safely mitigate the situation
2. Move all unnecessary personnel to a safe area
3. Isolate the area to prevent unauthorized personnel from inadvertently entering the area

↓

**Contact Security as referenced in this Chart if the situation cannot be mitigated with the personnel and equipment on hand**

# TABLE 1

## Quick Reference Emergency Telephone Roster

(Personnel highlighted in bold in this Table are environmental Emergency Response Coordinators for RCM and are considered emergency coordinators for purposes of RCRA hazardous waste requirements. Agencies and organizations that have been provided with a copy of this plan are designated with an asterisk*

| Title | Extension/Telephone or Cellular Number | Function |
|---|---|---|
| ***On-Site Resources*** | | |
| All Emergencies Security | Dial 3999<br>From a Cisco Desk Phone<br>For Mobile or Non-Desk Phone<br>Dial 520 689-3999<br>If Site Desk Phones Not Working Dial<br>520 689-2617 | Security Emergency Only Phones Activates emergency response actions. Contacts internal response groups and external agencies. Controls traffic during emergencies. |
| On Call Environmental Personnel Hotline | (520) 827-1105 | Environmental Duty Officer |
| **Environmental Manager Casey McKeon** | Work: 520-689-3254<br>Cell: 520-827-0322 | Environmental Response Supervisor (Primary)<br>Home address and home telephone number are maintained by Security. |
| **Environmental Coordinator Mayra Yrizarry** | Work: 520-689-3332<br>Cell: 602-689-8267 | Alternate for Environmental Response Supervisor<br>Home address and home telephone number are maintained by Security. |
| **Environmental Engineer Kacie Baak** | Work: 520-689-3293<br>Cell: 520-827-1111 | Alternate for Environmental Response Supervisor<br>Home address and home telephone number are maintained by Security |
| Environmental Advisor Lien Nguyen | Work: 520-6893404<br>Cell: 520-827-0394 | Alternate for Environmental Response Supervisor<br>Home address and home telephone number are maintained by Security |

| Title | Extension/Telephone or Cellular Number | Function |
|---|---|---|
| Health and Safety Manager<br>Tim Fox | Work: 520-689-3355<br>Cell: 520-827-2157 | Additional safety and health technical advisor to Safety Superintendent |
| RCM Underground Mine Rescue - Steve Gravley | Work: 520-689-3992<br>Cell: 520-827-9266<br>Home: 480-306-7272 | Provides underground emergency response services |
| RCM Underground Mine Rescue - Randy Seppala | Work: 520-689-3236<br>Cell: 520-827-9258<br>Home: 928-425-0729 | Provides underground emergency response services |
| ***Off-Site Resources*** | | |
| Arizona Department of Public Safety<br>2102 W Encanto Blvd.<br>Phoenix, AZ 85009 | 911<br>602-223-2000 | State Police, jurisdiction on State Highways. |
| *Superior Fire Department<br>236 Golf Course Rd.<br>Superior, AZ 85173 | 911<br>520-689-5252 | Local fire department, provides emergency assistance |
| *Superior Police Department<br>734 Main St.<br>Superior, AZ 85173 | 911<br>520-689-5254 | Local police department provides emergency assistance fire, ground ambulance. |
| *Pinal County Sheriff's Office<br>971 Jason Lopez Circle,<br>Building C<br>Florence, AZ 85132 | 800-352-3796<br>520-866-6800 | County sheriff provides emergency assistance outside of municipal jurisdiction. |
| Arizona State Mine Inspector<br>1700 W Washington, 4th Floor<br>Phoenix, AZ 85007 | 602-542-5971 | Serves as primary State safety and health regulatory agency for underground mine sites |
| *Pinal County<br>Emergency Planning Committee (LEPC)<br>31 N Pinal Street, Building F<br>PO Box 727<br>Florence, AZ 85132 | 520-866-6415<br>520 866-6942 | Serves as a local emergency-planning agency. Must be immediately notified if an EHS /CERCLA RQ is released outside facility boundary or into air. |
| *Arizona Department of Environmental Quality (ADEQ)<br>Emergency Response Unit<br>1110 W Washington St.<br>Phoenix, AZ 85007 | 602-771-2330<br>800-234-5677 | Serves as the state on-scene coordinator for fixed-facility and non-transportation incidents. Call meets requirements for State SERC notification |
| ADEQ Storm Water | 602 771-2330 | Used to reporting non-compliance which may endanger human health or the environment under the SWPPP and mining general permit |

| Title | Extension/Telephone or Cellular Number | Function |
|---|---|---|
| Air Evac Native Air | 800 806-7106 | Air medical evacuation |
| Air Evac Services | 800 321-9522 | Air medical evacuation |
| *Superior Clinic of Cobre Valley* 14 N. Magma Ave. Superior, AZ 85173 | 520 689-2423 | Nearest Clinic |
| *Cobre Valley Regional Medical Center 5880 N. Hospital Drive, Globe, AZ 85501 | 928-425-3261 | Hospital in Globe |
| *Banner Health Care 6644 East Baywood Avenue, Mesa, AZ 85206 | 480-321-4200 (Emergency Department) | Hospital in Mesa |
| Southwest Gas Natural Gas | 520 746-1076<br>800 727-4277 | Natural gas supplier, emergency numbers |
| Arizona Public Service | 800 253-9408<br>800 253-9405 | Emergencies, other than outages<br>Power outages |
| Arizona Water Company | 520 689-5752 | Potable water |
| Department of Homeland Security | 202 282-8000 | Operator Number |
| National Response Center (NRC) | 800-424-8802<br>202-267-2675 | Serves as primary Federal notification agency. Report releases into the environment from the facility that meet or exceed RQs, also used for DOT initial hazmat incident notifications, and releases to waters of the U.S. or adjoining shoreline |
| *State Emergency Response Commission | 602 231-6346 | AZSERC |
| Pinal County Air Quality Control District<br>31 N Pinal Street, Building F<br>Florence, AZ 85132 | 520-866-6929 | County air pollution control regulatory agency. |
| MSHA<br>MSHA Mesa Office<br>MSHA Headquarters. | 480 649-5452<br>800 746-1553 | Federal agency that regulates mining activities (800) number used to report "Dirty Dozen" |
| U.S. Forest Service | 602 225-5355 | Forest Dispatcher Wildfire Reporting Hotline |

| Title | Extension/Telephone or Cellular Number | Function |
|---|---|---|
| ***Off-Site Resources for Environmental Response/Cleanup*** | | |
| *MP Environmental Services, Inc. – 3045 S 51st Ave., Phoenix, AZ 85043 | 602-278-6233<br>800-833-7602 (24 hour) | Emergency response/ remediation/transportation/ environmental management |
| *Safety-Kleen Corporation<br>6625 W Frye Rd.<br>Chandler, AZ85226 | 480-940-7202<br>800-433-4981 | Emergency response/remediation contractor for chemical releases |
| *Clean Harbors Environmental - 1340 West Lincoln Street, Phoenix, AZ 85007-3420 | (602) 462-2300 | Treatment, storage, and disposal facilities |
| *Philip Services Corporation (PSC)<br>5150 N Tom Murray Ave.<br>Glendale, AZ 85301 | 602-252-1186<br>602-252-5181 | Emergency Response/remediation contractor/vac services for chemical releases |
| ***Off Site Resources for Environmental Testing*** | | |
| Test America<br>4625 East Cotton Blvd., #189<br>Phoenix, AZ 85040 | 602-437-3340 | Analytical laboratory |

Notes:
Reporting of MSHA Dirty Dozen requires reporting in less than 15 minutes

CERCLA RQ release reporting, EHS release reporting, or the reporting of releases to Waters of the U.S. or to adjoining shorelines must be reported immediately

Excursions under the facility air permit, storm water pollution prevention plan, aquifer protection permit, or spill prevention control and countermeasures plan, may require additional reporting as per permit conditions or plan requirements.

RCRA hazardous waste releases, that meet or exceed an RQ must be reported immediately. All other hazardous releases, that may threaten health outside the facility within 24 hours, hazardous waste releases to Waters of U.S. or adjoining shoreline must be reported immediately.

PCB releases must be reported immediately if RQ exceeded, otherwise within 24 hours

Continuous releases that meet or exceed RQ within a 24 hour period have special requirements for reporting. Refer to applicable regulation EPCRA 40 CFR 355.32 and CERCLA 40 CFR 302.8

Table 2 lists chemicals of concern at Resolution Copper Mining – Superior Operations and quantities for spills/released that must be reported to outside agencies. If a questionable amount of these materials is released or the material released is in question, immediately contact the Environmental Department (520-689-1106) to determine/verify that a Reportable Quantity (RQ) is involved. All reporting to the NRC and other State/Local agencies will be coordinated through the Environmental Department.

# TABLE 2

# Reportable Quantities for Chemicals of Concern

| Reportable Quantities of Hazardous and Extremely Hazardous Substances/Materials at RCM – Superior Operations | | | | |
|---|---|---|---|---|
| Hazardous Material | Regulatory RQ (pounds) | RQ for RCM (pounds) | Environmental Reporting to[1] | |
| | | | NRC & ADEQ | LEPC & ADEQ |
| Acetone | 5,000 | 5,000 | X | |
| Copper -No reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is larger than 100 micrometers (0.004 inches). There is no RQ assigned to the generic or broader class of copper and compounds | 5,000 | 5,000 | X | |
| Copper Sulfate | 10 | 10 | X | |
| Mercury | 1 | 1 | X | |
| Petroleum Products | Discharges that "may be harmful"[2] -otherwise contact Environmental Department | Discharges that "may be harmful" - otherwise contact Environmental Department | X | |
| Polychlorinated Biphenyls (PCBs) | 1 | 1 | X(3) | |
| Sulfuric Acid (100% acid)[4] | 1,000 (65 gal) | 1,000 (65 gal) | X | X |
| Sulfuric Acid 93-97% acid | 1,000 (67-70 gal) | 1,000 (67-70 gal) | X | X |
| Mill Tailings (0.1% copper, assuming all copper is sulfate) | --- | 10,000 | X | |
| Hazardous Wastes | | | | |
| D001 Ignitable | 100 | 100 | X | |
| D002 Corrosive | 100 | 100 | X | |

[1] Agency telephone numbers for spill reporting are referenced in Table 1. See other notes in this Table for when to notify LEPC

[2] Harmful means discharges of oil that violate applicable water quality standards, cause a film or sheen upon or discoloration of the surface of the water or cause a sludge or emulsion upon the adjoining shoreline of "Waters of the United States."

[3] Notify EPA for reportable PCB spills

[4] Calculate RQ in gallons for sulfuric acid of other strengths as follows:

- for acid strengths in %, divide 6,540.22 by % sulfuric acid – GQ in gallons
  e.g., 6,540.00/97% = 67.42 gallons
- For acid strengths in grams/liter, divide 119,839.47 by g/l acid – RQ in gallons
  e.g., 19,839.47/4.0 g/l – 49.959 gallons

| Reportable Quantities of Hazardous and Extremely Hazardous Substances/Materials at RCM – Superior Operations | | | | |
|---|---|---|---|---|
| D003 Reactive | 100 | 100 | X | |
| D004 Arsenic (total weight of material, not just arsenic) | 1 | 1 | X | |
| D006 Cadmium (total weight of material, not just cadmium) | 10 | 10 | X | |
| D007 Chromium (total weight of material, not just chromium) | 10 | 10 | X | |
| D008 Lead (total weight of material, not just lead) | 10 | 10 | X | |
| D009 Mercury (total weight of material, not just mercury) | 1 | 1 | X | |
| D011Silver (total weight of material, not just silver) | 1 | 1 | X | |
| D010 Selenium (total weight of material, not just selenium) | 10 | 10 | X | |
| F001 Spent halogenated solvents used in degreasing as specified | 10 | 10 | X | |
| F002 Spent halogenated solvents as specified | 10 | 10 | X | |
| F003 Spent non-halogenated solvents as specified | 100 | 100 | X | |
| F004 Spent non-halogenated solvents as specified | 100 | 100 | X | |
| F005 Spent non-halogenated solvents as specified | 100 | 100 | X | |

Note: If waste code is designated and concentrations or individual constituents are unknown, then reportable quantity is based upon the total quantity released into the environment. If the quantities (or concentrations) of all the hazardous waste constituents of the waste stream are known, notification is required only where an RQ or more of any hazardous constituent is released. However, if the quantity of one or more of the hazardous constituents in the waste stream is unknown, notification is required where the total amount of the waste released equals or exceeds the RQ for the hazardous constituent with the lowest RQ (i.e., the RQ for the waste stream) See 40 CFR 302.6(b).

Other notes:
a. Criteria for reporting are established in regulations.
b. CERCLA has a petroleum exclusion, however, this does not apply to EPCRA Reporting or reporting under the Clean Water Act.
c. EPCRA reporting applies to releases that meet or exceed the CERCLA or EHS RQ; however, it does not apply to any release that results in exposure to persons solely within the boundaries of the facility.
d. An EHS release into the air that meets or exceeds the RQ is assumed extend beyond the facility boundary. e. Table 2 is only a guide, for a complete listing of CERCLA chemicals and their respective RQs refer to 40 CFR 302.4, Final RQ. For a complete listing of EHS chemicals and their reporting requirements refer to Appendix A and B of 40 CFR Part 355.

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# 1 Facility Information

Resolution Copper Mining – Superior Operations (RCM) is located on more than 28,000 acres of land in Pinal County in the heart of Arizona's historic Superior Copper District (Figure 1). The facility was an underground copper mining operation from the late 1800's until 1996 when the facility began "Care and Maintenance" status. In 2004, RCM purchased the facility to advance mining operations. The current RCM facilities include the West Plant facility located immediately north of the town of Superior and the East Plant facility located approximately two miles east-northeast of the West Plant on contiguous property.

## 1.1 *Previous Processes*

The following is a description of the processes previously performed at RCM – Superior Operations.

### 1.1.1 Mining

For more than 100 years, RCM predecessors BHP Copper and Magma Copper Company mined copper ore at the facility. The facility is an underground sulfide mining operation with access to the underground operations located at both the west and east plant sites. Primary access in the latter years of mining was via the No. 9 Shaft located at the east plant site. Ore was removed and trained to the surface via the 500 level yard near the concentrator complex at the west plant site. The underground operation produced water that was pumped to the surface and routed through a series of treatment ponds prior to its permitted release into the Queen Creek system. The treatment consisted of settling and the addition of lime.

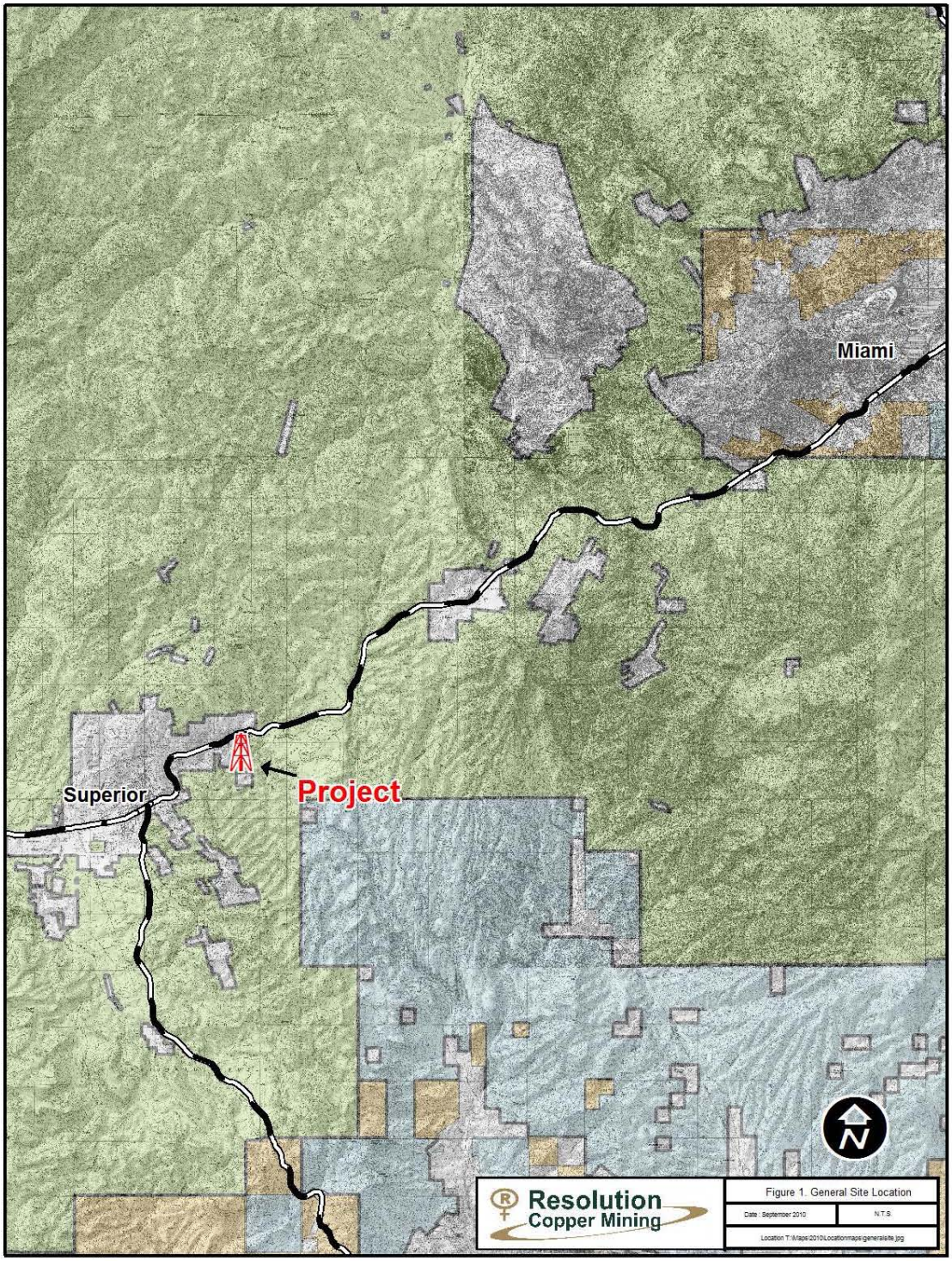
### 1.1.2 Milling

The milling operations ran from 1914 to 1982 and again from 1990 to 1996 when BHP Superior began "Care and Maintenance" status until 2004 when RCM purchased the site to restart copper mining. Ore from the underground mining operation was processed into copper concentrate via typical rotary ball mill and flotation methods. Tailings generated from the milling operation were deposited on site in a series of tailing impoundments, using typical deposition methods such as cycloning. The oldest impoundments are closest to the town of Superior. Newer tailings depositions are located north and west of the town.

### 1.1.3 Smelter

Smelting processes began in 1924 and terminated in 1971. The smelter and associated facilities were located in the west plant area. Copper concentrates form the Superior mill were processed into anodes in the smelter and then transported to San Manuel for further refining. Slag from smelting operations was deposited on site near the smelter and was sometimes used as railroad bed material.

# Figure 1: RCM General Site Location



## 1.2 *1.2 Specific Facility Data*

| | |
|---|---|
| Facility Name: | RCM, Superior Operations |
| Owner: | RCM<br>102 Magma Heights<br>Superior, AZ 85173 |
| Operator | RCM Superior Operations<br>PO Box 1944<br>Superior, AZ 85173 |
| Facility Address: | 102 Magma Heights, Superior |
| County: | Pinal |
| Longitude: | W111º 05.843 |
| Latitude: | N33º 18.018 |
| Elevation: | 2,882 feet above sea level |
| Facility Mailing Address: | PO Box 1944<br>Superior, AZ 85173 |
| EPA ID Number: | AZD001886654 |

Key Contacts:

- Tim Fox, Health & Safety Manager
  520-689-3255
- Casey McKeon, Environmental Manager
  520-689-3254
- Ian Edgar, Acting Project Director
  520-689-3304, 520-827-0946 (cell)

| | |
|---|---|
| Facility Phone Number: | 520-689-9374 |
| Facility Fax Number: | 520-689-9304 |

# 2 Emergency Contacts

RCM personnel, private contractors, and local, state and federal agencies comprise emergency contacts during incidents. On-site contacts include Emergency Response Coordinators and environmental contacts. The Emergency Response Coordinator(s) maintain overall responsibility for decision-making during emergency situations such as fires, explosions, and chemical releases. The Environmental Department provides technical assistance with releases of chemicals to air, water, and soil. The Environmental Manager and/or Environmental Coordinator will complete the necessary documentation of chemical releases for reporting to RCM Corporate and pertinent regulatory agencies. The Quick Reference Guide Table 1 provides ERC contact information for Resolution.

Whenever there is an imminent or actual emergency situation, the Emergency Response Coordinator (ERC) must immediately notify appropriate government agencies with designated response roles if their help is needed. A list of appropriate agencies is provided in the Quick Selection Guide Table 1.

Also included are local/community and supplemental emergency response organizations, local emergency agencies who have copies of the Emergency Response and Contingency Plan, and Off Site Resources for Environmental Response/Cleanup. The Quick Reference Guide Table 1 provides contact information for the other emergency response organizations. **Note that Security is responsible for notifying all facility personnel during an incident.**

# 3 Emergency Response Classification and Procedures

Depending on the severity of the incident, emergencies (including environmental) are broken into five categories as defined by the Business Resiliency and Recovery Plan; Minor, Medium, Serious, Major, and Catastrophic. Each emergency will have a designated emergency response coordinator (ERC). Part of the responsibilities of the designated ERC is to classify the incident based upon an onsite assessment. Examples of the classification system used are provided in Table 3.

## Table 3 Hazard Classifications Assigned to Emergencies

| **From Business Resilience Management Plan (BRMP)** | | |
|---|---|---|
| **Impact** | **Examples** | **Remarks** |
| Minor | A small, localized fire, an insignificant equipment malfunction a minor operational failure. No first aid or medical treatment case(s) | An internal incident, which is not visible/detectable off-site and requires no Emergency Response Team activation and no reports to local, State or Federal regulatory authorities.<br>These events can be managed by onsite personnel using the site's operating procedures. |
| Medium | A fire, a minor equipment malfunction, unusual noise or odor, a minor material release, minor emissions or near source spills (that do not breach regulations), minor Injury – typically a first aid or medical treatment case (but not a lost time injury). | An internal incident, which may be visible/detectable off-site and which may require a report to outside agencies. However it presents no off-site threat and requires no assistance or protective actions by offsite personnel.<br>The situation is under control, however activation of the emergency response team and emergency response plan may be required. |
| Serious | A serious fire resulting in injuries and/or serious damage to assets, a serious explosion, a serious equipment malfunction, a serious theft or security incident, serious pandemic/illness. | Incidents that have the potential to escalate to a more significant incident and/or disrupt operations. Requires activation of the Site Emergency Response Team and Emergency Response Plan.<br>The Business Resilience Team may be placed on standby and may require activation of the team, the Business Resilience Management Plan and/or the Business Continuity Plan and/or the Information Technology Disaster Recovery plan.<br>The incident is not under control but poses no threat to offsite areas, however response by offsite personnel may be required. |
| Major | A fatality, severe irreversible damage or impairment to one or more people, a major fire, a major explosion, major material release, a major | An incident that requires activation of the Business Resilience Team and activation of the, Business Resilience Management Plan and/or Business Continuity Plan and/or the Information Technology Disaster Recovery plan. This may also be an event |

| From Business Resilience Management Plan (BRMP) | | |
|---|---|---|
| **Impact** | **Examples** | **Remarks** |
| | equipment malfunction, natural occurrence, public exposure in national media. | that has occurred or is imminent, which poses a threat to residents in the immediate vicinity and/or seriously affects site operations.<br>Notification to the Corporate Business Resilience Team is mandatory.<br>The incident is not under control and action by off-site persons is necessary. Employees and/or assets are seriously threatened and operations will cease for an indeterminable period. |
| Catastrophic | A number of fatalities or permanent damage to multiple people, a catastrophic fire, explosion or material release, A catastrophic equipment malfunction which is likely to involve internal or external emergency services), a catastrophic environmental emissions or spill, a significant robbery or security incident, reputational damage and public exposure in international media. | An incident that requires activation of the Corporate Business Resilience Team and activation of the, Business Resilience Management Plan and/or Business Continuity Plan and/or the Information Technology Disaster Recovery plan. This may also be any business or financial incident reflecting on Rio Tinto's reputation or an event that has occurred (or is imminent), which seriously affects off-site areas well beyond site boundaries and/or site operations.<br>The incident is not under control and protective actions by off-site entities are necessary and ongoing. Employees, the public and property are seriously threatened and the operation will cease for an indeterminable period. |

The hazard classification system used by the facility is a guide for response and business recovery. Regardless as to the classification of the incident, appropriate response, notification, and reporting shall be initiated as required by this plan and applicable environmental plans, permits, and regulations. The ERC shall have an understanding of these requirements and consult with the Environmental Manager as needed.

A description of the ERC and associated responsibilities and other personnel in an emergency are described here:

## 3.1 *General Employee Requirements Notification*

In the event of a fire, explosion, chemical spill or medical emergency (injury or illness) personnel will immediately dial 3999 from a Cisco desk phone. If you are calling from a mobile or non-desk phone, you will dial 520-689-3999. Both of these numbers ring to a special 'Emergency Only' phone at East Plant Security. If site desk phone are not working call 520-689-2617. This line is the regular East Plant Security Number POTS (plain old telephone) number**. When a spill or fire is first discovered, the Emergency Response Coordinator (ERC) can be anyone whether they have training or not.** The first person to observe any incident becomes the ERC until assistance arrives. The untrained ERC will limit

their activities to notification of the area Supervisor, isolation of the scene, and evacuation if required.

Facility personnel will either direct or designate another employee to make this notification either by phone, 2-way radio, or in person. While any radio channel can be used in the event of an emergency, channels 3,5 and 6 are designated for emergency usage depending upon the location of the emergency.

The immediate Supervisor and Security or their designees will be instructed as to the nature of the emergency, location in the facility of the emergency, and resources required.

The immediate Supervisor and Security or their designees will utilize the Emergency Incident Telephone Procedures to notify facility personnel via the facility's internal communication system as referenced in Quick Selection Guide Table 1.

## 3.2 *Emergency Response Roles and Responsibilities*

### 3.2.1 Designation of ERC and ERC Responsibilities

The designation of the ERC and the ERC responsibilities are described below.

1. The ERC designation involves a continuum from first person on the scene up through resolution management. The first person on the scene will be the ERC until replaced by more experienced/higher level personnel form the list of Emergency Coordinators identified in Table 1. If the emergency designation remains a minor emergency, then the supervisor for the entity responsible for the spill remains the ERC For all other emergency classifications, ERC responsibilities will transfer to others within the Resolution structure as the event develops.

2. Following spill notification and definition of the type and severity of the emergency, an appropriate ERC is designated and contacted. At this point, under no circumstances will anyone but the ERC initiate any response actions for an emergency.

3. The ERC shall also initiate the following as required, based upon their judgment, training and assessment of the situation:
    - Assessing the identity of the hazardous materials released, the severity of the spill, the quantity released, the cause of the spill and the source of the discharge.
    - Assessing the situation and request additional resources or assistance from off-site agencies or organizations, as necessary.
    - Establishing an isolation perimeter and hazard control zones
    - Determining the appropriate PPE
    - Evacuating personnel and areas as appropriate (refer to Appendix 3).
    - Implementing appropriate actions to stop the release if the discharge is continuous.
    - Implementing appropriate actions to contain the spill and prevent released materials from leaving the boundary of the property.

- Notifying Environmental to provide verbal information to federal, state and/or local officials. If an RQ has been reached or exceeded, the Environmental Department notifies the relevant outside agencies.
- Evaluating clean-up options.
- Implementing decontamination (decon) procedures as necessary
- Utilize on site equipment as appropriate
- Utilizing contract assistance as appropriate.
- If applicable, utilizing Mutual Aid Agreements (MAAs), as necessary, with the appropriate emergency response organizations.

4. ERC, with assistance from technical advisors, assesses the spill site and recommends post-emergency action; including clean-up and remediation to Corporate.

5. The ERC obtains technical guidance from the various groups listed in Quick Reference Table 1 assesses the spill site, and recommends to corporate the requisite post-emergency action including clean-up and remediation.

6. ERC must effectively enlist the aid of other RCM Management who are capable of overall emergency management, committing company resources, and organizing/managing corporate communication. incorporate into a checklist for the ECP

### 3.2.2 Environmental Department

1. Provides technical expertise for chemical releases.

2. Determines the reportable quantity (RQ) for the spilled chemical.

3. Verbally notifies and provides written reports to the appropriate regulatory agencies for chemical releases.

4. Determines the extent and degree of soil contamination and proper waste determination for spill cleanup debris.

### 3.2.3 Fire and Rescue Support

For emergencies involving fires (beyond a minor classification) and rescue emergencies, the ERC will establish control of the incident and isolate people from the situation. The ERC conducts the following activities for site management.

1. Manages the response site with assistance from Security.

2. Establishes the isolation perimeter to limit the number of personnel exposed to hazardous materials.

3. Establishes hazard control zones within the isolation perimeter to limit personnel exposure and environmental contamination.

### 3.2.4 Safety Personnel

1. Monitors, evaluates, and provides guidance for control of chemical and biological hazards.

2. Provides technical assistance for use of personal protective equipment (PPE), decontamination procedures, and all incident aspects related to safe operations.

3. Provides assistance for worker injuries.

4. Schedules routine inspections for all equipment used for emergency response to ensure the availability and usability of the articles.

### 3.2.5 Security

1. Serves as the initial point of contact for all mine emergencies

2. Initiates on-site notification procedures during emergencies.

3. Initiates request for off-site emergency assistance as necessary and/or under the direction of the ERC

4. Uses radios, telephones, cellular phones and word of mouth to announce withdrawal at the incident site.

5. Initiates evacuation of the affected area when directed by the ERC.

## 3.3 Supplemental ERC Responsibilities for Hazardous Waste

### 3.3.1 Hazardous Waste ERC Responsibilities

At all times, there must be at least one employee either on the facility premises or on call (i.e., available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures. This Emergency Response Coordinator (ERC) must be thoroughly familiar with all aspects of the facility's contingency plan, all operations and activities at the facility, the location and

characteristics of waste handled and location of all records within the facility, and the facility layout. In addition, this person must have the authority to commit the resources needed to carry out the contingency plan. (40 CFR 265.55).

### 3.3.2 **Triggers for Hazardous Waste Contingency Plan Activation**

The provisions of the RCRA component to this Plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment. The ERC is responsible for the following measures for releases of hazardous waste as per the requirements of (40 CFR Part 265.56:

(a) Whenever there is an imminent or actual emergency situation, the emergency coordinator (or his designee when the emergency coordinator is on call) must immediately:

(1) Activate internal facility alarms or communication systems, where applicable, to notify all facility personnel; and

(2) Notify appropriate State or local agencies with designated response roles if their help is needed.

(b) Whenever there is a release, fire, or explosion, the emergency coordinator must immediately identify the character, exact source, amount, and areal extent of any released materials. He may do this by observation or review of facility records or manifests and, if necessary, by chemical analysis.

(c) Concurrently, the emergency coordinator must assess possible hazards to human health or the environment that may result from the release, fire, or explosion. This assessment must consider both direct and indirect effects of the release, fire, or explosion (e.g., the effects of any toxic, irritating, or asphyxiating gases that are generated, or the effects of any hazardous surface water run-offs from water or chemical agents used to control fire and heat-induced explosions).

(d) If the emergency coordinator determines that the facility has had a release, fire, or explosion which could threaten human health, or the environment, outside the facility, or when the generator has knowledge that a spill has reached surface water [or when a spill has discharged into a storm sewer or dry well, or such an event has resulted in any other discharge that may reach groundwater]. He must report his findings as follows:

(1) If his assessment indicates that evacuation of local areas may be advisable, he must immediately notify appropriate local authorities. He must be available to help appropriate officials decide whether local areas should be evacuated; and

(2) He must immediately notify either the government official designated as the on-scene coordinator for that geographical area, or the National Response Center (using their 24-hour toll free number 800/424–8802) and the Arizona

Department of Environmental Quality (602) 771-2330 or 800/234-5677. The report must include:

- Reporter Name
- Reporter telephone number
- Facility Name
- Facility Address
- Facility EPA Identification Number
- Date of incident
- Time of incident
- Type of incident (fire, release, explosion, etc.)
- Quantity and type of hazardous waste involved in the incident
- Extent of injuries
- Possible Hazards to Human Health or the Environment outside the facility.

(e) During an emergency, the emergency coordinator must take all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste at the facility. These measures must include, where applicable, stopping processes and operations, collecting and containing released waste, and removing or isolating containers.

(f) If the facility stops operations in response to a fire, explosion or release, the emergency coordinator must monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, wherever this is appropriate.

(g) Immediately after an emergency, the emergency coordinator must provide for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.

[ *Comment:* Unless the facility owner or operator can demonstrate, in accordance with §261.3(c) or (d) that the recovered material is not a hazardous waste, the facility owner or operator becomes a generator of hazardous waste and must manage it in accordance with all applicable requirements of parts 262, 263, and 265 of this chapter.]

(h) The emergency coordinator must ensure that, in the affected area(s) of the facility:

(1) No waste that may be incompatible with the released material is treated, stored, or disposed of until cleanup procedures are completed; and

(2) All emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

(i) The owner or operator must note in the operating record the time, date, and details of any incident that requires implementing the contingency plan. Within 15

days after the incident, he must submit a written report on the incident to the Regional Administrator (Arizona ADEQ Director). The report must include:

(1) Name, address, and telephone number of the owner or operator;

(2) Name, address, and telephone number of the facility;

(3) Date, time, and type of incident (e.g., fire, explosion);

(4) Name and quantity of material(s) involved;

(5) The extent of injuries, if any;

(6) An assessment of actual or potential hazards to human health or the environment, where this is applicable; and

(7) Estimated quantity and disposition of recovered material that resulted from the incident

## 3.4 General Spill Control Response and Clean Up Guidelines

### 3.4.1 **Initial Response**

Notification of responsible parties is the first and most important initial response action. Anyone who discovers a spill or unattended discharge is responsible for the immediate notification of the appropriate person or responsible organization. Under no circumstances will a person take any action that will result in undue risk to personnel or the environment.

The following delineates initial response activities:

1. Immediately notify the work area Supervisor in the event of any spill. The work area Supervisor becomes the Emergency Response Coordinator (ERC) for minor spills.

2. Isolate ignition sources and smoking materials from the spill site.

3. Determine the type and quantity of the material involved in the spill and the appropriate spill classification (i.e., Minor, Medium, Serious, Major, Catastrophic). If personnel have been task trained and it is safe to do so, clean up release as directed by work area Supervisor or ERC. If personnel <u>have not</u> been task trained or do not know the identity of the material, **Conduct no action, beyond initial notification if:**
   - The composition of the released material is unknown, regardless of quantity.
   - The hazard potential is not known, regardless of quantity.
   - Incompatible materials have been released and are reacting or show potential of reacting.

4. Immediately notify Security For ALL emergencies, dial 3999 from a Cisco desk phone. If you are calling from a mobile or non-desk phone, you will dial 520-689-3999. Both of these numbers ring to a special 'Emergency Only' phone at East Plant Security. If site desk phone are not working call 520-689-2617. This line is the regular East Plant Security Number POTS (plain old telephone) number**.** Dispatch for spills that cannot be handled by the facility personnel.

5. If the nature of the spill precludes the use of the telephone, make use of the next nearest phone, cellular phone, or 2-way radio to initiate the response by contacting the telephone numbers referenced in the preceding paragraph.

6. Immediately report information to the facility Emergency Response Coordinator (ERC) upon arrival, if necessary.

7. Inform Safety, Environmental, and other appropriate personnel or organizations according to the location, nature of the release, and inherent hazards or hazard potentials involved.

### 3.4.2 **General Response Procedures**

Spills will be contained, cleaned up, and material will be disposed of by the department responsible for the spill in accordance with this Plan, company policy, and under the direction of the ERC. For minor spills, the work area Supervisor serves as ERC, oversees the spill site and ensures that incompatible materials are isolated from the spill scene until the affected area is entirely cleaned up. The Supervisor may contact the Environmental Department for cleanup guidance.

Cleanup should be conducted by properly trained individuals and will entail the following:

1. Restrict access to the area and maintain security.

2. Obtain a copy of the SDS for the material. If not readily available in hard copy, Maxcom can be used (http://maxcomghs.com/).

3. Use appropriate PPE (only properly trained personnel; refer to the SDS and/or Safety Department guidance).

4. Isolate the leak and, if possible to perform safely, stop the spill at the source.

5. Apply absorbent as needed.
   - Recover and remove large quantities of spilled materials first unless prohibited,
   - Remove smaller quantities of material by skimming pumping, onsite chemical treatment, shoveling of contaminated soils, and dredging.

6. Refer to the spilled substance M

7. SDS to select the proper absorbent material and encircle the spill with absorbent material.

8. Contain the spill at the direction of the work area Supervisor/ERC.

9. Following adequate containment and prevention of spill expansion, the work area Supervisor/ERC will initiate cleanup actions to collect contaminants to the maximum extent possible.

10. Place the spill debris into an appropriate collection container. Contact the Environmental Department to obtain clean containers. Do not wash released materials into a storm drain or sewer system or place the debris into a dumpster.

11. Contact the Environmental Department for proper marking of containers and to coordinate the transfer of containers to the pending analysis area at the Central Accumulation Area (Building #203).

12. If the release is accidental (not routine maintenance), complete and submit the Environmental Incident Report form (see Appendix A). This form is available via the RCM portal Business Solution under Home/My Workspace/My Prospect and click Incident – Report.

13. If a spill occurs in a common area or is beyond the means of the responsible organization, cleanup will be handled by a small contingent of trained individuals under the direction of the ERC and Environmental Department or by contract.

14. The Environmental Department collects environmental samples, as necessary, to assess the extent of contamination and waste disposal requirements.

### 3.4.3 **General Cleanup Procedures**

Following clean-up operations, the recovered materials will be handled as follows:

1. Contact Environmental Department for proper instructions on container type, labeling, and location for waste accumulation.

2. Use spark proof tools if handling any flammable liquids.

3. Clean-up spills working from the outer edges of the spill inward.

4. Do not walk through the spilled material.

5. Ensure that any absorbents that are used are compatible with the chemical to be cleaned up.

6. If neutralizing any corrosive spills use dilute solutions to avoid exothermic reactions.

7. Collect absorbent materials and similar clean-up materials in appropriately sized and labeled drums or containers.

8. Ensure that all containers are properly closed and labeled prior to transferring to an approved accumulation area designated by the Environmental Department.

9. For spills that are beyond the resources or capabilities of site personnel, the ERC may request outside support services.

10. ERC will ensure that all contaminated materials are transported and disposed of in accordance with DOT, State, and Federal regulations.

If a contractor is used, the ERC and Environmental oversees clean-up and remediation activities that are conducted by a contractor.

### 3.4.4. Post Emergency Response Actions

Following the cleanup, the ERC/supervisor must ensure that all emergency response equipment is clean and is fit for immediate use in the event of another spill. If emergency response equipment is not usable, or in the case of disposable equipment it is not replaced immediately, work is temporarily suspended until replacement of equipment is completed.

The responsible organization should complete and submit an Incident Report form (see Appendix A). This form is available via the RCM portal Business Solution under Home/My Workspace/My Prospect and click Incident – Report. When complete, this report will be automatically forwarded to the Environmental Department.

The Environmental Department reviews the incident/spill report form to evaluate if any additional follow-up actions are necessary. For non-minor emergencies the ERC will conduct an incident critique to identify any improvements that may be required or modifications to the Plan. The Environmental Department will ensure that any follow up written reports or notifications are completed as required.

The Environmental Department will review incident/spill report form to evaluate if any additional follow-up actions are necessary. In addition, it must:

1. Review the completed RCM Environmental Incident Report form for verification that no reportable quantities were met or exceeded.

2. Once clean-up operations have been completed, submit the Environmental Incident Report form to RCM Corporate Legal.

If RQs were met or exceeded, forward the verbal and written report to the appropriate agencies in the required timeframes (e.g., NRC, LEPC, ADEQ, etc.). Refer to Section 4.0 for specific notification and reporting requirements.

## *3.5 Evacuation Procedures*

Evacuation maps of the facility are provided as Appendix C. Maps and site plans for evacuation of underground mining portions of the site are maintained in the Business Resiliency and Recovery Plan. Area evacuations will be coordinated through the ERC and supervisors. The method for communicating evacuation may include but not be limited to the use of fire alarms, air horns, verbal instructions, phone or email notifications, based upon the building and work locations within the mine site. Alternate evacuation routes will be designated by the ERC as required.

## *3.6 Definition of Hazard Control Zones for Site Control*

Emergency Responders or ERC will establish control of the incident and isolate people from the situation. The ER/ERC conducts the following activities for site control.

1. Control site access to the immediate spill with assistance from Security, as required.
2 Establishes the isolation perimeter to limit the number of personnel exposed to hazardous materials.
3. Establishes hazard control zones within the isolation perimeter to limit personnel exposure and environmental contamination. The hazard control zones are defined in Table 4.

### TABLE 4 – HAZARD CONTROL ZONES

| Zone | Description |
|---|---|
| **Hot**<br>**Exclusion Zone** | Area immediately surrounding the HazMat incident, which extends far enough to prevent adverse effects from HazMat release to personnel outside the zone. |
| **Warm**<br>**Contamination Reduction Zone** | Area where personnel and equipment decontamination and hot zone support takes place. Includes control points for the access corridor, helping to reduce the spread of contamination. |
| **Cold**<br>**Support Zone** | Area that contains the command post and other support functions required to control the incident |

## *3.7 Decontamination Procedures*

Decontamination is the systematic process of removing or neutralizing contaminants that have accumulated on personnel and equipment. Decontamination protects workers from hazardous substances that may contaminate and eventually permeate the protective clothing, respiratory equipment, tools vehicles, and other equipment used on site. It also protects workers by minimizing the transfer of harmful materials to clean areas; it helps prevent mixing of incompatible chemicals; and it protects the community by preventing uncontrolled transportation of contaminants from the site.

Decontamination can be accomplished by simply removing contaminated clothing (being careful not to contaminate other equipment) and depositing them into a drum for disposal as hazardous waste, or by washing, removing or neutralizing chemical contaminants and reusing the equipment.

## 3.7.1 Emergency Decontamination

The purpose of emergency decontamination (decon) is to minimize exposure and reduce additional harm to contaminated persons. The quickest and most effective method of accomplishing this goal is to immediately remove the person to a safe area, remove contaminated clothing, and flush with copious amounts of water. It is important that all contaminated areas of the body and those areas where contamination may be overlooked (hair, underarms, etc.) are thoroughly washed.

Please remember there are certain chemicals that react with water (i.e. lime). In this instance, remove all material from the skin via dry methods. Follow up by thoroughly flushing with copious amounts of water.

Those persons assisting in the removal and decontamination procedures must be protected against exposure to the chemical by taking protective action (Personal protective equipment, respiratory protection, etc.) as appropriate. The Emergency Response Coordinator (ERC), along with safety will determine the proper PPE for workers at the decon station.

All personnel who have been injured and are contaminated should be field decontaminated prior to being transported to a medical facility for examination and treatment.

**Never transport a person before decontamination procedures have been performed. Failure to decontaminate will result in the spreading of the contaminant to other persons, vehicles and medical facilities and possibly rendering these facilities/equipment unusable.**

## 3.7.2 Simple Decontamination

Simple decontamination may be used for minor incidents with little or no contamination and with the use of disposal personal protective equipment.

1. Remove grossly contaminated items first (boots or boot covers, outer gloves) and place in disposal drum. **Always remove respirator and then inner gloves last!**

2. To remove a suit, roll suit down and away from you.

3. Place all disposable protective equipment and contaminated tools into a drum to be disposed of according to applicable regulations.

4. The last item to be removed after your respirator is your inner glove.

5. Ensure that proper waste determinations are completed by Environmental for all decontaminated materials and solutions that are to be discarded. If equipment is to be decontaminated and then reused, it is very important to decontaminate as quickly as possible so that the chemical does not degrade the material.

## 3.7.3 Personnel Decontamination

This procedure shall be used for incidents where gross contamination has occurred (even for equipment that is identified as disposable) or if the items are to be removed from the area or reused.

1. Decide which decontamination solution is most appropriate for the chemical constituent you are attempting to remove. Consult the SDS for assistance.

2. Set up the decontamination (decon) area by using a plastic drop cloth to protect the surrounding soil and a tub to contain the decontamination solution and rinse waters (small blow up kiddy swimming pools are very effective and inexpensive containment tubs).

3. Personnel performing decon duties should be protected from contamination by using appropriate personal protective equipment and respiratory protection.

4. The contaminated person will stand in the decon containment tub while the decon personnel wash and brush them down thoroughly. The person being decontaminated will then step into a second containment tub and be rinsed with clean water. Depending on the chemical and the amount of contamination to personnel and equipment, multiple decontamination stations may be needed to successfully remove contaminants.

5. After completion of decon procedures, removal of equipment shall be accomplished in a manner to ensure that the wearer avoids contact with the outer surfaces of the clothing as well as the outer clothing of decon personnel.
6. Persons performing decon duties shall also be decontaminated, using appropriate procedures and prior to leaving the area.

7. Reusable equipment that has been decontaminated must be tested and inspected to ensure that the decon procedures have been effective in removing the contaminant. Prior to being placed into service, an inspection must be performed to ensure that the equipment has not been damaged or lost it protective abilities. Proper records should be kept on each piece of equipment with notifications regarding contamination, method of decontamination and inspections.

8. If necessary, testing for the effectiveness of decon can be accomplished by field observation or taking a wipe sample from the decontaminated equipment.

## 3.7.4 Equipment or Sample Decontamination

1. The ERC shall establish a decontamination zone for any heavy equipment that requires decontamination prior to leaving the exclusion zone.

2. The decontamination zone for heavy equipment shall be kept away from the decontamination area used for the decontamination of personnel.

3. Decontamination solutions shall be contained for a proper waste determination by the Environmental Department.

4. Environmental samples that are to be shipped for laboratory analysis shall be wiped of residue and secured to minimize contamination to other personnel.

## *3.8 Emergency Equipment*

The facility maintains various types of equipment that can be utilized site wide in case of a fire or spill. These items and their storage locations are listed in Table 6. The major storage location for equipment is identified on the West Plant Central Accumulation Building site map (Figure 2).

If off-property transport is necessary, RCM will contact and coordinate with public emergency medical services (e.g. Superior Ambulance Service, Superior Fire Department, and/or Department of Public Safety) for services. Additionally, all other manpower and earthmoving equipment at the mine site will be at the disposal of incident command to mitigate serious emergency response incidents. Heavy equipment that might be available on site includes:

1. Bulldozer
2. Front end loader
3. Backhoe
4. Excavator
5. Dump Truck
6. Boom Truck with Man Basket
7. Scraper
8. Water truck
9. Tractor with blade
10. Forklift

# TABLE 5

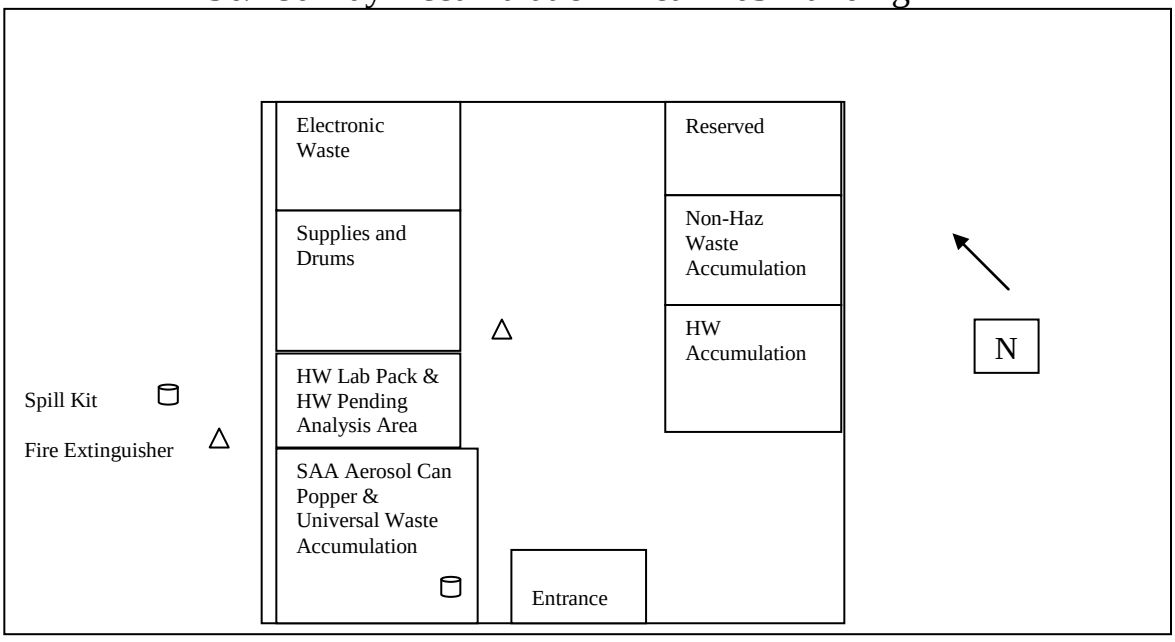
# EMERGENCY EQUIPMENT THAT IS MAINTAINED SITE-WIDE FOR RESPONSE

| Item | General Use | Locations |
|---|---|---|
| **Fire Fighting** | | |
| Fire Hydrants | Fires | Throughout the West and East Plants Buildings |
| ABC Fire Extinguishers | Fires | Throughout the West and East Plants Buildings and company trucks |
| **Chemical Spills** | | |
| Booms | Solvent, Spills/Oils | West Plant – Building #203<br>East Plant – E & M Building |
| Absorbent sheets | Absorbent for chemical spills | West Plant – Building #203<br>East Plant – E & M Building |
| Absorbent Pillows | Absorbent for small quantity chemical spills | West Plant – Building #203<br>East Plant – E & M Building |
| Empty Drums | Spill Clean Up | West Plant – Building #203<br>East Plant – E & M Building |
| PPE (Tyvek, gloves, safety glasses, tape, etc.) | Spill Clean Up | East Plant – E & M Building |
| Shovels | Fire and Spill Clean up | Various Locations |
| **Communications and Alarm Systems** | | |
| Telephones, cell phones, and 2-way radios | Communications during emergencies | Facility-wide |
| Electronic mail system (e-mail) | Communications during emergencies | Company-wide |

# TABLE 6
# EMERGENCY EQUIPMENT MAINTAINED IN 90 DAY/180 DAY HAZARDOUS WASTE ACCUMULATION AREAS

| Item | General Use | Locations and Volumes |
|---|---|---|
| Absorbents | Used to absorb certain types of liquids | West Plant – Building #203, |
| Shovels | Fire and Spill Clean up | West Plant – Building #203, |
| ABC Fire Extinguishers | Fires | West Plant – Building #203, |
| Telephones, cell phones, and 2-way radios | Communications during emergencies | West Plant – Building #203, |
| Empty Drums | Spill Clean Up | West Plant – Building #203, |
| Decontamination Tubs | Personnel decontamination | West Plant – Building #203, |
| Drum Closure Tools | Securing containers prior to transport | West Plant – Building #203, |
| Neutralizers | Neutralizing corrosives as required | West Plant – Building #203, |
| Plastic sheeting | Temporary cover for certain spills or to place beneath decon tubs | West Plant – Building #203, |
| Traffic cones | Access control | West Plant – Building #203, |
| Barrier tape | Access control | West Plant – Building #203, |
| Decon Buckets | Contain clean decon solutions | West Plant - Building #203 |
| Brushes | Decon people and equipment | West Plant - Building #203 |
| Sprayer | Apply decon solutions | West Plant - Building #203 |

Figure 2:
90/180 Day Accumulation Area #203 Building



# 4 Notification and Reporting Procedures

## 4.1 *Internal Notification Procedures for Departments*

For ALL emergencies, dial 3999 from a Cisco desk phone. If you are calling from a mobile or non-desk phone, you will dial 520-689-3999. Both of these numbers ring to a special 'Emergency Only' phone at East Plant Security. If site desk phone are not working call 520-689-2617. This line is the regular East Plant Security Number POTS (plain old telephone) number. Security notifies all the appropriate internal coordinators and outside emergency response agencies.

## 4.2 *Notification Procedures for Security to Perform*

This section presents information to be executed by Security in the event of fires, medical emergencies, evacuations, and hazardous material incidents.

### 4.2.1 Fire, Medical, Evacuation

Refer to Business Resilience and Recovery Plan.

### 4.2.2 Hazardous Materials Incident

1. Ensure everyone has moved from the area of the incident.

2. Obtain the following information from the person reporting the incident:
   - Caller's Name
   - Caller's Phone number, RCM extension or cell phone
   - Caller's Department or Location
   - Location of the hazardous materials incident (exact location of the affected area)
   - Type of material: acid, oil, gasoline, diesel, mercury, propane, etc., if known.

3. Complete the Emergency Call Log Sheet (Appendix B) for hazardous materials and document any other information that will assist in a quicker response to the emergency.

4. Restrict the area so that no one enters into the hazard zone.

5. Ask if anyone is in immediate danger or needs medical attention.

6. After obtaining the information:
   - Page the RCM Mine Rescue Team (only if needed)
   - Contact the RCM emergency response personnel, using Tables 1.
   - If needed or directed by the ERC, call 911 and relay all of the information regarding the Evacuation and include any injuries.

## 4.3 *Notification Procedures for Safety to Perform*

Depending on the severity of the situation, the Safety Department may notify the following department and agencies to provide necessary information:

1. RCM Corporate
2. Mine Safety and Health Administration (MSHA)

Safety will follow up with all exposed or affected employees for initial and documented, measured or estimated exposures relating to the emergency.

## 4.4 *Notification Procedures for Environmental Department*

**Only the Environmental Manager or Corporate notifies the outside regulatory agencies in the event of a reportable release.** Call the Environmental Department to report a spill or environmental incident (refer to Table 1). Environmental will consult with the RCM legal department, if required, before any outside notification is conducted. Reporting obligations under various regulations and plans calls for immediate notification.

### 4.4.1 Clean Water Act

#### 4.4.1.1 Initial / Verbal Notification

1. Immediately notify the National Response Center (NRC) at 800-424-8802 as soon as the facility has knowledge of any harmful discharge of oil into navigable waters (40 CFR 110.6). Discharges of oil that the Administrator has determined may be harmful to the public health, welfare or the environment of the United States include discharges of oil that:
    a. Violate applicable water quality standards
    b. Case a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or causes a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines (40 CFR 110.3).
2. If a discharge of oil is suspected of having reached navigable water, the ERC will direct Environmental to contact the NRC immediately.

#### 4.4.1.1 Written Reports

In accordance with the Spill Prevention, Control and Countermeasure (SPCC) requirements under the CWA (40 CFR 112.4(a), notify the EPA regional administrator within 60 days if the facility has:

1. Discharged more than 1,000 gallons of oil in a single event,

2. Experienced two (2) reportable discharges of oil (greater than 42 gallons) within a 12-month period.

Include the following information in the notice:

1. Name of the facility

2. Names of the owners or operators of the facility

3. Location of the facility

4. Maximum storage or handling capacity of the facility and normal daily discharge

5. The corrective actions and countermeasures taken, including a description of equipment repairs and replacements

6. Description of the facility, including maps, flow diagrams, and topographical map

7. The causes of the discharge as described in 112.1(b), including a failure analysis of the system or subsystem in which the failure occurred

8. Additional preventive measures taken or contemplated to minimize the possibility of recurrence

9. Other information required by the regional administrator

### 4.4.2 Resource Conservation and Recovery Act Requirements

Under Resource Conservation and Recovery Act (RCRA), emergency notifications include all fires, explosions, sudden releases, and non-sudden releases that could threaten or have affected human health or the environment **outside** the facility. The Arizona hazardous waste regulations (A.A.C. R18-8-262 expand this requirement to include a provision when the generator has knowledge that a spill has reached surface water [or when a spill has discharged into a storm sewer or dry well, or such an event has resulted in any other discharge that may reach groundwater].

#### 4.4.2.1 Initial / Verbal Notification

In the event of a fire, explosion, or other release which could threaten human health outside the facility or when the generator has knowledge that a spill has reached surface water [or when a spill has discharged into a storm sewer or dry well, or such an event has resulted in any other discharge that may reach groundwater], the generator immediately [shall] notify the National Response Center (using their 24-hour toll-free number 800/424-8802) [and the DEQ (using their 24-hour number (602) 771-2330 or 800/234-5677)].

If this trigger is met, the emergency coordinator shall take the following actions:

1. If the assessment indicates that evacuation of local areas may be advisable, the emergency coordinator must immediately notify appropriate local authorities. The emergency coordinator must be available to help appropriate officials decide whether local areas should be evacuated; and
2. Immediately notify either the government official designated as the on-scene coordinator for that geographical area, or the National Response Center (using their 24-hour toll free number 800/424–8802).and the Arizona Department of Environmental Quality (ADEQ) at 602-771-2330 The verbal notification will include the following information:
    - Reporter Name

- Reporter telephone number
- Facility Name
- Facility Address
- Facility EPA Identification Number
- Date of incident
- Time of incident
- Type of incident (fire, release, explosion, etc.)
- Quantity and type of hazardous waste involved in the incident
- Extent of injuries
- Possible Hazards to Human Health or the Environment outside the facility

#### 4.4.2.2 Written Reports

Note in the operating record the time, date, and details of any incident that requires implementing the contingency plan. Submit a written report to ADEQ within 15 days after the incident. The written report will include the following information 40 CFR 265.55(i):

1. Name, address, and telephone number of the owner or operator
2. Name, address, and telephone number of the facility
3. Date, time, and type of incident (e.g., fire, explosion)
4. Name and quantity of materials(s) involved
5. Extent of injuries, if any
6. Assessment of actual or potential hazards to human health or the environment
7. Estimated quantity and disposition of recovered material that resulted from the incident

### 4.4.3 Emergency Planning and Community Right-to-Know Act

A reportable release under the Emergency Planning and Community Right-to-Know Act (EPCRA) is defined as a release that meets or exceeds a reportable quantity (RQ) of any EHS or of a hazardous substance as defined by CERCLA (40 CFR 355.30). Certain releases are exempt, including any release that results in exposure to persons solely within the boundaries of the facility. Other exempt releases include any release of a federally permitted release as defined in CERCLA and any release that does not meet the definition of release under CERCLA. For purposes of this reporting, RCM assumes that a release into the air that meets or exceeds the RQ is assumed to extend beyond the facility boundary. There are reduced requirements for reporting continuous releases See specific requirements of 40 CFR 355.32.

#### 4.4.3.1 Initial / Verbal Notification

Immediately report releases of extremely hazardous substance (EHS) or CERCLA hazardous substances that meet or exceed the reportable quantity (RQ) (refer to RQ Table 1) to the following[5] (40 CFR 355.40)

1. ADEQ - 602-771-2330 or 800-234-5677
2. Local Emergency Planning Committee (LEPC) for Pinal County – 520-866-6415
3. NRC – 800-424-8802, if the release is a CERCLA substance

Include the following information in the verbal notification:

1. The chemical name or identity of any substance involved in the release.
2. Indicate whether the substance is an EHS.
3. Provide an estimate of the quantity of any such substance that was released into the environment.
4. State the time and duration of the release.
5. The medium or media into which the release occurred.
6. Any known or anticipated acute or chronic health risks associated with the emergency and, where appropriate, advice regarding medical attention necessary for exposed individuals.
7. Proper precautions to take as a result of the release, including evacuation (unless such information is readily available to the community emergency coordinator pursuant to the emergency plan).
8. The name and telephone number of the individual (or individuals) to be contacted for further information.

#### 4.4.3.2 Written Reports

As soon as practicable after the release (under Federal requirements but not later than 30 days (under State requirements), submit a written follow-up notice (or notices, as more information becomes available) to AZERC and LEPC,[6] updating the initial verbal information, and including the following additional information:

1. Actions taken to respond to and contain the release
2. Any known or anticipated acute or chronic health risks associated with the release
3. If appropriate, advice regarding medical attention necessary for exposed individuals.

[5] See Table 1 for telephone numbers and addresses.
[6] See Table 1 for telephone numbers and addresses.

4. Measures which have been or will be taken at the facility to avoid a reoccurrence of similar releases

RCM is not required to submit a written follow-up notification for a release that occurred during transportation or from storage incident to transportation. For a release that occurs during transportation or from storage incident to transportation, the site may meet the requirements by notifying the 911 operator of the immediate notification information listed under 4.4.3.1. The site is not required to submit a written follow-up notification if this requirement is met during transportation or storage incident to transportation under EPCRA. Other DOT incident reporting requirements may apply under 49 CFR 171.15 and 16 and Incident Report Form 5800.1

### 4.4.4 Comprehensive Environmental Response, Compensation, and Liability Act

A Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) release is defined as any release to the environment (air, water, land) from a facility, vessel, vehicle, rolling stock or aircraft meeting or exceeding reportable quantities in any **24 hours period**. These releases pertain to both on-site and off-site releases. Note that reporting obligations are immediate as soon at the RQ is met or exceeded.

Exceptions are noted for some metals with particulate diameters over 100 micrometers. CERCLA includes provision for notification of on-going or continuous releases (40 CRF 302.8)

#### 4.4.4.1 Initial/Verbal Notification

1. Immediately report releases of a CERCLA hazardous substance equal to or greater than the reportable quantity (RQ – refer to RQ Table 2 and 40 CFR 302.4), to the following agencies:
    - NRC – 800-424-8802
    - ADEQ – 602-771-2330 or 800-234-5677
    - AZSERC – 602-231-6346 and LEPC (if the release is off-site) for Pinal County – 520-866-6415. (AZ SERC notice requirements in Arizona may be met by notifying ADEQ (A.R.S. 26-348.A)

2. Determine the RQ by the following guidelines for mixtures of substances and hazardous wastes:
    - Releases of mixtures or solutions (including hazardous waste streams) of hazardous substances, except for radionuclides, are subject to the following notification requirements:

      > If the quantity of all the hazardous constituents of the mixture or solution is known, notification is required where an RQ or more of any hazardous constituent is released.

      > If the quantity of one or more of the hazardous constituent(s) of the mixture or solution is unknown, notification is required where the total amount of the

mixture or solution released equals or exceeds the RQ for the hazardous constituent with the lowest RQ.

- Refer to 40 CFR 302.4 (Final RQs) for the list of hazardous substances and reportable quantities. Table 2 is only an abbreviated summary.
- Refer to 40 CFR 302.8 for reporting requirements for continuous releases. A continuous release is a release that occurs without interruption or abatement or that is routine, anticipated, and intermittent and incidental to normal operations or treatment processes.

#### 4.4.4.2 Written Reports

- Refer to 40 CFR 302.8 for reporting requirements for continuous releases.

## 4.4.5 Aboveground Storage Tanks and Containers

Please refer to the RCM Spill Prevention Control and Countermeasures Plan for requirements associated with oil releases from tanks and containers that are 55 gallons in size or greater and RCM Storm Water Pollution Prevention Plan. All spills of used oil must be cleaned up immediately.

## 4.4.6 Transportation Incidents

According to DOT regulations, reportable incidents are those occurring during transportation, including loading, unloading, and temporary storage, in which any of the following occurs (49 CFR 171):

1. As a direct result of hazardous materials:
    - A person is killed
    - A person receives injuries requiring hospitalization
    - Estimated carrier or other property damage exceeds $50,000
    - An evacuation of the general public occurs lasting one or more hours
    - One or more major transportation arteries or operations are closed or shut down for one hour or more
    - Fire, breakage, spillage, or suspected radioactive contamination occurs involving shipment of radioactive material
    - Fire, breakage, spillage, or suspected contamination occurs involving shipment of infectious substances.
    - A release of a marine pollutant occurs in a quantity exceeding 119 gallons of liquids or 882 pounds for solids
    - A situation exists of such a nature (e.g., a continuing danger to life exists at the scene of the incident) that, in the judgment of the carrier, it should be reported to DOT even though it does not meet the criteria discussed above

*Note: Under 40 CFR 302.6, EPA requires persons in charge of facilities (including transport vehicles, vessels, and aircraft) to report any release of a hazardous substance in a quantity equal to or greater than its reportable quantity, as soon as that person has knowledge of the*

*release, to DOT's National Response Center at (toll free) 800–424–8802 or (toll) 202–267–2675.*

#### 4.4.4.1 Initial /Verbal Notification

Telephone notice to the NRC under DOT regulations must be made as soon as practicable but no later than 12 hours after the incident occurs. Provisions also exist for online reporting at *http://www.nrc.uscg.mil*.

EPA reporting under 302.6 (RQs) or releases to navigable waters in harmful quantities is required (immediately) as soon as the person has knowledge of the release.

- NRC – 800-424-8802
- 911 if EHS RQ met or exceeded for transportation only or if immediate emergency assistance is required.

Provide the following information when reporting a transportation incident:

1. Reporter Name
2. Name and address of person represented by reporter;
3. Phone number where reporter can be contacted;
4. Date, time, and location of incident;
5. The extent of injury, if any;
6. Class or division, proper shipping name, and quantity of hazardous materials involved, if such information is available; and
7. Type of incident and nature of hazardous material involvement and whether a continuing danger to life exists at the scene.

#### 4.4.4.2 Written Reports

Each person in physical possession of a hazardous material at the time that any of the following incidents occurs during transportation (including loading, unloading, and temporary storage) must submit a Hazardous Materials Incident Report on DOT Form F 5800.1 (01/2004) within 30 days of discovery of the incident.

- Refer to 49 CFR 171.16 for specific information requirements.
- Refer to http://phmsa.dot.gov/hazmat/incident-report for incident report Form F 5800.1 (o1-2004).

## 4.4.7 PCB Releases

PCB releases may be reportable under multiples requirements including CERCLA, TSCA, CWA. The CERCLA RQ for PCBs is 1 pound. If the PCB concentration is 50 ppm or greater, reporting under TSCA may be required. If the PCBs are in an oil, applicable CWA requirements will apply for discharges in harmful quantities as defined under the CWA. Under TSCA.

### 4.4.4.3 Initial/Verbal Notification

1. Immediately report releases of a CERCLA hazardous substance equal to or greater than the reportable quantity (RQ – refer to RQ Table 2 and 40 CFR 302.4), to the following agencies:

- NRC – 800-424-8802
- ADEQ – 602-771-2330 or 800-234-5677
- AZSERC – 602-231-6346 and LEPC (if the release is off-site) for Pinal County – 520-866-6415. (AZ SERC notice requirements in Arizona may be met by notifying ADEQ (A.R.S. 26-348.A)

2. Immediately notify the National Response Center (NRC) at 800-424-8802 as soon as the facility has knowledge of any harmful discharge of oil into navigable waters (40 CFR 110.6). Discharges of oil that the Administrator has determined may be harmful to the public health, welfare or the environment of the United States include discharges of oil that:

a. Violate applicable water quality standards

b. Cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or causes a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines (40 CFR 110.3).

3. Unless otherwise noted, the following requirements also apply if the PCB concentration is 50 ppm or greater:

a. If the spill directly contaminates surface water, sewers, or drinking water supplies, as discussed under §761.120(d), the responsible party shall notify the appropriate EPA regional office (the Office of Prevention, Pesticides and Toxic Substances Branch) and obtain guidance for appropriate cleanup measures in the shortest possible time after discovery, but in no case later than 24 hours after discovery.

b. Where a spill directly contaminates grazing lands or vegetable gardens, as discussed under §761.120(d), the responsible party shall notify the appropriate EPA regional office (the Office of Prevention, Pesticides and Toxic Substances Branch) and proceed with the immediate requirements specified under paragraph (b) or (c) of this section (40 CFR 761.125),

depending on the source of the spill, in the shortest possible time after discovery, but in no case later than 24 hours after discovery.

c. Where a spill exceeds 10 pounds of PCBs by weight and is not addressed in paragraph (a or b), the responsible party will notify the appropriate EPA regional office (Pesticides and Toxic Substances Branch) and proceed to decontaminate the spill area in accordance with this TSCA policy in the shortest possible time after discovery, but in no case later than 24 hours after discovery.

#### 4.4.4.4 Written Reports

- Refer to other requirements under CWA/CERCLA for specific requirements under other programs
- Refer to TSCA 40CFR 761 for applicable written requirements applicable to clean up, sampling, and record keeping.

## 4.4.8 Continuous Releases under EPCRA and CERCLA

The following requirements apply for continuous releases as described in 40 CFR 355.32 and 40 CFR 302.8.

#### 4.4.4.5 4.4.8.1 Continuous Releases Under EPCRA

If the release of an EHS or CERCLA hazardous substance is continuous and stable in quantity and rate at the facility as defined in 40 CFR 302.8(b), then the release qualifies for reduced reporting requirements under the EPCRA regulations. Under these reduced reporting requirements, the facility does not need to provide the notifications required under §355.40. However, in addition to the notifications required under 40 CFR 302.8, the facility must make all of the following notifications to the community emergency coordinator for the LEPC for any area likely to be affected by the release and to the SERC of any State likely to be affected by the release:

(a) Initial notifications as specified in 40 CFR 302.8 (d) and (e).

(b) Notification of a “statistically significant increase,” defined in 40 CFR 302.8(b) as any increase above the upper bound of the reported normal range.

(c) Notification of a “new release” as specified in 40 CFR 302.8(g)(1).

(d) Notification of a change in the normal range of the release as specified under 40 CFR 302.8(g)(2).

### 4.4.4.6 **4.4.8.2 Continuous Releases Under CERCLA**

(a) Except as provided in paragraph (c) of this section, no notification is required for any release of a hazardous substance that is, pursuant to the definitions in paragraph (b) of this section, continuous and stable in quantity and rate.

(b) *Definitions.* The following definitions apply to notification of continuous releases:

*Continuous.* A continuous release is a release that occurs without interruption or abatement or that is routine, anticipated, and intermittent and incidental to normal operations or treatment processes.

*Normal range.* The normal range of a release is all releases (in pounds or kilograms) of a hazardous substance reported or occurring over any 24-hour period under normal operating conditions during the preceding year. Only releases that are both continuous and stable in quantity and rate may be included in the normal range.

*Routine.* A routine release is a release that occurs during normal operating procedures or processes.

*Stable in quantity and rate.* A release that is stable in quantity and rate is a release that is predictable and regular in amount and rate of emission.

*Statistically significant increase.* A statistically significant increase in a release is an increase in the quantity of the hazardous substance released above the upper bound of the reported normal range of the release.

(c) *Notification.* The following notifications shall be given for any release qualifying for reduced reporting under this section:

(1) Initial telephone notification;

(2) Initial written notification within 30 days of the initial telephone notification;

(3) Follow-up notification within 30 days of the first anniversary date of the initial written notification;

(4) Notification of a change in the composition or source(s) of the release or in the other information submitted in the initial written notification of the release under paragraph (c)(2) of this section or the follow-up notification under paragraph (c)(3) of this section; and

(5) Notification at such times as an increase in the quantity of the hazardous substance being released during any 24-hour period represents a statistically significant increase as defined in paragraph (b) of this section.

(d) *Initial telephone notification.* Prior to making an initial telephone notification of a continuous release, the person in charge of a facility or vessel must establish a sound basis for qualifying the release for reporting under CERCLA section 103(f)(2) by:

(1) Using release data, engineering estimates, knowledge of operating procedures, or best professional judgment to establish the continuity and stability of the release;

(2) Reporting the release to the National Response Center for a period sufficient to establish the continuity and stability of the release; or

(3) When a person in charge of the facility or vessel believes that a basis has been established to qualify the release for reduced reporting under this section, initial notification to the National Response Center shall be made by telephone. The person in charge must identify the notification as an initial continuous release notification report and provide the following information:

(i) The name and location of the facility or vessel; and

(ii) The name(s) and identity(ies) of the hazardous substance(s) being released.

(e) *Initial written notification.* Initial written notification of a continuous release shall be made to the appropriate EPA Regional Office for the geographical area where the releasing facility or vessel is located. (Note: In addition to the requirements of this part, releases of CERCLA hazardous substances are also subject to the provisions of SARA title III section 304, and EPA's implementing regulations codified at 40 CFR part 355, which require initial telephone and written notifications of continuous releases to be submitted to the appropriate State emergency response commission and local emergency planning committee.)

(1) Initial written notification to the appropriate EPA Regional Office shall occur within 30 days of the initial telephone notification to the National Response Center, and shall include, for each release for which reduced reporting as a continuous release is claimed, the following information:

(i) The name of the facility or vessel; the location, including the latitude and longitude; the case number assigned by the National Response Center or the Environmental Protection Agency; the Dun and Bradstreet number of the facility, if available; the port of registration of the vessel; the name and telephone number of the person in charge of the facility or vessel.

(ii) The population density within a one-mile radius of the facility or vessel, described in terms of the following ranges: 0–50 persons, 51–100 persons, 101–500 persons, 501–1,000 persons, more than 1,000 persons.

(iii) The identity and location of sensitive populations and ecosystems within a one-mile radius of the facility or vessel (e.g., elementary schools, hospitals, retirement communities, or wetlands).

(iv) For each hazardous substance release claimed to qualify for reporting under CERCLA section 103(f)(2), the following information must be supplied:

(A) The name/identity of the hazardous substance; the Chemical Abstracts Service Registry Number for the substance (if available); and if the substance being released is a mixture, the components of the mixture and their approximate concentrations and quantities, by weight.

(B) The upper and lower bounds of the normal range of the release (in pounds or kilograms) over the previous year.

(C) The source(s) of the release (e.g., valves, pump seals, storage tank vents, stacks). If the release is from a stack, the stack height (in feet or meters).

(D) The frequency of the release and the fraction of the release from each release source and the specific period over which it occurs.

(E) A brief statement describing the basis for stating that the release is continuous and stable in quantity and rate.

(F) An estimate of the total annual amount that was released in the previous year (in pounds or kilograms).

(G) The environmental medium(a) affected by the release:

(*1*) If surface water, the name of the surface water body;

(*2*) If a stream, the stream order or average flow rate (in cubic feet/second) and designated use;

(*3*) If a lake, the surface area (in acres) and average depth (in feet or meters);

(*4*) If on or underground, the location of public water supply wells within two miles.

(H) A signed statement that the hazardous substance release(s) described is(are) continuous and stable in quantity and rate under the definitions in paragraph (b) of this section and that all reported information is accurate and current to the best knowledge of the person in charge.

(f) *Follow-up notification.* Within 30 days of the first anniversary date of the initial written notification, the person in charge of the facility or vessel shall evaluate each hazardous substance release reported to verify and update the information submitted in the initial written notification. The follow-up notification shall include the following information:

(1) The name of the facility or vessel; the location, including the latitude and longitude; the case number assigned by the National Response Center or the Environmental Protection Agency; the Dun and Bradstreet number of the facility, if available; the port of registration of the vessel; the name and telephone number of the person in charge of the facility or vessel.

(2) The population density within a one-mile radius of the facility or vessel, described in terms of the following ranges: 0–50 persons, 51–100 persons, 101–500 persons, 501–1,000 persons, more than 1,000 persons.

(3) The identity and location of sensitive populations and ecosystems within a one-mile radius of the facility or vessel (e.g., elementary schools, hospitals, retirement communities, or wetlands).

(4) For each hazardous substance release claimed to qualify for reporting under CERCLA section 103(f)(2), the following information shall be supplied:

(i) The name/identity of the hazardous substance; the Chemical Abstracts Service Registry Number for the substance (if available); and if the substance being released is a mixture, the components of the mixture and their approximate concentrations and quantities, by weight.

(ii) The upper and lower bounds of the normal range of the release (in pounds or kilograms) over the previous year.

(iii) The source(s) of the release (e.g., valves, pump seals, storage tank vents, stacks). If the release is from a stack, the stack height (in feet or meters).

(iv) The frequency of the release and the fraction of the release from each release source and the specific period over which it occurs.

(v) A brief statement describing the basis for stating that the release is continuous and stable in quantity and rate.

(vi) An estimate of the total annual amount that was released in the previous year (in pounds or kilograms).

(vii) The environmental medium(a) affected by the release:

(A) If surface water, the name of the surface water body;

(B) If a stream, the stream order or average flow rate (in cubic feet/second) and designated use;

(C) If a lake, the surface area (in acres) and average depth (in feet or meters);

(D) If on or underground, the location of public water supply wells within two miles.

(viii) A signed statement that the hazardous substance release(s) is(are) continuous and stable in quantity and rate under the definitions in paragraph (b) of this section and that all reported information is accurate and current to the best knowledge of the person in charge.

(g) *Notification of changes in the release.* If there is a change in the release, notification of the change, not otherwise reported, shall be provided in the following manner:

(1) *Change in source or composition.* If there is any change in the composition or source(s) of the release, the release is a new release and must be qualified for reporting under this section by the submission of initial telephone notification and initial written notification in accordance with paragraphs (c) (1) and (2) of this section as soon as there is a sufficient basis for asserting that the release is continuous and stable in quantity and rate;

(2) *Change in the normal range.* If there is a change in the release such that the quantity of the release exceeds the upper bound of the reported normal range, the release must be reported as a statistically significant increase in the release. If a change will result in a number of releases that exceed the upper bound of the normal range, the person in charge of a facility or vessel may modify the normal range by:

(i) Reporting at least one statistically significant increase report as required under paragraph (c)(7) of this section and, at the same time, informing the National Response Center of the change in the normal range; and

(ii) Submitting, within 30 days of the telephone notification, written notification to the appropriate EPA Regional Office describing the new normal range, the reason for the change, and the basis for stating that the release in the increased amount is continuous and stable in quantity and rate under the definitions in paragraph (b) of this section.

(3) *Changes in other reported information.* If there is a change in any information submitted in the initial written notification or the follow-up notification other than a change in the source, composition, or quantity of the release, the person in charge of the facility or vessel shall provide written notification of the change to the EPA Region for the geographical area where the facility or vessel is located, within 30 days of determining that the information submitted previously is no longer valid. Notification shall include the reason for the change, and the basis for stating that the release is continuous and stable under the changed conditions.

(4) Notification of changes shall include the case number assigned by the National Response Center or the Environmental Protection Agency and also the signed certification statement required at (c)(2)(xi) of this section.

(h) *Notification of a statistically significant increase in a release.* Notification of a statistically significant increase in a release shall be made to the National Response Center as soon as the person in charge of the facility or vessel has knowledge of the increase. The release must be identified as a statistically significant increase in a continuous release. A determination of whether an increase is a “statistically significant increase” shall be made based upon calculations or estimation procedures that will identify releases that exceed the upper bound of the reported normal range.

(i) *Annual evaluation of releases.* Each hazardous substance release shall be evaluated annually to determine if changes have occurred in the information submitted in the initial written notification, the follow-up notification, and/or in a previous change notification.

(j) *Use of the SARA Title III section 313 form.* In lieu of an initial written report or a follow-up report, owners or operators of facilities subject to the requirements of SARA title III section 313 may submit to the appropriate EPA Regional Office for the geographical area where the facility is located, a copy of the Toxic Release Inventory form submitted under SARA Title III section 313 the previous July 1, provided that the following information is added:

(1) The population density within a one-mile radius of the facility or vessel, described in terms of the following ranges: 0–50 persons, 51–100 persons, 101–500 persons, 501–1,000 persons, more than 1,000 persons.

(2) The identity and location of sensitive populations and ecosystems within a one-mile radius of the facility or vessel (e.g., elementary schools, hospitals, retirement communities, or wetlands).

(3) For each hazardous substance release claimed to qualify for reporting under CERCLA section 103(f)(2), the following information must be supplied:

(i) The upper and lower bounds of the normal range of the release (in pounds or kilograms) over the previous year.

(ii) The frequency of the release and the fraction of the release from each release source and the specific period over which it occurs.

(iii) A brief statement describing the basis for stating that the release is continuous and stable in quantity and rate.

(iv) A signed statement that the hazardous substance release(s) is(are) continuous and stable in quantity and rate under the definitions in paragraph (b) of this section and that all reported information is accurate and current to the best knowledge of the person in charge.

(k) *Documentation supporting notification.* Where necessary to satisfy the requirements of this section, the person in charge may rely on recent release data, engineering estimates, the operating history of the facility or vessel, or other relevant information to support notification. All supporting documents, materials, and other information shall be kept on file at the facility, or in the case of a vessel, at an office within the United States in either a port of call, a place of regular berthing, or the headquarters of the business operating the vessel. Supporting materials shall be kept on file for a period of one year and shall substantiate the reported normal range of releases, the basis for stating that the release is continuous and stable in quantity and rate, and the other information in the initial written report, the follow-up report, and the annual evaluations required under paragraphs (e), (f), and (i), respectively. Such information shall be made available to EPA upon request as necessary to enforce the requirements of this section.

(l) *Multiple concurrent releases.* Multiple concurrent releases of the same substance occurring at various locations with respect to contiguous plants or installations upon contiguous grounds that are under common ownership or control may be considered separately or added together in determining whether such releases constitute a continuous release or a statistically significant increase under the definitions in paragraph (b) of this section; whichever approach is elected for purposes of determining whether a release is continuous also must be used to determine a statistically significant increase in the release.

(m) *Penalties for failure to comply.* The reduced reporting requirements provided for under this section shall apply only so long as the person in charge complies fully with all requirements of paragraph (c) of this section. Failure to comply with respect to any release from the facility or vessel shall subject the person in charge to all of the reporting requirements of §302.6 for each such release, to the penalties under §302.7, and to any other applicable penalties provided for by law

## 4.4.9 Reporting Releases Under Other Facility Plans and Permits

### 4.4.9.1 Multi-Sector Storm Water General Permit

Duty to Mitigate. [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(d)] The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

Reporting Requirements. [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(l)]

Anticipated noncompliance. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

Twenty-four hour reporting.

i. The permittee shall report to ADEQ any noncompliance with this permit which may endanger human health or the environment. The permittee shall orally notify the office listed below within 24 hours:

Arizona Department of Environmental Quality – Water Quality Compliance
1110 W. Washington Street, Mail Code 5515 B-1
Phoenix, AZ 85007
Office: 602-771 – 2330; Fax 602-771 – 4505

ii. A written submission shall also be provided to the office identified above within five (5) days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

iii. The following shall be included as information which must be reported within 24 hours under this paragraph.

1) Any upset which exceeds any effluent limitation in the permit.
2) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit to be reported within 24 hours. (See 40 CFR 122.44(g which is incorporated by reference at A.A.C. R18-9-A905(A)(3)(d)).

iv. ADEQ may waive the written report on a case-by-case basis for reports under this subsection if the oral report has been received within 24 hours.

# 5.0 Emergency Preparedness

## *5.1 RCRA Requirements for Hazardous Waste*

RCM maintains and operates its facility as per 40 CFR 265.31 to minimize the possibility of a fire, explosion, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water which could threaten human health or the environment. This is accomplished through routine inspections, training, and operational controls.

### 5.1.1 Spill and Safety Equipment for 90/180 Day Accumulation Areas

RCM maintains spill response and safety equipment, as per 40 CFR 265.32 and identified in Table 6 of this Plan. The following information pertains to the RCM 90 /180 day hazardous waste accumulation areas:

(a) An internal communications or alarm system capable of providing immediate emergency instruction (voice or signal) to facility personnel. The communication system used at RCM to meet this requirement is that all hazardous waste personnel entering the designated 90/180 day hazardous waste accumulation area must have immediate access to a cell phone or two way radio.

(b) A device, such as a telephone (immediately available at the scene of operations) or a hand-held two-way radio, capable of summoning emergency assistance from local police departments, fire departments, or State or local emergency response teams. The communication system used at RCM to meet this requirement is that all hazardous waste personnel entering the designated 90/180 day hazardous waste accumulation area must have immediate access to a cell phone or two way radio.

(c) Portable fire extinguishers, fire control equipment (including special extinguishing equipment, such as that using foam, inert gas, or dry chemicals), spill control equipment, and decontamination equipment. The 90/180 day hazardous waste accumulation area has portable fire extinguishers and spill and decontamination equipment as identified in Table 6.

(d) Water at adequate volume and pressure to supply water hose streams, or foam producing equipment, or automatic sprinklers, or water spray systems. Water is available onsite as needed; however, for the types of hazardous waste that are accumulated in the 90/180 day hazardous waste accumulation area, water hose streams are not required. Incipient stage fires may be controlled with portable fire extinguishers.

### 5.1.2 Testing and Maintenance of Equipment (40 CFR 265.33)

All facility communications or alarm systems, fire protection equipment, spill control equipment, and decontamination equipment, where required, are tested and maintained as necessary to assure proper operation in time of emergency. Inspections are completed

weekly within the 90/180 day hazardous waste accumulation area. Safety also routinely tests the equipment as part of their inspection procedures.

## 5.1.3 Access to Communications or Alarm System (40 CFR 265.34)

(a) Whenever hazardous waste is being poured, mixed, spread, or otherwise handled, all personnel involved in the operation must have immediate access to an internal alarm or emergency communication device, either directly or through visual or voice contact with another employee, *unless* such a device is not required under §265.32. The communication system used at RCM to meet this requirement is that all hazardous waste personnel entering the designated 90/180 day hazardous waste accumulation area must have immediate access to a cell phone or two way radio.

(b) If there is ever just one employee on the premises while the facility is operating, he must have immediate access to a device, such as a telephone (immediately available at the scene of operation) or a hand-held two-way radio, capable of summoning external emergency assistance, *unless* such a device is not required under §265.32. The communication system used at RCM to meet this requirement is that all hazardous waste personnel entering the designated 90/180 day hazardous waste accumulation area must have immediate access to a cell phone or two way radio.

## 5.1.4 Required Aisle Space (40 CFR 265.35)

The owner or operator must maintain aisle space to allow the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment to any area of facility operation in an emergency, *unless* aisle space is not needed for any of these purposes. Within the 90/180 day hazardous waste accumulation area, adequate aisle space of at least 2-3 feet is provided.

## 5.1.5 Arrangements with Local Authorities (40 CFR 265.37).

(a) The owner or operator must attempt to make the following arrangements, as appropriate for the type of waste handled at his facility and the potential need for the services of these organizations:

(1) Arrangements to familiarize police, fire departments, and emergency response teams with the layout of the facility, properties of hazardous waste handled at the facility and associated hazards, places where facility personnel would normally be working, entrances to roads inside the facility, and possible evacuation routes. RCM has sent copies of the facility Emergency Response and Contingency Plan to organizations designated with an (*) in Table 1. As part of this effort, RCM has invited response agencies to the facility to meet this requirement.

(2) Where more than one police and fire department might respond to an emergency, agreements designating primary emergency authority to a specific police and a specific fire department, and agreements with any others to provide support to the primary emergency authority. RCM has met this requirement. Response agencies have designated roles within their respective areas of jurisdiction. RCM has requested response agencies to respond to RCM acknowledging receipt of this Plan and affirming if they would respond within the limits

of their respective manpower, equipment, and jurisdiction. Copies of this information is maintained in the Environmental Department.

(3) Agreements with State emergency response teams, emergency response contractors, and equipment suppliers. RCM has an Agreement with the Town of Superior (April 2008) whereby the Town agrees to provide police, fire suppression, and ambulance services to all RCM property.

(4) Arrangements to familiarize local hospitals with the properties of hazardous waste handled at the facility and the types of injuries or illnesses which could result from fires, explosions, or releases at the facility. RCM has sent copies of the facility Emergency Response and Contingency Plan to organizations designated with an (*) in Table 1. As part of this effort, RCM has invited hospitals to the facility to meet this requirement.

(b) Where State or local authorities decline to enter into such arrangements, the owner or operator must document the refusal in the operating record. RCM has sent copies of the facility Emergency Response and Contingency Plan to organizations designated with an (*) in Table 1. Acknowledgement of receipt and of response within their respective jurisdictions has been documented and is available in the Environmental Department.

# 6. Planning and Prevention

Planning and prevention entails numerous subjects including handling and storage of hazardous materials; hazardous waste inspections and recordkeeping; proper use of safety equipment; public information and community relations; resource management training; fire prevention; and hazardous materials training. Details for these can be found in the Environmental Materials Management Plan. Of significance with respect to this plan is the emergency Response and Contingency Plan review and training and arrangements with local authorities as described below.

## *6.1* Emergency Response and Contingency Plan Review and Training

This Emergency Response and Contingency Plan shall be reviewed periodically and RCM personnel will be trained to ensure that the plan is effective and usable. This review will help ensure that the safest and most efficient procedures are being utilized. This review will also allow input from involved individuals who may offer suggestions to make the procedures more effective.

## *6.2 Testing of Plan Procedures*

The entire plan will be reviewed on an annual basis. Testing can be accomplished by utilizing tabletop or simulate exercises during training. Testing can be divided into individual sessions involving one portion of the plan or one department/operation. Exercises will be run periodically to ensure that individuals remain familiar and competent in the response procedures provided in the plan. This is typically done in conjunction with the DRM exercises. The Safety Coordinator documents and evaluated all emergency response drills and exercises.

## *6.3 Annual Re-Evaluation of the Plan*

Review the Emergency Response and Contingency Plan annually and amend, as required, to reflect any of the following events:

1. Amendments to pertinent federal or state legislation. Particular attention will be given to changes in reportable spill quantities.

2. Pertinent modifications in federal, state, and local contingency plans.

3. Changes that increase the potential for spills or change the spill prevention and response procedure methods and equipment.

4. Revisions to the plan should be made in a timely manner to ensure the effectiveness of the plan.

5. Upon any revision to the plan, all personnel shall be advised of the changes utilizing appropriate training methods.

Conditions for amendments/changes to the emergency response/contingency plan for the listed regulations/plans follows:

1. Resource Conservation and Recovery Act (RCRA) Spill Contingency Plan:

- Applicable regulations are revised;
- The plan fails in an emergency;
- The facility changes in its design, construction, operation, maintenance, or other circumstances in a way that materially increases the potential for fires, explosions, or release of hazardous waste or hazardous waste constituents, or changes in the response necessary in an emergency;
- The list of emergency coordinators changes; or
- The list of emergency equipment changes.

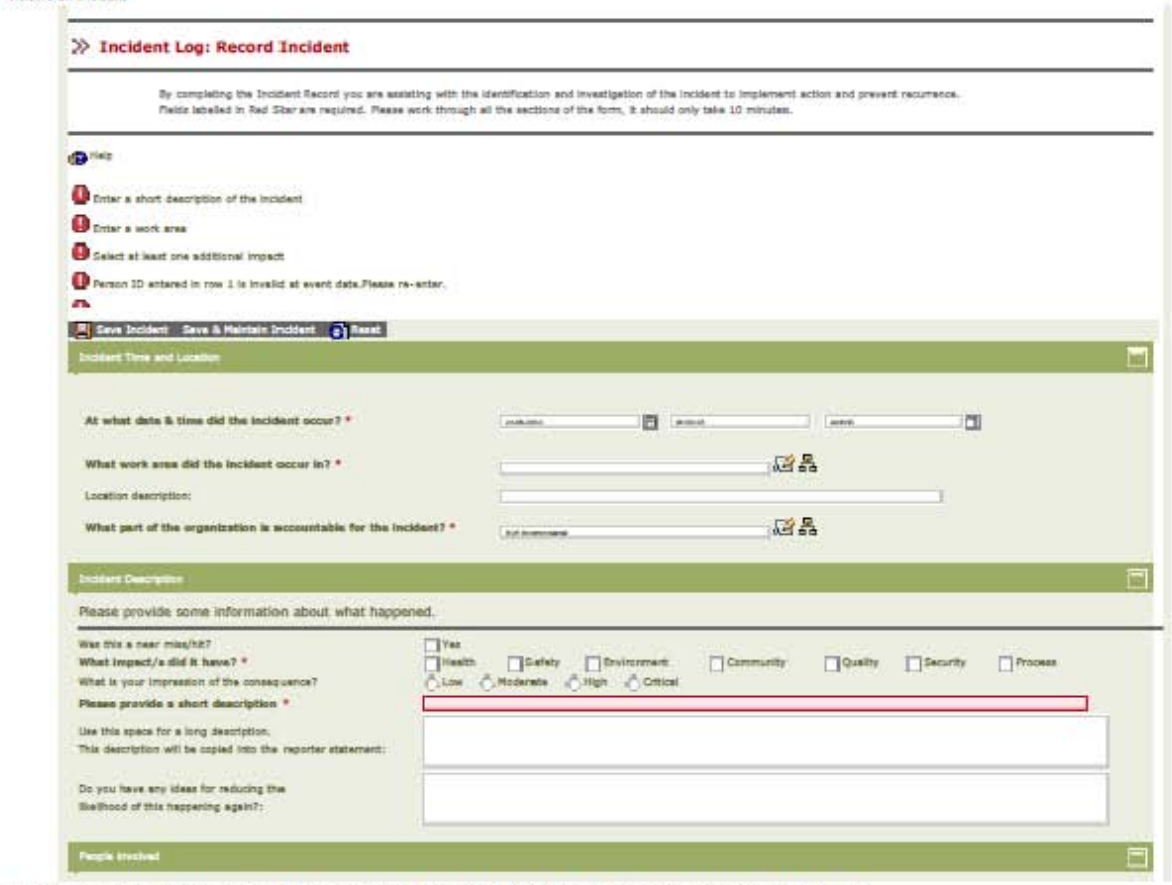
2. Emergency Planning and Community Right-to-Know Act (EPCRA) (as applicable):
   - The list of emergency coordinators (on-scene commanders) changes;
   - The list of emergency equipment changes;
   - Changes in extremely hazardous substances (EHSs), transport routes and methods;
   - The plan fails in an emergency or in a demonstration of the capability to execute the plan.

# 7 Record of Review and Revisions

| Revision # | Description | Author | Approver | Approved Date | Effective Date |
|---|---|---|---|---|---|
| 0 | ERCP | Westland Resources | | 2007 | |
| 1 | ERCP | Resolution Copper | | 2010 | |
| 2 | ERCP | Resolution Copper | | 2011 | |
| 3 | ERCP | Resolution Copper/Norm Weiss Consulting | C. McKeon | 9/2012 | |
| 4 | ERCP | Resolution Copper | C. McKeon | 4/2013 | |

# Appendix A – Example of Incident Reporting Form in SAP

Record an Incident




http://prospect.riotinto.org/irj/servlet/prt/portal/prtroot/pcd!3aportal_content!2frt!2fentl2fgen!2fvul2fRecordIncident[8/23/2011 7:58:33 AM]

# Appendix B – Security Emergency Call Log Sheet

# SECURITY'S EMERGENCY CALL LOG SHEET

Date:___/___/___ Time:___:___am/pm Security Officer:_____

Caller's Name:_____ Caller's Location:_____

Type of Emergency (*circle*): FIRE EMS HAZMAT EXPLOSION

OTHER_____

Location:_____

Description of Emergency:_____

# EMERGENCY NOTIFICATION LOG

Name of Safety Representative_____

Time Contacted:____:___am/pm (*circle*)

Name of Environmental Representative _____

Time Contacted: ____:___am/pm (*circle*)

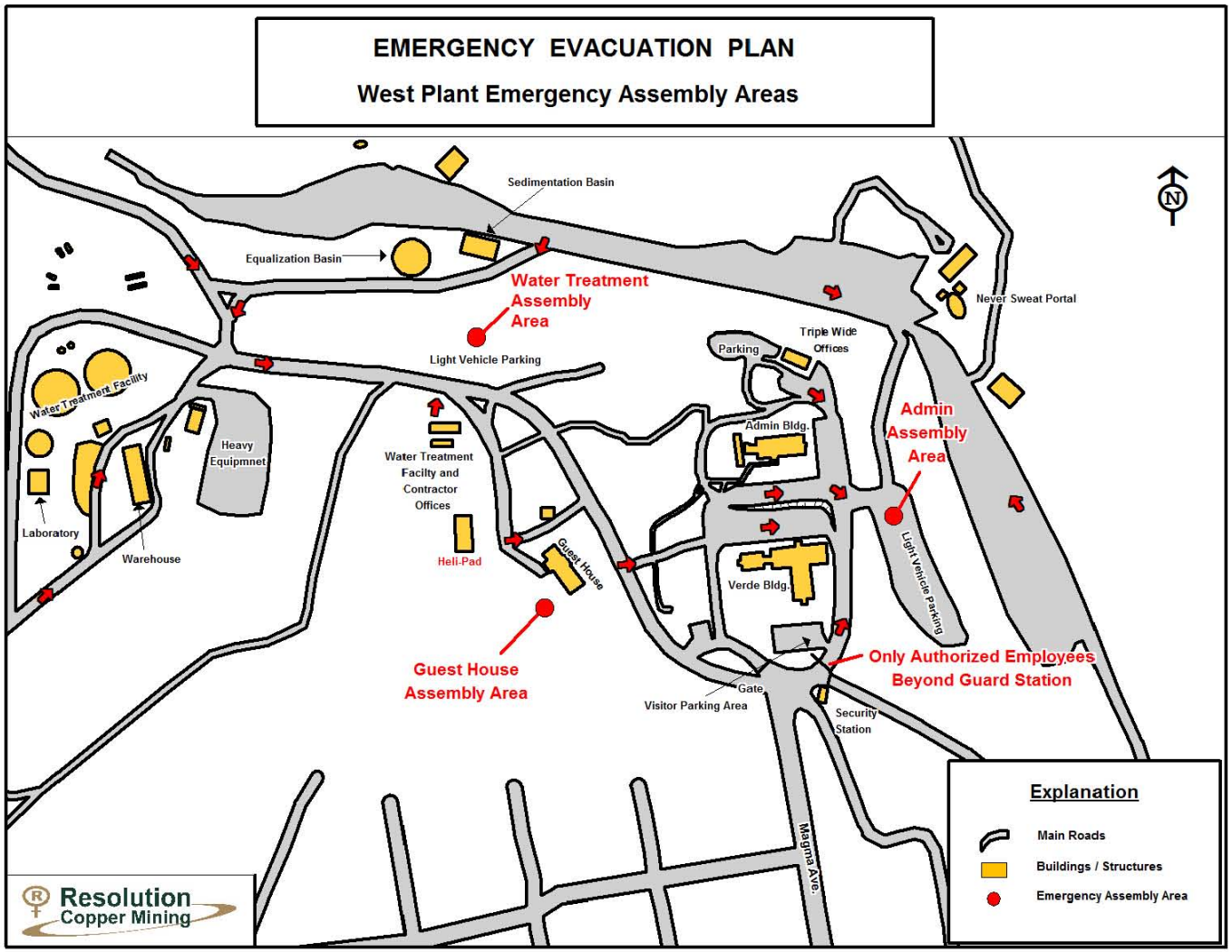
Name of Outside Agency Contacted_____

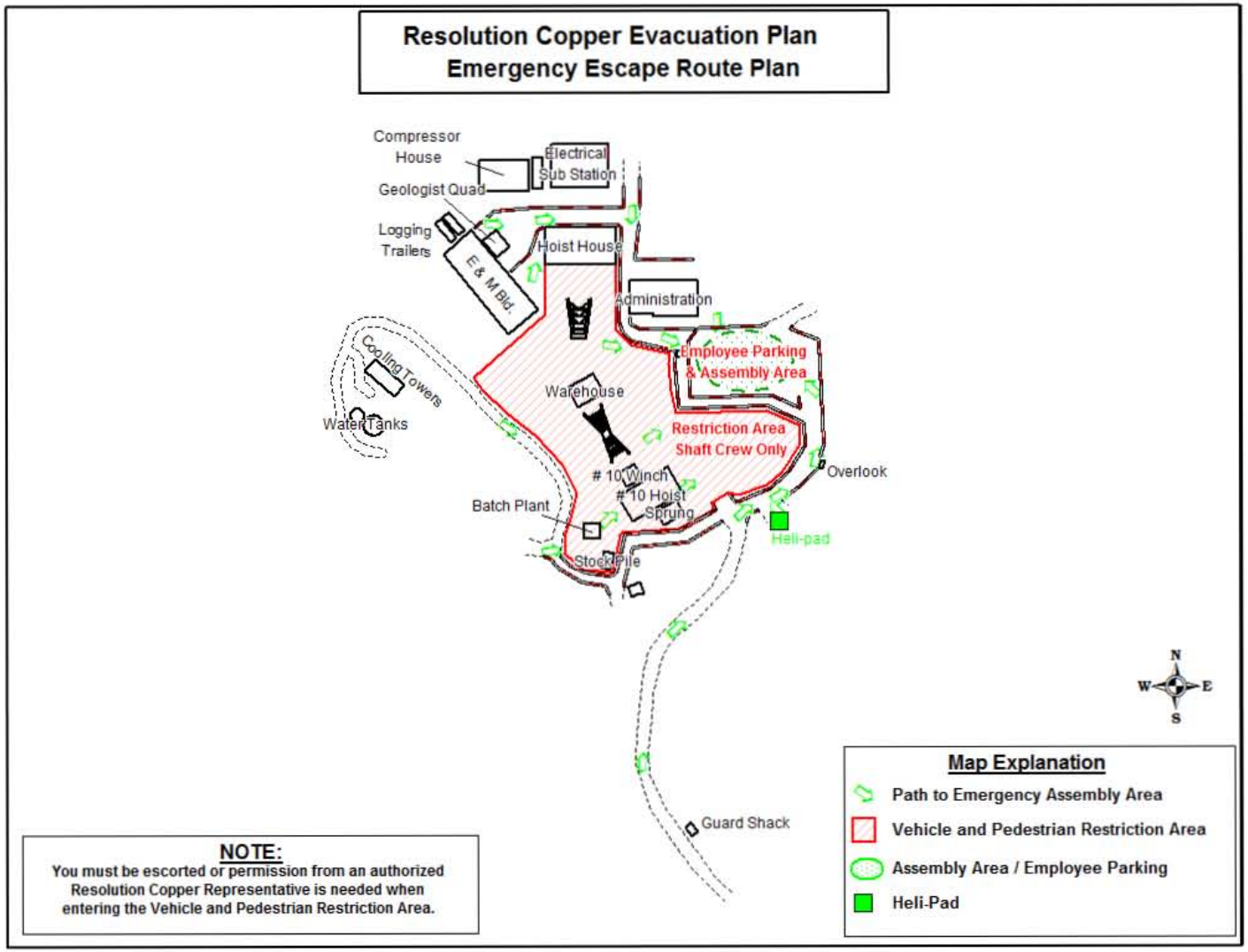
Time Contacted:____:___am/pm (*circle*)

Name of Representative _____ Phone Number:_____

**NOTES:**

# Appendix C – Surface Evacuation Plans


EMERGENCY EVACUATION PLAN
West Plant Emergency Assembly Areas
Sedimentation Basin
Equalization Basin
Water Treatment Assembly Area
Light Vehicle Parking
Never Sweat Portal
Triple Wide Offices
Parking
Admin Bldg.
Admin Assembly Area
Water Treatment Facility
Heavy Equipmnet
Water Treatment Facilty and Contractor Offices
Laboratory
Warehouse
Heli-Pad
Guest House
Verde Bldg.
Light Vehicle Parking
Guest House Assembly Area
Only Authorized Employees Beyond Guard Station
Gate
Visitor Parking Area
Security Station
Magma Ave.
N
Explanation
Main Roads
Buildings / Structures
Emergency Assembly Area
Resolution Copper Mining


Resolution Copper Evacuation Plan
Emergency Escape Route Plan
Compressor House
Electrical Sub Station
Geologist Quad
Logging Trailers
E & M Bld.
Hoist House
Administration
Employee Parking & Assembly Area
Cooling Towers
Water Tanks
Warehouse
Restriction Area Shaft Crew Only
# 10 Winch
# 10 Hoist
Sprung
Overlook
Batch Plant
Heli-pad
Stock Pile
Guard Shack
N
W
E
S
NOTE:
You must be escorted or permission from an authorized Resolution Copper Representative is needed when entering the Vehicle and Pedestrian Restriction Area.
Map Explanation
Path to Emergency Assembly Area
Vehicle and Pedestrian Restriction Area
Assembly Area / Employee Parking
Heli-Pad

# APPENDIX M

Fire Prevention and Response Plan




General Plan of Operations

# Fire Prevention and Response Plan

September 2014

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## ATTACHMENTS

Attachment 1. Hot Work Permit
Attachment 2. Emergency Services Agreements

# 1. INTRODUCTION

Resolution Copper Mining, LLC (Resolution Copper) submitted a General Plan of Operations (Plan), dated November 2013, to the Tonto National Forest (TNF) for authorization to construct an underground mine, ore processing operation, and associated facilities and infrastructure near Superior, Pinal County, Arizona. These components are collectively identified as the Resolution Copper Project (Project). The proposed location for the Project is referred to as the General Project Area (GPA) as defined in the submitted Plan.

The main sites and associated primary project elements within the GPA include:

- East Plant Site (EPS) – Underground mine and attendant shafts and surface support facilities;
- West Plant Site (WPS) – Ore and development rock stockpiles, Concentrator (ore processing facilities), and administrative facilities;
- Tailings Storage Facility (TSF) – Tailings storage area and associated Tailings Corridor (distribution pipeline and access roads);
- The Magma Arizona Railroad Company (MARRCO) Corridor (existing and future pipelines) ; and
- Filter Plant and Loadout Facility

A fully developed Fire Prevention and Response Plan would be implemented by Resolution Copper to reduce the probability and seriousness of a fire underground and at surface facilities. This preliminary plan is intended to describe Resolution Copper's existing fire prevention and response policies and procedures as well as those to be developed as the Project advances. The following sections identify Resolution Copper's general procedures for permitted burns (***Section 2***), fire prevention and response (***Section 3***), facility plan development (***Section 4***), and employee training (***Section 5***). A final Fire Prevention and Response Plan for all facilities would be prepared in accordance with Rio Tinto's corporate Health, Safety, and Environmental standards, Mine Safety and Health Administration (MSHA) regulations and all other applicable federal, state, and local requirements upon finalization of the Project and Plan.

# 2. PERMITTED BURNS

Resolution Copper does not conduct permitted burns other than hot work operations. Hot work is work that can produce a source of ignition and includes welding, cutting, grinding, and soldering activities. All hot work must be permitted before work start-up, and the permit must remain at the job site until either the job is complete or a new permit is issued. The permit becomes void if any conditions change, and an expired permit must be sent to the safety office. When the work is complete and the site is verified as being free from fire risk, a signed copy of the hot work permit must be sent to the Resolution Copper safety coordinator. A copy of the hot work permit is provided as ***Attachment 1***.

The following conditions must be identified as requirements of the permit if they are applicable to the work being performed:

- Risk assessment done
- Emergency reporting procedure understood
- Fire watch appointed
- Safe work procedure reviewed
- Equipment filled with inert gas or water
- Shielding of equipment required
- Combustibles moved for 35 feet radius or shielded/wetted
- Fire extinguisher available
- Area barricaded
- Supervisor inspected area
- Ventilation monitoring required
- Explosive gases monitored
- Protective leathers worn
- Sparks/slag contained
- Water hose available
- Confined space permit required.

It should be noted that Resolution Copper's vegetation management includes weed control and mechanical brush clearing that does not require any burning.

# 3. FIRE PLANNING, PREVENTION, AND RESPONSE

## 3.1. FIRE PLANNING AND PREVENTION

Resolution Copper currently has several policies in place to help prevent fires which include weed control, brush clearing, clearing of fire breaks, strictly enforced no smoking policies, and careful storage and containment of fuels and other ignitable materials. Planning and prevention of fires is also managed through appropriate handling and storage of hazardous materials, hazardous waste inspections and recordkeeping, spill prevention and response procedures, proper use of safety equipment, resource management training, fire prevention training, and hazardous materials training. Resolution Copper abides by applicable regulatory requirements that cover these procedures as well as Rio Tinto corporate standards for health, safety, and environmental practices. As such, Resolution Copper has developed and operates under numerous plans that describe internal policies and standards for management of these issues including an Environmental Materials Management Plan, Spill Prevention Control and Countermeasure Plan, Hydrocarbon Management Plan, and an Environmental Emergency Response and Contingency Plan. Additional fire precaution measures that would be implemented for the Project are described below.

Fire and smoke alarms would be installed in all employee work areas. Systems and components would be inspected monthly. Annual testing and maintenance would be conducted for systems and components. Records of inspections would be kept on site for a minimum of five years.

Adequate and reliable illumination would be installed and maintained for all exits. Battery-powered backup would provide a minimum of 60 minutes of illumination and would be standard for all emergency lighting and exit signs. Maintenance inspections would be conducted on a monthly basis. Emergency and exit lighting systems would be tested annually.

The National Fire Protection Association (NFPA) established NFPA 10, which is the Standard for Portable Fire Extinguishers. NFPA 10 mandates the type, size, placement, and minimum number of extinguishers required for each building. Fire extinguishers would be installed in accordance with this standard.

## 3.2. EMERGENCY RESPONSE PROCEDURES

Resolution Copper currently operates under an Environmental Emergency Response and Contingency Plan which was designed as a tool to assist the facility and external emergency response agencies and organizations in their response to an emergency at the facility, including fires. In general, this plan establishes emergency response procedures for Resolution Copper staff that consists of the following steps:

- Realize an emergency situation exists (injury, explosion, fire, chemical spill/release, etc.);
- Evaluate the situation and determine the need for additional personnel and equipment;
- Isolate the area;
- Notify the front desk, security, and/or the 911 dispatcher:
    - For ALL emergencies, dial 3999 from a Cisco desk phone. If you are calling from a mobile or non-desk phone, you will dial 520-689-3999. Both of these numbers ring to a special ‘Emergency Only’ phone at Security.
- Control the situation to the best of your ability without endangering yourself or nearby personnel and property; and
- If the situation is manageable utilizing personnel and equipment on hand, conduct the following procedures:
    - Continue to assess the situation and determine what appropriately trained personnel and equipment are required to safely mitigate the situation;
    - Move all unnecessary personnel to a safe area;
    - Isolate the area to prevent unauthorized personnel from inadvertently entering the area; and
    - Contact Security and/or the 911 dispatch if the situation cannot be mitigated safely with equipment and personnel on hand.

Resolution Copper maintains an onsite mine rescue team and has assigned emergency response coordinators. Designated personnel are trained to meet the Occupational Safety and Health Administration's (OSHA's) Hazardous Waste Site Operations and Emergency Response (HAZWOPER) training requirements. Some emergency response coordinators and personnel are trained to meet 40 hour HAZWOPER requirements for site clean-up and others are trained to meet First Responder Operations Level Training. For emergencies involving fires (beyond a minor classification) and rescue emergencies, the emergency response coordinator would establish control of the incident and isolate people from the situation.

Resolution Copper maintains contracts and agreements with outside emergency response contractors to provide emergency response support services to surface facilities on a 24/7 hour on-call basis as described further in ***Section 3.6***. Fire emergency and response procedures specific to underground operations would be prepared and implemented as described in ***Section 4.1.1***.

## 3.3. EVACUATION PROCEDURES

In general, area evacuations would be coordinated through Resolution Copper's designated emergency response coordinator and supervisors. The method for communicating evacuation may include but not be limited to the use of fire alarms, air horns, verbal instructions, phone or email notifications, and would differ slightly depending on specific building and/or work locations. Alternate evacuation routes would be designated by the emergency response coordinator as required. General evacuation plans for each facility are described in ***Section 4***. Evacuation maps and site plans for each project facility would be developed and included in the final Fire Prevention and Response Plan.

## 3.4. FIREFIGHTING

A small fire is one that does not create enough smoke, flame and heat to prevent fighting the fire using a hand-held fire extinguisher or a small water hose. Small fires would be fought by the use of a hand-held extinguisher, and personnel would make a reasonable effort to extinguish the fire. If two or more people are present, one would fight the fire while one reports the size, type and location in the event the fire grows out of control. Small fires are referred as fires in the incipient stage. Personnel would not directly engage any fire which is beyond the incipient stage, i.e., a fire which has progressed to the point it has substantially inundated the structure/equipment or one that involves explosives.

A large fire is one that creates enough smoke, flame and heat that would not allow personnel to fight the fire using normal firefighting equipment. Resolution Copper would not have the capability to fight large fires. Large surface fires would be fought by the local fire departments of Queen Valley, town of Superior in accordance with the emergency services agreements maintained with Resolution Copper (***Attachment 2***). Both fire departments have a full fleet of fire trucks for water delivery and application. Additionally, Resolution would have fire water lines at all facilities including the mine. The emergency services agreements do not include underground fire suppression services. In the event of an underground fire, Resolution Copper personnel would follow procedures to be developed as described in ***Section 4.1.1***.

## 3.5. FIRE FLOW SUPPLY

Fire flow supplies would generally be incorporated into the process water systems at all of the facilities, although separate fire supply storage tanks may be provided at certain locations. Capacity would be made available in the total system for adequate water storage for fire pump systems and firefighting. Resolution Copper plans to construct and maintain fire supply storage tanks and pump stations on site at the WPS Concentrator Complex and administration building area, EPS mine office complex, and the Filter Plant and Loadout Facility. Final building material types would determine the number of gallons of water to be stored for firefighting and fire protection purposes at each site.

## 3.6. EMERGENCY SERVICES

Resolution Copper would not have the capability to fight large fires but maintains emergency services agreements with local fire departments in Queen Valley and the town of Superior that include as-needed, on-call emergency fire suppression for surface facilities at EPS, WPS, TSF (***Attachment 2***). The agreements do not include any fire suppression services for fires underground. Other services include police, emergency life support, first aid, cardiac emergency services, and transport to area hospitals. The local fire department of Pinal County will be contacted in the event of a fire at the Filter Plant and Loadout Facility.

The fire departments are located in proximity to the proposed project facilities and as such would have prompt response times. Both fire departments have a full fleet of fire trucks for water delivery and application. Additionally, Resolution would have fire water lines at all facilities including the mine, concentrator complex, administration buildings, Filter Plant and Loadout Facility, and the TSF to supply the needed capacity in the event of a fire in those locations.

## 3.7. WILDFIRE PREVENTION

Of special concern would be the prevention of wildfires. Fire prevention policies have already been established and enforced to minimize fire potential, including those that prohibit parking on vegetated areas and those that dictate proper disposal of cigarette butts. All mine vehicles would be equipped with, at a minimum, fire extinguishers, shovels, and first aid kits.

Any vegetation cleared from the site would be temporarily stored on site at a location with minimal fire risk, well within a cleared area away from ignition sources. No vegetation burning would be conducted by Resolution Copper. Handheld and large equipment (e.g. saws, tractors) used for vegetation clearing would be equipped with spark arresters and maintained in proper working condition. Resolution Copper would take additional precautions if work is to be conducted during critical dry season, which may include larger amounts of extinguishing agents, shovels, and possibly a fire watch.

In the event of a wildfire, Resolution Copper would immediately notify the Forest Service. When the Forest Service arrives on scene, the Forest Service would assume responsibilities as incident commander and Resolution Copper would respond accordingly.

# 4. FACILITY PLANS

## 4.1. MINE FACILITIES

The EPS encompasses the proposed underground mine, associated shafts and ore handling systems, and surface support facilities. The following sections describe firefighting and evacuation plans for underground operations and surface support facilities at EPS.

### 4.1.1. UNDERGROUND OPERATIONS

Resolution Copper would conform to Rio Tinto's corporate safety standards (D01) and MSHA standards for underground operations. Fire precaution measures underground would include but are not limited to the following:

- Proper storage and handling of flammable and combustible materials
- Strict "no smoking" policies and restricted use of open flames
- Limited waste accumulation
- Prohibited use or storage of gasoline underground
- Establish a system for the installation, inspection, and maintenance of fire detection, warning, and suppression systems
- Require self-contained self-rescuers with a minimum 30-minute oxygen supply
- Implement mobile equipment controls on potential ignition sources
- Require the use of fire retardant, low-toxicity cables in new electrical installations
- There will be no long term storage of explosives underground. Small quantities of explosives will be delivered underground from the main surface magazine to the blasting area for immediate use.

#### 4.1.1.1. *Firefighting*

In the event of a small fire underground, Resolution Copper employees would be directed to use fire extinguishers, fire suppression system or fire hoses to extinguish it, provided it is safe to do so. Twenty pound fire extinguishers will be located in strategic places underground, and manually activated fire suppression systems will be provided on diesel equipment. Under no circumstances would personnel fight fires after donning of self-rescuers.

If the fire is beyond the incipient stage and is too large for immediate containment, personnel would evacuate from underground immediately. Mine rescue teams would be called out to fight uncontained fires after the mine is safely evacuated. In the event of an underground fire, efforts will be undertaken to ensure ventilation to the mine is maintained.

#### 4.1.1.2. *Evacuation Plan*

Resolution Copper's current Mine Escape and Evacuation Plan will be updated pursuant to MSHA standards (30 CFR 57.11053) to include the following:

- Mine maps showing principal air flow, location of escape routes and telephones, primary fans, primary fan controls, ventilation doors, and refuge chambers. Sections of these maps will be posted in appropriate locations.
- Procedures to show how the miners will be notified of an emergency.
- An escape plan for each working area in the mine to include instructions showing how each area will be evacuated.
- A firefighting plan.
- Surface procedure to follow in an emergency, including the notification of proper authorities, preparing rescue equipment, and other equipment which may be used in rescue and recovery operations.
- A statement of the availability of emergency communicator and transportation facilities, emergency power and ventilation and location of personnel and equipment.

### 4.1.2. EAST PLANT SITE MINE SURFACE SUPPORT FACILITIES

#### 4.1.2.1. *Firefighting*

Fire extinguishers would be made available throughout the facilities at EPS. In the event of a large fire, Resolution Copper staff would follow emergency response procedures (see ***Section 3.3***) and contact the local fire departments of Queen Valley or town or Superior.

Fire flow supplies would generally be incorporated into the service water systems at the EPS, although separate fire supply tanks may be provided at certain locations. The potable and fire flow water for the EPS would be delivered to tanks at the site and pumped as required to supply potable water and fire flow demands. A new Fire Flow Tank and diesel pump station would be constructed to supply fire flow to all EPS facilities.

#### 4.1.2.2. *Evacuation Plan*

Personnel would evacuate the EPS following the general procedures described in ***Section 3.4***. Personnel would be instructed to report to the administration office as to account for all personnel assigned to the EPS. An evacuation plan and map would be finalized as part of the final mine plan.

## 4.2. MILLING AND PROCESSING FACILITIES

### 4.2.1. WEST PLANT SITE

The WPS would include rail facilities, development rock stockpiles, new ore processing facilities (the Concentrator Complex), conveyor systems, and associated surface infrastructure (including administration buildings) to support the underground development and mining occurring at the East Plant Site.

#### 4.2.1.1. *Firefighting*

Fire extinguishers would be made available throughout the facilities at WPS. In the event of a large fire, Resolution Copper staff would follow emergency response procedures (see ***Section 3.4***) and contact the local fire departments of Queen Valley or town or Superior.

Fire flow will be provided by a fire water system specifically constructed for the WPS facilities. The Fire Water Tank will be located at the same site as the Central Arizona Project (CAP) Water Distribution Tank, and will be filled from the same CAP Water Tank supply line. The Fire Water Tank will be kept full in case of emergency, and will be equipped with a pumping station for pressurizing the fire distribution system.

#### 4.2.1.2. *Evacuation Plan*

Personnel would evacuate the WPS following the general procedures described in ***Section 3.3***. Personnel would be instructed to report to the administration office as to account for all personnel assigned to the WPS. An evacuation plan and map for the WPS would be finalized as part of the final mine plan.

### 4.2.2. TAILINGS STORAGE FACILITY

Tailings produced from ore processing would be stored in the Lower West TSF, located approximate 5 m (8 km) west of the WPS.

#### 4.2.2.1. *Firefighting*

Resolution would have fire water lines available to the TSF. In the event of a large fire, Resolution Copper staff would follow emergency response procedures (see ***Section 3.4***) and contact the local fire departments of Queen Valley or town or Superior.

#### 4.2.2.2. *Evacuation Plan*

Personnel would evacuate the TSF following the general procedures described in ***Section 3.3***. Personnel would be instructed to report to an administration office as to account for all personnel assigned to the TSF. An evacuation plan and map would be finalized as part of the final mine plan.

### 4.2.3. MARRCO CORRIDOR

The MARRCO corridor extends approximately 30 mi (48 km) from Magma Junction to the West Plant Site. The corridor includes the railroad track, concentrate pipeline, water supply pipelines, the filtrate water return line, and other utility lines (fiber optics, telephone, natural gas, electric transmission).

#### 4.2.3.1. *Firefighting*

Fire extinguishers would be made available at the Queen Valley pump station. In the event of a large fire, Resolution Copper staff would follow emergency response procedures (see ***Section 3.4***) and contact the local fire departments of Queen Valley or town or Superior.

#### 4.2.3.2. *Evacuation Plan*

Personnel would evacuate the area following the general procedures described in ***Section 3.3***. Personnel would be instructed to report to an administration office as to account for all personnel assigned to the MAARCO Corridor. An evacuation plan and map would be finalized as part of the final mine plan.

### 4.2.4. FILTER PLANT AND LOADOUT FACILITY

The Filter Plant and Loadout Facility would be constructed approximately 7 mi (11 km) northeast of Magma Junction. The Filter Plant would include a control room, three concentrate stock tanks, up to six concentrate filters, a filtrate clarifier, and compressors, as well as ancillary support facilities. Filtrate from the plant would be pumped to a 3-MG (11,400-$m^3$) tank at the southeast corner of the site. The Loadout Facility would consist of a covered stockpile with a capacity of approximately 110,000 tons (100,000 tonnes).

#### 4.2.4.1. *Fire fighting*

Fire extinguishers would be made available throughout the Filter Plant and Loadout Facility, and Resolution Copper plans to construct and maintain fire supply storage tanks and pump stations on site. In the event of a large fire, Resolution Copper staff would follow emergency response procedures (see ***Section 3.4***) and contact the local fire department of Pinal County.

#### 4.2.4.2. *Evacuation Plan*

Personnel would evacuate the building following the general procedures described in ***Section 3.3***. Personnel would be instructed to report to the administration office as to account for all personnel assigned to the Filter Plant and Loadout Facility. An evacuation plan and map would be finalized as part of the final mine plan.

## 5. EMPLOYEE TRAINING

All Resolution Copper employees would be trained on basic fire prevention, detection, and suppression tasks as well as fire extinguisher use. Employees would also be trained on emergency response

procedures, evacuation plans, and the contents of the Fire Prevention and Response Plan developed for the final mine plan of operations. Employee training would improve response time to a fire, reduce the chance of a fire spreading, and decrease the intensity of a fire.

The final Fire Prevention and Response Plan would be reviewed periodically, and Resolution Copper personnel would be trained to ensure that the plan is effective and usable. This review would help ensure that the safest and most efficient procedures are being utilized. This review would also allow input from involved individuals who may offer suggestions to make the procedures more effective.

# ATTACHMENT 1

# Hot Work Permit

# HOT WORK PERMIT

**ALL FIELDS MUST BE COMPLETED BEFORE APPROVAL**

- **PERMIT WILL REMAIN AT JOB SITE UNTIL JOB IS COMPLETE OR A NEW PERMIT IS ISSUED.**
- **EXPIRED PERMIT MUST BE SENT TO THE SAFETY OFFICE.**
- **This permit is void if conditions change.**

**DATE & TIME ISSUED__** _____

**EQUIPMENT ID & LOCATION__** _____

**WORK TO BE PERFORMED**_____

**ISSUED BY (SUPERVISOR): Signature**_____

**WORK PERFORMED BY: Signature**_____

**FIRE WATCH: Signature** _____

## PERMIT REQUIREMENTS

| | | | | | |
|---|---|---|---|---|---|
| RISK ASSESSMENT DONE | Y | N/A | AREA BARRICADED | Y | N/A |
| EMERGENCY REPORTING PROCEDURE UNDERSTOOD | Y | N/A | SUPERVISOR INSPECTED AREA | Y | N/A |
| FIRE WATCH APPOINTED | Y | N/A | VENTILATION MONITORING REQUIRED | Y | N/A |
| SAFE WORK PROCEDURE REVIEWED | Y | N/A | EXPLOSIVE GASES MONITORED | Y | N/A |
| EQUIPMENT FILLED WITH INERT GAS OR WATER | Y | N/A | PROTECTIVE LEATHERS WORN | Y | N/A |
| SHIELDING OF EQUIPMENT REQUIRED | Y | N/A | SPARKS/SLAG CONTAINED | Y | N/A |
| COMBUSTIBLES MOVED FOR 35 FEET RADIUS OR SHIELDED/WETTED | Y | N/A | WATER HOSE AVAILABLE | Y | N/A |
| FIRE EXTINGUISHER AVAILABLE | Y | N/A | CONFINED SPACE PERMIT REQUIRED | Y | N/A |

| **SPECIAL INSTRUCTIONS** |
|---|
| |

## WORK COMPLETED AND SITE VERIFIED FREE FROM FIRE RISK

**SIGNED COPY TO BE SENT TO RCML SAFETY COORDINATOR**

| | |
|---|---|
| **DATE:** | **TIME:** |
| **SUPERVISOR** | **SIGNATURE** |
| **WORK PERFORMED BY.** | **SIGNATURE** |
| **FIRE WATCH** | **SIGNATURE** |

# ATTACHMENT 2

# Emergency Services Agreements

# QVFD-Resolution 6/11/2014-02

The **QUEEN VALLEY FIRE DISTRICT** adopts the following **MEMORANDUM OF UNDERSTANDING AND SUPPORT AGREEMENT REGARDING FIRE PROTECTION, RESCUE AND EMERGENCY MEDICAL SERVICES** entered into by and between RESOLUTION COPPER MINING LLC("RCM") and QUEEN VALLEY FIRE DISTRICT (the "District"), a fire district organized and existing under Title 48 of the Arizona Revised Statues.

WHEREAS RCM is the operator of the Resolution Mine, Mine ID No. 0200152, Pinal County, Arizona, and utilizes certain parcels of real property in conjunction with RCM's activities at the Resolution Mine (collectively the "Resolution Mine Property"; and

WHEREAS RCM is located in the service area of Pinal County and desires to improve access to emergency services and response times; and

WHEREAS RCM currently contracts for emergency services, including fire protection, rescue, and emergency medical services, with the Town of Superior, Arizona; and

WHEREAS the District has entered into an Automatic Mutual Aid Agreement, with the effective date of **July 1, 2014**, by which the District provides fire protection, rescue, and emergency medical services to the Town of Superior Fire Department (the "Mutual Aid Agreement"); and

WHEREAS RCM and the District wish to have a clear understanding regarding the nature of the services that the District will provide to RCM under the Mutual Aid Agreement; and

WHEREAS RCM wishes to support the District's ability to provide fire protection, rescue, and emergency medical services to the Resolution Mine Property under the Mutual Aid Agreement;

THEREFORE RCM and the District agree as follows:

1. Services provided. The District shall provide fire protection, rescue, and emergency medical services to the Resolution Mine Property in accordance with the Mutual Aid Agreement. The District's provision of such services shall be for the surface areas of the Resolution Mine Property only. The Resolution Mine Property is identified in Exhibit A

2. Obligations of District. During the term of this Agreement the District agrees that the District shall:

    a. At all times maintain its status as a fire district organized under Title 48 of the Arizona Revised Statutes, and comply with National Fire Protection Association (NFPA) standard 1720.

    b. Require that all District firefighters maintain a Firefighter I or higher NFPA certification, or an equivalent level certification from an IFSAC-certified training facility.

c. Operate and maintain sufficient firefighting equipment to be able to comply with its obligations under the Mutual Aid Agreement. Such equipment shall be maintained in compliance with the NFPA standards for automotive fire apparatus. As of the effective date of this Agreement, the District represents that Command 551, BC 551, Rescue 551, Engine 551, Engine 552, Water Tender 551, Tender 552, Brush 551, Brush 552, Brush 553 are all available to provide support to the Resolution Mine Property under the Mutual Aid Agreement.

d. Maintain workers' compensation for its personnel, and shall be deemed the statutory employer of any District personnel who provide services to RCM under this Agreement.

e. Ensure that all District personnel who may respond to the Resolution Mine Property have up-to-date MSHA Part 48 site-specific hazard training.

f. Lead development of an emergency-response plan for the Resolution Mine Property, to include mapping, identification of surface structures and contents, and different types of emergent situations that may require response from the District under the Mutual Aid Agreement. The emergency-response plan shall be completed no later than September 30, 2014.

g. Conduct an annual "fire drill" exercise on RCM property to help prepare RCM staff for emergency staging and evacuation.

3. RCM obligations.

a. Support payment. To further and support the District's ability to provide services under the Mutual Aid Agreement to the Town of Superior Fire Department, RCM agrees to pay a support payment in amount of one hundred twenty-five thousand dollars $125,000.00 (the "Support Payment"). RCM will pay the Support Payment to the District over five years in five installments. Subject to the adoption this Agreement by resolution of the District Board, RCM's first installment will be a cash payment to the District in the amount of twenty-five thousand dollars ($25,000.00), to be paid to the District on or before July 1, 2014. RCM's four additional cash installments of twenty-five thousand dollars ($25,000.00) each will be paid to the District on the annual anniversary of the first installment date in 2015, 2016, 2017, and 2018.

The intended purpose of the Support Payment is to assist the District with the care and proper maintenance of equipment, facilities, enhance staff training, staff compensation, and the general readiness of the District's operations.

The Support Payment shall be the only financial reimbursement that the District shall receive from RCM for the provision of services under the Mutual Aid Agreement, and the District shall not be entitled to collect any fee-for-service from RCM for services provided to RCM under the Mutual Aid Agreement.

b. MSHA training. RCM shall provide site-specific MSHA training for District personnel within thirty (30)days of the effective date of this agreement. The District shall provide a list of personnel names and contact information to RCM so that RCM may schedule training. The District acknowledges that this training will be effective for one (1) year following the training date. The District shall use best efforts to work with RCM to ensure that District personnel are re-trained every twelve (12) months. If new personnel are hired-in or recruited-to the District, such personnel must receive MSHA training prior to being eligible to respond to the Resolution Mine Property.

c. Work with the District to develop an emergency-response plan for the Resolution Mine Property, to include mapping, identification of surface structures and contents, and different types of emergency situations that may require response from the District under the Mutual Aid Agreement.

4. No agency, joint venture, or partnership, no third party beneficiaries, and no assumption of obligations. It is specifically understood and agreed to by the parties that the RCM operations are a private venture, and that the District is a public fire district, and that this Agreement does not create any type of agency relationship, joint venture, or partnership between the parties. Nothing in this Agreement is intended to create duties, obligations to, or rights in third parties not parties to this Agreement, and as such this Agreement shall not be construed as or deemed to be an agreement for the benefit of any third party or parties. For the avoidance of doubt, independent obligations the District, including but not limited to, financial or other obligations that the District may have under the Mutual Aid Agreement, or other aid agreements, shall remain solely the responsibility of the District.

5. Assignment and Inurement. This Agreement shall inure to the benefit and shall be binding upon RCM and the District and their respective successors and assigns.

6. No Fault Terminations. RCM may terminate this Agreement, in whole or in part, at any time and for any reason upon giving the District not less than thirty (30)days written notice.

7. For Cause Termination. RDCM will not be obligated to continue to perform under this unless, at the time in question, the District is in substantial compliance with its representations, warranties and obligations hereunder. If the District is not in substantial compliance, RCM shall provide the District with written notice of such breach in the manner set forth herein and thereafter, RCM's obligations hereunder shall be suspended until such noncompliance has been cured by the District. If the noncompliance is not cured within a reasonable time of such notice, or, in any event, continues for

more than six months, RCM may declare a default under this Agreement and the and seek monetary damages, specific performance or may exercise or enforce any or all of the rights and remedies provided at law or in equity.

8. General.

a. Entire agreement. This Agreement shall constitute the sole understanding of the parties with respect to the subject matter hereof, and supersedes any prior understandings, agreements, or representations, verbal or written. No modification or amendment of the terms of this Agreement shall be binding unless such modification or amendment in writing and executed by both parties.

b. Further assurances. Each party agrees to undertake and perform all further acts that are reasonably necessary to carry out the intent and purposes of the Agreement.

c. Construction and severability. The title headings of the various sections of this Agreement are inserted for convenience only and shall not be deemed to be a part of this Agreement. This Agreement has been reviewed by the parties with their respective counsel, and no presumption or rule that ambiguities shall be construed against the drafting party shall apply to the interpretation or enforcement of this Agreement. If any provision of this Agreement shall be held to be invalid or unenforceable, the remaining provisions shall remain valid and enforceable to the fullest extent permitted by law.

d. Choice of law. This Agreement shall be governed and interpreted in accordance with the laws of the State of Arizona, excluding any conflict of law principles that would require the application of the law of any other jurisdiction.

e. Dispute resolution. The parties will work in good faith to resolve any dispute which arises under this Agreement. If a dispute arises, and a party wishes to trigger the dispute resolution mechanism set forth in this paragraph, the party shall give formal written notice, specifying the nature of the dispute, to the other party as set forth in paragraph 12. If the dispute is not resolved within seven (7) days after notice is given, each party shall nominate, by written notice to the other party, a representative from its senior management to attempt to resolve the dispute. Following nomination, the parties shall endeavor to resolve their dispute through direct negotiation, or if the parties further agree, through nonbinding mediation utilizing a mediator agreed-upon by both parties. If the dispute is not resolved within ninety (90) days after senior management is nominated under this paragraph, then either party may pursue its respective remedies in a court of competent jurisdiction, state or federal, located within the City of Phoenix, Arizona. EACH PARTY FURTHER WAIVES TO THE FULL EXTENT PERMITTED BY LAW THE RIGHT TO TRIAL BY JURY.

f. Terms. This Agreement shall terminate on July 1, 2019, except for those provisions that expressly survive.

12. Notice. All notices required or permitted under this Agreement shall be set forth in writing and shall be sent either by personal delivery, or a reputable overnight courier which keeps receipts of such delivery (UPS, or Federal Express), through the United States Mail, postage prepaid, certified or registered mail, returned receipt requested. Any such notice shall be effective upon delivery, if delivered by personal delivery or overnight courier, and seventy-two (72) hours after dispatch, if sent

by Untied States Mail. Notices shall be sent to the respective parties as follows unless written notice of a change of address has been previously provided pursuant to this paragraph:

To Resolution Copper Mining LLC:

c/o Resolution Copper Company
102 Magma Heights
Superior, AZ 85273
Attn:_____

Resolution Copper Mining LLC

To Queen Valley Fire District
1494 E. Queen Valley Dr.
Queen Valley, AZ 85118
Attn: Cecil G. Fendley, Chief

13. Effective date. This Agreement shall become effective upon execution by RCM and adoption by resolution of the District Board. The District shall send RCM a copy of the minutes of the board meeting at which such adoption occurs.

**Resolution Copper Mining LLC**

By: Cecil G Fendley

Resolution Copper Mining LLC
a Delaware limited liability company

Title: Fire Chief

By: Resolution Copper Company, as Manager and not on its own behalf.

Date: 6-11-14

By: _____

Title: Project Director

Date: 07-22-14

**Queen Valley Fire District**

Queen Valley Fire District
A public fire district created and existing
Under the laws of the State of Arizona

# EMERGENCY SERVICES AGREEMENT

**THIS EMERGENCY SERVICES AGREEMENT** (this "**Agreement**") is entered into as of the "**Effective Date**" (as defined herein) by and between the Town of Superior, an Arizona municipal corporation (the "**Town**"), and Resolution Copper Mining LLC, a Delaware limited liability company ("**RCML**"), acting by and through its manager, Resolution Copper Company, and not in its own capacity.

## RECITALS

A. RCML owns land adjacent to or near the municipal boundaries of the Town, more particularly described in Exhibit A (the "**RCML Property**"). The RCML Property currently includes several different parcels of land, including the "**West Plant Site**", the "**East Plant Site**", and "**Smelter Town**", each depicted on the map attached hereto as Exhibit A-1.

B. Previously, the Town has provided certain police, fire suppression and ambulance emergency services to RCML for the RCML Property, for which RCML has paid to the Town $12,500 for each of the calendar years 2004 and 2005, $40,000 for the calendar year 2006, and $40,000 for the calendar year of 2007. RCML and Town desire to enter into an agreement for the future provision of such services, as set forth herein.

C. RCML and Town entered into that certain Services and Support Memorandum of Understanding dated September ___, 2007, which contemplates RCML and the Town entering into a more definitive agreement in connection with the agreements and principles set forth therein.

D. The Town is willing to enter into this Agreement based on its determination that this Agreement promotes the goals of the Town in furtherance of its public policies, including its land use policies, goals, and other requirements, to promote the public health, welfare, and safety, and in the exercise of its legislative powers and in its sole discretion has elected to enter into this Agreement.

## AGREEMENT

NOW THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged and intending to be legally bound, RCML and the Town agree as follows:

1. **Provision of Emergency Services**. Pursuant to the terms of this Agreement, the Town hereby agrees to provide or cause to be provided certain emergency services described below (collectively the "**Emergency Services**") to the RCML Property. In the event RCML acquires additional property in the vicinity of the Town through a land exchange with U.S. Government or from BHP Copper Inc., such additional real property shall be considered part of the RCML Property for purposes of this Agreement and the Town shall provide or cause to be provided Emergency Services to all of the RCML Property, including such additional real property. The Town and RCML acknowledge and agree that the level of Emergency Services may vary from time to time. Nothing contained in this Agreement shall be deemed to affect the

provision of similar emergency services or other services for any area within the Town boundaries, including that portion of Smelter Town that is within the Town boundaries.

2. **Description of Emergency Services.** The Emergency Services to be provided by the Town hereunder shall include all of the following services provided by any provider of Emergency Services hereunder, including the Town's police department, paramedics (if any) and fire department (each, an "**Emergency Service Provider**"), as required by RCML from time to time:

(a) Police services, which shall include response to emergency calls for crimes in progress and other circumstances involving imminent threats to life and property. Investigative police services and security services outside of the Town boundaries shall not be included in the Emergency Services and RCML agrees that it shall obtain such services from law enforcement personnel having jurisdiction over such matters. Notwithstanding the foregoing, RCML, in its discretion, may independently hire individual Town police officers for security services for RCML, provided, however, that the Town has no responsibility for any such service and any such services shall be deemed to be outside the scope of this Agreement.

(b) Fire suppression services, which shall include emergency fire suppression services for fire outbreaks on the surface and in above-ground improvements on the RCML Property. Nothing herein shall require the Town to provide fire suppression services for any underground fire on the RCML Property.

(c) Ambulance services, which shall include ambulance and paramedic services to the extent available to the Town, including emergency life support, first aid, cardiac emergency services, and transport to area hospitals. Nothing herein shall require the Town to provide ambulance services to underground facilities on the RCML Property.

3. **Conditions to Provision of Emergency Services.**

(a) The Town shall provide to the RCML Property the same level of Emergency Services as are provided to residents of the Town within the Town boundaries, with reasonable differences attributable to distance and access routes serving the RCML Property from the location of the Emergency Service Provider within the Town boundaries, and nothing in this Agreement shall require the Town to provide to RCML any Emergency Services which are not provided to the rest of the Town. The Emergency Service Providers may be located in the Town and are not required by this Agreement to be located on the RCML Property.

(b) Emergency Services shall be provided by the Town on as as-needed, on-call basis. Each Emergency Service Provider shall respond to any request for Emergency Services on the RCML Property pursuant to its regular response protocol for emergency calls. RCML acknowledges that the Emergency Services shall be provided based on the priority of such request, and that at the time of a request for Emergency Services an Emergency Service Provider may not be able to respond due to prior or higher priority requests within the Town's municipal boundaries or elsewhere on the RCML Property. In such event, the Emergency Services Provider shall use all reasonable efforts to respond to requests for Emergency Services

as soon as possible. RCML acknowledges that it may have to seek Emergency Services from the County of Pinal, Arizona ("**County**") or elsewhere.

(c) Nothing herein shall be deemed to limit the right of RCML to obtain the same or similar Emergency Services from other entities that may offer to provide the same from time to time, including the County and from its own forces, or to limit RCML's use of Emergency Services exclusively to the Town.

4. **Payment for Emergency Services**.

(a) Pursuant to the terms of this Agreement, the Town shall invoice RCML for the following amounts, and RCML shall pay to the Town in advance an annual lump sum payment amount equal to One Hundred Thousand Dollars ($100,000) per year, as may be adjusted upward as provided herein. The initial payment shall be made on or before April 15, 2008 to cover the Town fiscal year period from July 1, 2008 to June 30, 2009. Each subsequent payment shall be made on or before February 15 of each year during the term of this Agreement, which payment shall be applicable to services provided during the following Town fiscal year beginning July 1 and ending June 30 of the relevant years. For each payment made after the initial payment, the amount of the payment shall be the amount of the payment for the previous year, adjusted by the percentage change of the Implicit Price Deflator from the previous year. For example, the payment for 2008 shall be $100,000. If the Implicit Price Deflator shows a 3% increase from 2008 to 2009, the payment to be made on or before February 15, 2009 shall be $103,000. Similarly, if the Implicit Price Deflator shows a 3% increase from 2009 to 2010, the payment to be made on or before February 15, 2010 shall be $106,090 (which is 103% of $103,000). As used herein, the term "**Implicit Price Deflator**" means the United States Department of Commerce, Bureau of Economic Statistics, Implicit Price Deflator for Gross Domestic Product, or its successor index, using as the base year the immediately preceding calendar year for such adjustments. Any such amounts due hereunder shall be rounded to the nearest whole dollar amount. The Town acknowledges that RCML has previously paid for the provision of Emergency Services for the period beginning on the Effective Date until July 1, 2008.

(b) The Town shall include in its annual budget each year an amount equal to the amount of the payment made by RCML for the relevant year pursuant to this Agreement. The parties acknowledge that the provision of Emergency Services to the RCML Property shall be funded by RCML as set forth herein, and shall not be provided from the Town's general funds. Such funds shall supplement the public safety portion of the Town's budget as enhancements to and increases in the Town budget for such items, and shall not supplant any portions that would otherwise be provided by the Town. In the event the Town fails to include the amount of payment made by RCML in its applicable annual budget, it shall not be an Event of Default hereunder and the Town shall promptly return the payment to RCML by July 1 of such year.

(c) The amounts paid by RCML hereunder shall only be applied to that portion of the Town's budget for public safety, including police, fire, and ambulance departments, and shall not be expended for any other purpose.

5. **Term of Emergency Services Obligations.** Subject to the provisions set forth in this Agreement, the initial term of this Agreement shall be a five (5) year term commencing on July 1, 2008, and expiring on June 30, 2013, as automatically extended or earlier terminated pursuant to the terms hereof. The term of this Agreement shall continue on an evergreen year-to-year basis, unless terminated as set forth herein. Either party shall have the right to terminate the obligations set forth in this Agreement upon the expiration of the initial five (5) year term, or on any anniversary thereafter, by providing prior written notice of termination to the other party at least one year in advance of such termination.

6. **Events of Default; Remedies.**

(a) Events of Default. The occurrence of any of the following events shall constitute an "**Event of Default**" (whether such events shall be voluntary or involuntary or come about or be effected by operation of law or pursuant to or in compliance with any judgment, decree or order of any court or any order, rule or regulation of any administrative or governmental body) and shall be just cause for termination:

(i) a party's failure to make any payment due hereunder on any due date thereof, which is not cured within ten (10) business days after written notice of the same has been given by the non-defaulting party; provided, however, that in the event the Town fails to include such amounts in the relevant budget, non-payment by RCML shall not be an Event of Default hereunder;

(ii) a party's failure to observe or perform any of its other covenants and obligations under this Agreement and its failure to fully cure the same within thirty (30) days after written notice thereof to such party; provided, however, that failure by the Town to include the payments by RCML in its annual budget shall not be an Event of Default hereunder;

(iii) any representation or warranty of a party herein or in any document or certificate furnished to the other party in connection herewith or pursuant hereto shall prove to be incorrect in any material respect; and

(iv) a party shall (A) become insolvent; (B) generally not pay its debts (trade or other) as they become due; (C) file, or consent by answer or otherwise to the filing against it of, a petition of relief or reorganization or arrangement or any other petition in bankruptcy, for liquidation or to take advantage of any bankruptcy or insolvency law of any jurisdiction; (D) make an assignment for the benefit of its creditors; (E) consent to the appointment of a custodian, receiver, trustee or other officer with similar powers of itself or of any substantial part of its property; or (F) take corporate action for the purpose of any of the foregoing; (G) or if a court or governmental authority of competent jurisdiction shall enter an order appointing, without consent by a party, a custodian, receiver, trustee or other officer with similar powers with respect to it or with respect to any substantial part of its property, or constituting an order for relief or approving a petition for relief or reorganization or any other petition in bankruptcy or for liquidation or to take advantage of any bankruptcy or insolvency law of any jurisdiction, or ordering the dissolution, winding-up or liquidation of a party, or if any such petition shall be filed against a party and such condition is not reversed or such petition

shall not be dismissed within thirty (30) days; or (H) any similar event in any jurisdiction in which a party is in operation has occurred.

(b) Remedies. Upon the occurrence of any Event of Default and at any time thereafter so long as the same shall be continuing, the non-defaulting Party may, at its option, declare the Agreement to be in default, except in the case of any event in Section 6(a)(iv) occurring, in which case this Agreement shall automatically be in default and shall automatically terminate without notice to the non-defaulting party. Except with respect to an event in Section 6(a)(iv), at any time after any other Event of Default, and so long as the same is continuing, the non-defaulting party may do one or more the following with respect to all or any part of the Agreement as the non-defaulting party in its sole discretion shall elect, to the extent permitted by, and subject to compliance with any mandatory requirements of applicable law then in effect:

(i) The non-defaulting party may proceed by appropriate court action or actions to enforce specific performance of this Agreement for the applicable fiscal year and/or or to recover damages for the breach thereof; provided, however, the amount of the damages that may be recovered is capped at the amount paid by RCML for the year in which the Event of Default occurred;

(ii) Where RCML is the non-defaulting party, RCML may suspend any payment contemplated in this Agreement pending any cure of such Event of Default;

(iii) The non-defaulting party may terminate this Agreement.

(iv) Notwithstanding anything herein to the contrary, in the event the Town fails to include in its annual budget payments by RCML as contemplated hereunder, RCML shall have the right to suspend any payment contemplated in this Agreement and may terminate this Agreement effective as of the subsequent June 30.

(c) Remedies Cumulative. Each and every remedy hereby specifically given a non-defaulting party shall be in addition to every other remedy specifically so given, and each and every remedy may be exercised from time to time individually or simultaneously and as often and in such order as may be deemed expedient by the non-defaulting party. All such remedies shall be cumulative and the exercise of one shall not be deemed a waiver of the right to exercise any other or others.

(d) Waiver. No delay in exercising any right or remedy shall constitute a waiver thereof, and no waiver by RCML or the Town for the breach of any covenant of this Agreement shall be construed as a waiver of any preceding or succeeding breach of the same of any other covenant or condition of this Agreement.

7. **Miscellaneous Provisions**.

(a) Notice. All notices required or permitted under this Agreement shall be in writing and shall be sent by either personal delivery, a reputable overnight courier which keeps receipts of delivery (such as UPS or Federal Express), through the facilities of the United States Post Office, postage prepaid, certified or registered mail, return receipt requested. Any such notice shall be effective upon delivery, if delivered by personal delivery or overnight courier, and

seventy-two (72) hours after dispatch, if sent by U.S. postal service in accordance with the above. Notices sent to the respective parties shall be sent to the following addresses unless written notice of a change of address has been previously given pursuant hereto:

| | |
|---|---|
| To Town: | Town of Superior<br>734 W. Main St.<br>Superior, Arizona 85273<br>Attention: Mayor |
| To RCML: | Resolution Copper Mining LLC<br>c/o Resolution Copper Company<br>102 Magma Heights<br>Superior, Arizona 85273<br>Attention: President<br>Tel: 520 689 3341<br>Fax: 520 689 2471 |

(b) Applicable Law. This Agreement shall be governed by and interpreted under the laws of the state of Arizona, excluding any conflict of law principles that would require the application of the law of any other jurisdiction.

(c) Further Assurances. Each party agrees to undertake and perform all further acts that are reasonably necessary to carry out the intent and purposes of the Agreement at the request of the other party.

(d) No Agency, Joint Venture, or Partnership. It is specifically understood and agreed to by the parties that the RCML operations are a private venture, and this Agreement in no way creates any type of agency relationship, joint venture, or partnership among RCML and the Town.

(e) Construction. This Agreement has been reviewed and revised by legal counsel for RCML and the Town, and no presumption or rule that ambiguities shall be construed against the drafting party shall apply to the interpretation or enforcement of this Agreement. The descriptive headings of the paragraphs of this Agreement are inserted for convenience only and shall not control the meaning or construction of any of the provisions hereof.

(f) Severability, Invalidity. If any provision of this Agreement shall be held to be unconstitutional, invalid, or unenforceable by a court of competent jurisdiction or as a result of any legislative action, such holding or action shall be strictly construed. Furthermore, provided the parties are still able to retain all of the material benefits of their bargain hereunder, such provision shall be construed, limited, or if necessary, severed, but only to the extent necessary to eliminate such invalidity or unenforceability, and the other provisions of this Agreement shall remain unaffected and this Agreement shall be construed and enforced as if such provision in its original form and content had never comprised a part hereof.

(g) Dispute Resolution. Under all circumstances, any disputes that are not otherwise resolved by agreement of the parties shall be resolved by litigation. Any litigation

shall be instituted only in a court of competent jurisdiction, whether state or federal, located within the city of Phoenix, Arizona. If any such litigation is commenced, each party irrevocably consents and submits to personal jurisdiction of any such court and to the service of process upon them in accordance with the rules or statutes governing service of process; provided that nothing in this Section 7(g) shall be deemed to prevent either party from seeking to remove any action to federal court in Phoenix, Arizona. EACH PARTY FURTHER WAIVES TO THE FULL EXTENT PERMITTED BY LAW (i) THE RIGHT TO TRIAL BY JURY, (ii) ANY OBJECTION THAT IT MAY NOW OR HEREAFTER HAVE TO VENUE IN ANY SUCH LITIGATION IN A COURT OF COMPETENT JURISDICTION, WHETHER STATE OR FEDERAL, IN PHOENIX, ARIZONA, AND (iii) ANY CLAIM THAT ANY SUCH LITIGATION HAS BEEN BROUGHT IN AN INCONVENIENT FORUM.

(h) Effective Date. The **"Effective Date"** of this Agreement means the date on which both parties have signed this Agreement and it has been first ratified by the Town Council.

(i) Entire Agreement, Amendment. This Agreement, together with all exhibits and attachments, constitutes the entire agreement between the parties and supersedes any prior understandings, agreements, or representations, verbal or written, and specifically supersedes the Services and Support Memorandum of Understanding. Except as expressly provided herein, this Agreement shall not be amended except in a written form executed by both of the parties. In the case of the Town, such amendment shall be made pursuant to a vote of the Town Council taken with the same formality as the vote approving this Agreement.

[Signatures on following page.]

IN WITNESS WHEREOF, RCML and the Town have executed this Agreement by their duly authorized representatives effective as of the Effective Date.

**RCML:**

**RESOLUTION COPPER MINING LLC,** a Delaware limited liability company

By: Resolution Copper Company, as Manager and not in its own behalf.

By: _____

Print Name: David Salisbury

Title: President, Resolution Copper Company, as Manager

Date: April 17, 2008

**TOWN:**

**THE TOWN OF SUPERIOR,** a municipal corporation

By: _____

Print Name: Mayor Michael Hing

Title: Mayor

Date: _____, 2008

Attested to:

By: _____

Print Name: Melanie Oliver

Title: Interim Town Manager

Date: _____, 2008

Approved as to Form:

By: _____

Print Name: Michael F. Beers

Title: Town Attorney

Date: _____, 2008

# APPENDIX N

Stormwater Drainage Design

# STORMWATER DRAINAGE DESIGN MEMORANDUM

**Prepared for:** Resolution Copper Mining

**Prepared by:** WestLand Resources, Inc.

**Date:** September 23, 2014

**Project No.:** 807.94 07

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# 1. INTRODUCTION

Resolution Copper Mining, LLC (Resolution Copper) proposes to construct an underground mine, ore processing operation, and associated facilities and infrastructure near the town of Superior in Pinal County, Arizona (***Figure 1***). These components are collectively identified as the Resolution Copper Project (Resolution Project or Project). Resolution has submitted a General Plan of Operations (Plan) to the US Forest Service (USFS), Tonto National Forest (TNF) for authorization to use National Forest System lands for a portion of the Project. WestLand Resources, Inc. (WestLand) has prepared this stormwater drainage design memorandum to describe the preliminary design, layout, and strategies for stormwater management at sites and facilities associated with the proposed Resolution Project. If the Project is approved, the stormwater management systems described herein would be advanced through the design process.

The main sites and Project facilities are (***Figure 2***):

- East Plant Site (EPS);
- West Plant Site (WPS);
- Tailings Storage Facility (TSF);
- Filter Plant and Loadout Facility; and
- Magma Arizona Railroad Company (MARRCO) Corridor.

The EPS is approximately 68 miles east of Phoenix and 2 miles east of Superior in Section 32, Township 1 South, Range 13 East, of the Gila and Salt River Baseline and Meridian. The EPS encompasses the proposed underground mine, associated shafts, and surface support facilities. The existing mine and related surface support facilities are on private lands, and during mine operations would largely expand onto private lands. The support facilities, some of which already exist, are in a previously disturbed area and include a mine site where Shaft 9 was constructed in the 1970s. Additional area encompassed by the EPS includes the land surface above the ore body, comprised of unpatented mining claims on the Tonto National Forest and Arizona State Trust lands administered by the Arizona State Land Department (ASLD).

The WPS is approximately 65 miles east of Phoenix and 1 mile north of Superior in Section 32, Township 1 South, Range 13 East of the Gila and Salt River Baseline and Meridian. The WPS is on Resolution Copper private property and the Tonto National Forest. The WPS encompasses ore and development rock stockpiles, the Concentrator Complex (ore processing facilities), and administrative facilities.

The TSF will be situated west of the WPS and north of Queen Station, within the Tonto National Forest. The TSF will consist of the tailings storage area and associated Tailings Corridor (distribution pipeline and access roads). Tailings will arrive at the TSF from the WPS via a pipeline that traverses the intervening area (along with other infrastructure) along the Tailings Corridor.

The Filter Plant and Loadout Facility will be constructed near Magma adjacent to the existing Magma Arizona Railroad Company (MARRCO) right-of-way. The Filter Plant and Loadout Facility will consist of a copper concentrate filtration plant and facility to load concentrate onto trains for shipment.

The MARRCO Corridor will provide connecting infrastructure between the WPS and other Project facilities, crossing private, Tonto National Forest, and ASLD land. The infrastructure will include the railroad, water supply pipelines, dewatering pipelines, concentrate pipelines, and electrical power lines and other utility lines within the MARRCO right-of-way.

The following sections describe the methods used to design the Project stormwater management system (***Section 2***); site-specific design considerations for locating and sizing detention basins, diversion structures, and outfalls (***Section 3***); and conclusions regarding surface water management strategies for Project facilities (***Section 4***).

## 2. METHODS

The water management facilities (*e.g.*, stormwater basins and diversion structures) for the EPS, WPS, and Filter Plant and Loadout facilities are designed to have sufficient capacity to contain runoff generated by the 100-year, 24-hour storm event. Stormwater basins would be constructed with a minimum of 1 foot of freeboard above the high water mark of the stormwater event. The following sections describe the calculation assumptions and procedures for sizing each of the stormwater facilities.

The stormwater runoff and facility sizing calculations for the TSF and surrounding facilities (*e.g.*, seepage collection dams and diversion channels) are not detailed in this report as these calculations were performed and the facilities were designed by Klohn Crippen Berger (KCB 2014). However, this report summarizes the KCB stormwater management system design for the TSF and surrounding facilities.

### 2.1. DESIGN STORM EVENT

The design storm event selected for sizing the water management facilities at the EPS, WPS, and Filter Plant and Loadout Facility is the 100-year, 24-hour storm event. This return period was selected based on recommendations from the Arizona Department of Environmental Quality (ADEQ) *Arizona Mining Guidance Manual BADCT* [Best Available Demonstrated Control Technology] (BADCT Manual). The BADCT Manual describes the process and procedures required to obtain an Aquifer Protection Permit (APP) from ADEQ, which will be required for the Resolution Project. 100 years is the typical design storm return period; larger return periods are only recommended if it is required by another regulatory agency or failure of the facility presents an "imminent risk to human life." 24 hours is the typical storm duration outlined in the BADCT Manual. The Resolution Project water management facilities that collect and return for reuse or treatment potentially impacted waters would be permitted under the APP Program.

## 2.2. PRECIPITATION DATA

Rainfall data for the area was obtained from the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 Precipitation Frequency Data Server, Volume 1 Version 5.0: *Semiarid Southwest (Arizona, Southeast California, Nevada, New Mexico, Utah)*. This data server provides depth-duration point precipitation frequency estimates for many locations within the United States, based on latitude and longitude, as well as for specific weather stations.

Precipitation records were obtained for the closest NOAA weather station in the area, in Superior (Site ID 02-8348). This station is at 33.3008 north latitude and 111.0967 west longitude, at an elevation of 2,861 feet (872 m). The period of record for the Superior weather station is from July 12, 1930 through August 31, 2006. During that period, the extreme maximum daily precipitation was recorded as 3.80 inches (96.52 mm), which occurred in July 1990.

NOAA's estimated 100-year, 24-hour rainfall for the Superior area, is approximately 5.04 inches (128 mm). This rainfall data was used for designing the WPS, EPS, and Filter Plant and Loadout Facility water management systems. This precipitation depth is overly conservative for the final design of facilities at the Filter Plant and Loadout Facility, because the elevation at this site is much lower and receives less precipitation than the EPS and WPS. However, it is sufficiently conservative for the preliminary design of water management systems.

The assumed 5.04 inch precipitation depth from the design storm is significantly greater than the maximum daily rainfall event during the station's period of record, and may therefore be considered sufficiently conservative for preliminary design of retention basins. The locations of the WPS, EPS, and Filter Plant and Loadout Facility relative to the weather station are shown in ***Figure 2***.

## 2.3. OFFSITE CATCHMENT AREAS

Offsite catchment areas are undeveloped land upstream of mine facilities; they are kept isolated from the developed mine facilities. Runoff from these catchments is considered non-contact water and is not routed into stormwater management basins. Instead, it is diverted around the mine facilities to the original discharge areas downstream. For the final design, the channels must be sized using peak flow rates determined by using either the Rational Method or a more detailed hydrograph method, and detailed grading plans for each facility. This level of analysis and design was not conducted for the preliminary designs described in this memorandum.

Offsite catchment area boundaries for the EPS, WPS, and Filter Plant and Loadout Facility were delineated from 1-meter contour data projected in UTM NAD 1927. The delineation was based on high points, ridges, and natural drainages identified in the contour data.

## 2.4. ONSITE CATCHMENT AREAS

Onsite catchment areas are generally defined as developed land containing either existing or proposed mine facilities. However, some undeveloped lands are considered onsite catchments since the runoff from these areas cannot be diverted around mine facilities. This is either due to the layout of facilities or the constraints of the surrounding topography. All direct rainfall and local runoff from onsite catchments is considered contact water and would be retained on site and reused in the mine process water system. This runoff would be collected in concrete or high density polyethylene- (HDPE-) lined "contact water basins" to be pumped out and incorporated into the process water circuit.

In order to calculate required basin volumes, onsite catchment area boundaries were determined from preliminary grading plans. M3 Engineering provided preliminary grading plans for the WPS and Filter Plant and Loadout Facility, and AMEC provided the preliminary grading plans for the EPS. The delineation was limited to identifying high and low points, and placing concentration points in areas that do not conflict with other mine functions.

## 2.5. RUNOFF VOLUME CALCULATION

The total runoff volumes of offsite and onsite catchment areas were calculated using the same method to promote a consistent method of measurement. Total runoff volume was calculated using a modified Rational Method where the total rainfall received over the site for the design storm is converted into a total volume of water. This value was then multiplied by the Rational Method runoff coefficient for the applicable land use. The runoff coefficient represents the ratio of runoff to rainfall and is used to represent or account for many factors including initial abstraction, infiltration, antecedent soil moisture, ground slopes, and soil types. This method of volume calculation is provided in Section 3.4 of the *Drainage Design Manual for Maricopa County*[1] (Drainage Manual; Flood Control District of Maricopa County 2011).

The runoff coefficient values used for onsite and offsite catchment areas were 0.88 and 0.69, respectively, and were obtained from Table 3.2, "Runoff Coefficients for Maricopa County", in the Drainage Manual. When a range of Rational Method coefficients are given for a specific land use, the greater value is chosen in order to remain conservative. The Rational Method formula used to calculate runoff volume is:

$$= \left(\frac{}{12}\right) =$$

Where,

V= volume in acre-feet (ac-ft)
C = runoff coefficient, Table 3.2 of the Drainage Manual
P = total rainfall depth for the 100-year, 24-hour storm, in inches
I = P/12 = total rainfall depth for the 100-year, 24-hour storm, in feet
A = area of the catchment in acres

[1] This Drainage Design Manual was used as there is no manual for Pinal County.

Because all Project sites would be closed systems and all basins were designed as retention basins, there is no need to calculate detention volumes. This method of hydrological analysis requires no time-of-concentration calculations; therefore, it is unaffected by grading changes to the sites as long as the runoff is routed to the same location.

In addition to runoff volumes, the contact water basins themselves would receive direct rainfall. All rain that falls directly on the basin would be retained within the basin, giving it a runoff coefficient of 1.0. Since the basin sizes have not been finalized, and the surface area may change from preliminary design to final design, a minimum of 1 foot of freeboard was added above the 100-year, 24-hour runoff volume water surface elevation. Contact water basins would typically remain empty; they would retain water only in immediate response to large storm events.

# 3. SITE-SPECIFIC DESIGN CONSIDERATIONS

## 3.1. EAST PLANT SITE DESIGN

### 3.1.1. Current Conditions

The EPS area measures approximately 40 acres, approximately 13 acres of which is currently disturbed. Surface water runoff from undeveloped portions of this site reports to Queen Creek, which is located within the Gila River Watershed.

The land use of disturbed portion of the EPS is light industrial. The topography of this area is mainly flat, with a gentle slope to the southeast. The ground surface is primarily bare soil, though there are several mine buildings and various appurtenant facilities. The Rational Method coefficient chosen for this condition and all new mining facility areas is 0.88, as described in the Drainage Manual. The undisturbed portion of the EPS is currently considered Sonoran Desert Hillslopes. The Rational Method coefficient chosen for this condition is 0.69, as described in the Drainage Manual.

### 3.1.2. Future Conditions

Eighteen separate catchment areas were identified at the EPS, with six identified as onsite catchments and 12 identified as offsite catchments. A detailed layout of the catchments identified at the EPS is shown in ***Figure 3***.

#### *3.1.2.1. Non-Contact Water*

All non-contact water at the EPS would be diverted away from the onsite catchment areas by channels and berms. Offsite catchments A7 through A18 at EPS are shown in ***Figure 3***.

Drainage from the offsite catchments along the ridge west of the mine site (A7 through A11) would be diverted through the north diversion channel along the western edge of the EPS and prevented from entering the mine facilities. This channel would run along the northwestern side of the EPS until it reaches onsite catchment A5. At this point, the flow would enter a drainage vault and then be conveyed

through an underground culvert under onsite catchments A5 and A4. There is an existing buried drainage pipe of unknown condition at this location that, depending on its precise slope and location, may require replacement. The culvert passes into Tonto National Forest land and discharges at an existing rip-rap outfall. A discharge channel would route the drainage from the existing outfall into a new rip-rap sediment basin to the existing natural channel downstream of Contact Water Basin E2. This existing channel currently receives all runoff from the EPS and is assumed to have adequate capacity for the slightly reduced flows it would experience after construction of the mine facilities.

Drainage from offsite catchments A12 through A18 would flow through a new South Diversion Channel along the southeastern edge of the property and pass under the new Magma Mine Road alignment. The non-contact water would then flow to the discharge channel and to a new rip-rap sediment basin. From there, it would travel in the existing natural drainage downstream of Contact Water Basin E2 and away from the EPS.

#### *3.1.2.2. Contact Water*

The site grading would follow the general existing slope of the land, with a gradual slope from west to east. Contact Water Basins E1, E2, and E3 would be constructed on the eastern edge of the EPS at low points to catch all stormwater flows from all of the onsite catchments. These basins are described further below.

##### 3.1.2.2.1. Contact Water Basins E1 and E2

Contact Water Basins E1 and E2 would be constructed at the eastern edge of the EPS. The basins would be sited at low points in an existing drainage to capture the majority of the stormwater flows from the newly developed mine area. The southern portion of the EPS is within a single catchment area (catchment A1 in ***Figure 3***), which would be graded to flow to Contact Water Basin E1. Contact Water Basin E2 would capture overflow from Contact Water Basin E1. The basins would be lined according to BADCT standards to prevent any infiltration of contact water into the soil. Contact Water Basins E1 and E2 would contain approximately 12 ac-ft (15,000 $m^3$) and 11 ac-ft (13,600 $m^3$) of water, respectively. These basins would be emptied after each storm event, and contact water would be reused in the process water supply or the underground mine operations.

##### 3.1.2.2.2. Contact Water Basin E3

Contact Water Basin E3 would contain flows from the existing mine facilities in catchments A4 and A5, as well as from the newly developed mine facilities in catchments A2, A3, and A6. This basin would be in the area of an existing sump, which would be deepened and widened to catch all contact flow from these areas. This basin would be lined to prevent surface water infiltration. The basin would contain 13 ac-ft (16,000 $m^3$) of contact water.

### 3.1.3. East Plant Site Runoff Volume Calculations

The offsite and onsite runoff volume calculations for the EPS are provided in ***Tables 1*** and ***2***. The assumptions used for these calculations are provided in ***Section 2***.

Table 1. East Plant Site Offsite Runoff Volume Calculations

| Channel | Catchment | Land Use Category[1] | C[1,2] | I[3] (ft) | Area (acres) | Volume (ac-ft) |
|---|---|---|---|---|---|---|
| North Diversion Channel | A7 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 1.5 | 0.4 |
| | A8 | Hillslopes, Sonoran Desert | 0.69 | | 3.4 | 1.0 |
| | A9 | Hillslopes, Sonoran Desert | 0.69 | | 3.2 | 0.9 |
| | A10 | Hillslopes, Sonoran Desert | 0.69 | | 4.4 | 1.3 |
| | A11 | Hillslopes, Sonoran Desert | 0.69 | | 6.2 | 1.8 |
| **North Diversion Channel Total** | | | | | | **5.4** |
| South Diversion Channel | A12 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 1.2 | 0.4 |
| | A13 | Hillslopes, Sonoran Desert | 0.69 | | 23.0 | 6.7 |
| | A14 | Hillslopes, Sonoran Desert | 0.69 | | 2.4 | 0.7 |
| | A15 | Hillslopes, Sonoran Desert | 0.69 | | 4.1 | 1.2 |
| | A16 | Hillslopes, Sonoran Desert | 0.69 | | 8.7 | 2.5 |
| | A17 | Hillslopes, Sonoran Desert | 0.69 | | 3.9 | 1.1 |
| | A18 | Hillslopes, Sonoran Desert | 0.69 | | 0.5 | 0.1 |
| **South Diversion Channel Total** | | | | | | **12.7** |
| **Offsite Total:** | | | | | | **18.1** |

Table 2. East Plant Site Onsite Runoff Volume Calculations

| Basin | Catchment | Land Use Category[1] | C[1,2] | I[3] (ft) | Area (acres) | Volume Required (ac-ft) | Volume Provided (ac-ft) |
|---|---|---|---|---|---|---|---|
| Basin E1 & E2 | A1 | Industrial-1 | 0.88 | 0.42 | 57.0 | 21.1 | |
| **Basin E1 & E2 Total** | | | | | | **21.1** | **22.7** |
| Basin E3 | A2 | Industrial-1 | 0.88 | 0.42 | 1.5 | 0.5 | |
| | A3 | Hillslopes, Sonoran Desert | 0.69 | | 0.8 | 0.2 | |
| | A4 | Industrial-1, Hillslopes, Sonoran Desert | 0.87[4] | | 19.9 | 7.3 | |
| | A5 | Hillslopes, Sonoran Desert | 0.69 | | 8.8 | 2.6 | |
| | A6 | Industrial-1 | 0.88 | | 6.2 | 2.3 | |
| **Basin E3 Total** | | | | | | **12.9** | **13.0** |
| **Onsite Total** | | | | | | **34.0** | **35.7** |

1 Source: Drainage Manual (FCD of Maricopa County 2011)
2 C = Runoff Coefficient
3 I = total rainfall depth for the 100-year, 24-hour storm; Source: NOAA 2013
4 Weighted Runoff Coefficient for percentage area of Industrial-1 and Hillslopes Sonoran Desert

## 3.2. WEST PLANT SITE DESIGN

### 3.2.1. Current Conditions

The WPS encompasses facilities associated with past mining activity and facilities that are currently in operation either to support new development or for closure of legacy facilities. This section of the report focuses on the Stockpile, the Concentrator Complex, and the Ancillary Facilities, which occupy an area of approximately 453 acres of former mine impacted and developed land.

The land use of the disturbed portion of the WPS is light industrial. This area is generally flat, with a gentle slope to the southeast. The ground surface is mainly bare soil with several mine buildings and various appurtenant facilities. The Rational Method coefficient chosen for this condition and all new mining facility areas is 0.88, as described in the Drainage Manual. The undisturbed portion of the WPS is Sonoran Desert Hillslopes. The Rational Method coefficient chosen for this condition is 0.69, as described in the Drainage Manual.

The current surface water runoff from the WPS is managed to eliminate all mining-related discharges from the facility, including those permitted from the existing individually permitted Outfall 001. Permit information for Outfall 001 is presented in Table 1.1-3 of the General Plan of Operations.

### 3.2.2. Future Conditions

The stormwater management system design for the WPS considers three main facilities:

- The Stockpile, which includes the Development Rock and Intermediate Rock stockpiles;
- The Concentrator Complex, which includes the process water pond, ore stockpile facility, tailings thickeners, copper molybdenum and copper concentrator thickeners, and the molybdenum plant; and
- The Ancillary Facilities, which include the administration building, contractor and warehouse laydown yards, and construction and employee parking.

#### *3.2.2.1. Stockpile*

The Development Rock Stockpile and Intermediate Rock Stockpile are two separate temporary rock storage facilities that would be located between the Concentrator Complex and the Ancillary Facilities. The rock would be generated from excavations in Resolution's preparations for mining. The runoff from the stockpiles is considered contact water since the material is potentially acid-generating. Once the Concentrator Complex is constructed and mine production commences, no additional waste rock would be produced and the Development Rock Stockpile and Intermediate Rock Stockpile would be removed and processed with the ore at the Concentrator Complex.

The proposed stormwater management system for the stockpiles is shown in ***Figure 4***. The stockpile area is subdivided into 11 catchment areas. Catchments that are upstream of the Concentrator Complex

facilities and/or undeveloped land are categorized as offsite catchments (non-contact areas). Catchments that would either contain or be impacted by runoff from the stockpiles are categorized as onsite catchments.

#### 3.2.2.1.1. Non-Contact Water

The runoff from the area upstream of the Development Rock Stockpile (catchment B1) currently flows following the existing land surface to the Apex Tunnel. The Apex Tunnel is an existing structure that diverts offsite flows from north of the stockpiles to the Silver King Wash, west of the site. This runoff is considered non-contact water. The runoff from catchment B1 would continue to flow to the Apex Tunnel until the construction of the Concentrator Complex.

Stormwater in the locations of the proposed stockpiles currently flows following the natural ground surface to legacy Tailings Pond 6. However, once the stockpiles are in place the stormwater runoff from them would be contained on site in contact water basins, as described below.

#### 3.2.2.1.2. Contact Water

***Contact Water Basin W1***

Contact Water Basin W1 would be constructed to collect onsite runoff from the northern portion of the Development Rock Stockpile (catchment A1), from the tailings thickener pad (catchment A2), and from the eastern hillsides (catchment A3). The pad for the thickeners would be constructed to provide drainage to Contact Water Basin W1. Contact Water Basin W1 would be used during mine operations to collect contact water runoff from the Concentrator Complex, and would be constructed to contain 49.4 ac-ft (61,000 $m^3$) of water (***Figure 5***). The basin would be lined according to BADCT standards and emptied after each storm event, and the contact water would be reused. The north stockpile diversion channel would direct flows between the tailings thickener pad fill slopes and the Development Rock Stockpile to Contact Water Basin W1 during this interim period.

***Contact Water Basin W2***

Stormwater from the southeast portion of the Development Rock Stockpile (catchment C1) would flow to Contact Water Basin W2. Stormwater from the eastern hillsides (catchment C2) would flow south along the existing roadway in a new drainage v-ditch, through an opening in the roadside safety berm, and into a culvert that would direct flow into Basin W2. The onsite runoff from the Intermediate Rock Stockpile and upstream hillsides (catchments C3, C4, and C5) would be collected in v-ditches along the toe of the stockpile. The runoff in these v-ditches would enter a culvert at the southwest corner of the Intermediate Rock Stockpile. From there, it would flow under the existing road into the roadside v-ditch, through an opening in the roadside safety berm into a culvert, and finally into Contact Water Basin W2. Contact Water Basin W2 would be constructed to contain 30.8 ac-ft (38,000 $m^3$) of water. The basin would be lined according to BADCT standards and would be emptied after each storm event for reuse.

***Contact Water Basin W3***

Onsite runoff from the west slopes of the Development Rock Stockpile would be directed to flow via the west stockpile berm to Contact Water Basin W3. This will ensure containment of contact water on the

east side of the ridge to which the stockpile abuts. The berm would be relocated as necessary to contain water from that part of the stockpile as its footprint changes during operations. The runoff directed by the berm, combined with the runoff from the southwest portion of the stockpile (catchment D1), would flow to Contact Water Basin W3. Contact Water Basin W3 would be constructed to contain 12.3 ac-ft (15,000 $m^3$) of water. The basin would be lined according to BADCT standards and would be emptied after each storm event for reuse. A berm at the southern edge of Contact Water Basin W3 would divert water to this basin and prevent it from continuing downstream to legacy Tailings Pond 6.

***Contact Water Basin W5***

Stormwater runoff from the far west portion of the Development Rock Stockpile (catchment E1) would be captured in Contact Water Basin W5. Contact Water Basin W5 would be constructed to contain 8.4 ac-ft (10,400 $m^3$) of water. The basin would be constructed by excavating a portion of an existing tailings deposit down into the native subgrade. The southern embankment slope of the basin that abuts the existing tailings would be stabilized by an earthen fill. The basin would be lined according to BADCT standards and would be emptied after each storm event for reuse in the thickeners.

#### 3.2.2.1.3. Stockpile Runoff Volume Calculations

The offsite and onsite water runoff volume calculations for the Stockpile area are provided in ***Tables 3 and 4***. These calculations are based on the assumptions described in ***Section 2***.

Table 3. Stockpile Offsite Runoff Volume Calculations

| Basin | Catchment | Land Use Category[1] | C[1,2] | I[3] (ft) | Area (acres) | Volume (ac-ft) |
|---|---|---|---|---|---|---|
| Apex Tunnel | B2 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 349.2 | 101.2 |
| | | | | | **Offsite Total** | **101.2** |

1 Source: Drainage Manual (FCD of Maricopa County 2011)
2 C = Runoff Coefficient
3 I = total rainfall depth for the 100-year, 24-hour storm; Source: NOAA 2013

Table 4. Stockpile Onsite Water Runoff Volume Calculations

| Basin | Catchment | Land Use Category[1] | C[1,2] | I[3] (ft) | Area (acres) | Volume Required (ac-ft) | Volume Provided (ac-ft) |
|---|---|---|---|---|---|---|---|
| Basin W1 | A1 | Industrial-1 | 0.88 | 0.42 | 16.1 | 5.9 | |
| | A2 | Industrial-1 | 0.88 | | 18.8 | 6.9 | |
| | A3 | Hillslopes, Sonoran Desert | 0.69 | | 9.3 | 2.7 | |
| | | | | | **Basin W1 Total** | **15.6** | **49.4** |
| Basin W2 | C1 | Industrial-1 | 0.88 | 0.42 | 28.5 | 10.5 | |
| | C2 | Hillslopes, Sonoran Desert | 0.69 | | 10.1 | 2.9 | |
| | C3 | Hillslopes, Sonoran Desert | 0.69 | | 25.8 | 7.5 | |
| | C4 | Industrial-1 | 0.88 | | 9.9 | 3.6 | |
| | C5 | Hillslopes, Sonoran Desert | 0.69 | | 9.8 | 2.8 | |
| | | | | | **Basin W2 Total** | **27.4** | **30.8** |
| Basin W3 | D1 | Industrial-1 | 0.88 | 0.42 | 20.4 | 7.5 | |
| | | | | | **Basin W3 Total** | **7.5** | **12.3** |
| Basin W5 | E1 | Industrial-1 | 0.88 | 0.42 | 18.9 | 7.0 | |
| | | | | | **Basin W5 Total** | **7.0** | **8.4** |
| | | | | | **Onsite Total:** | **47.9** | **100.9** |

1 Source: Drainage Manual (FCD of Maricopa County 2011)
2 C = Runoff Coefficient
3 I = total rainfall depth for the 100-year, 24-hour storm; Source: NOAA 2013

#### *3.2.2.2. Concentrator Complex*

The stormwater management system design for the Concentrator Complex addresses the new facilities proposed for the northern part of the WPS. The Concentrator Complex would be situated north of the Development Rock Stockpile, Intermediate Rock Stockpile, and legacy Tailings Pond 6. The stormwater management system for the Concentrator Complex, once the stockpiles are removed, is shown in ***Figure 5***. The Concentrator Complex site and adjacent upstream areas are subdivided into 16 catchment areas.

##### 3.2.2.2.1. Non-Contact Water

The west diversion channel would run on the surface along the north and west edge of the WPS. Runoff from the northernmost offsite catchments B2 and B3 would report to the west diversion channel. The channel would direct stormwater through a culvert passing between the Process Water Pond and the Ore Stockpile Facility, then south along the western side of the WPS past the thickeners to discharge at the inlet of the Apex Tunnel.

#### 3.2.2.2.2. Contact Water

The stormwater that falls in the remaining 14 Concentrator Complex catchment areas is considered contact water and would be retained on site in five separate HDPE-lined retention basins:

- Contact Water Basin W1 would be southeast of the Concentrator, and would be constructed to contain approximately 49.4 ac-ft (61,000 $m^3$) of water.
- Contact Water Basin W2 would be south of the Concentrator Complex, and would be constructed to contain 30.8 ac-ft (38,000 $m^3$) of water.
- Contact Water Basin W3 would also be south of the Concentrator Complex, and would be constructed to contain 12.3 ac-ft (15,000 $m^3$) of water.
- Contact Water Basin W4 would be north of the thickeners and would be constructed to contain approximately 2.2 ac-ft (2,700 $m^3$) of water.
- Contact Water Basin W5 would be in the drainage west of the Concentrator Complex within onsite Catchment E1, to capture runoff from the area that would have been previously occupied by the Development Rock Stockpile. This basin would be constructed to contain 8.4 ac-ft (10,400 $m^3$) of water.

The stormwater runoff from the majority of the site (catchments A2 and A6) would flow along surface roads and be routed by a series of berms and small channels into Basin W1. Catchments A3, A4, and A5 would be on a westward-facing slope and report to the east stormwater channel to be routed south into Basin W1. Catchment 7 would collect runoff from a small area of the site and report to Basin W4.

Stormwater from the eastern hillsides and plant site, south of the Concentrator Complex catchments C2, C3, C4, C5, and C7), is considered contact water and would be routed via roadway, channel, and culvert to Contact Water Basin W2. In the event that Contact Water Basin W1 overflows, an emergency overflow ditch would route excess water to Contact Water Basin W2. Contact water runoff from the south slopes of the Concentrator Complex and areas previously occupied by the Development Rock Stockpile (catchments C6 and D2) would be captured in Contact Water Basins W2 and W3. A berm at the southern edge of Contact Water Basin W3 would divert water to this basin and keep it from continuing downstream to legacy Tailings Pond 6.

#### 3.2.2.2.3. Concentrator Complex Runoff Volume Calculations

The offsite and onsite water runoff volume calculations for the Concentrator Complex are provided in ***Tables 5 and 6***. These calculations are based on the assumptions described in ***Section 2***.

Table 5. Concentrator Offsite Runoff Volume Calculations

| Basin | Catchment | Land Use Category[1] | C[1,2] | I[3] (ft) | Area (acres) | Volume (ac-ft) |
|---|---|---|---|---|---|---|
| West Diversion Channel | B2 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 147.2 | 42.7 |
| | B3 | Hillslopes, Sonoran Desert | 0.69 | | 61.2 | 17.8 |
| | | | | | **Offsite Total** | **60.4** |

Table 6. Concentrator Onsite Runoff Volume Calculations

| Basin | Catchment | Land Use Category[1] | C[1,2] | I[3] (ft) | Area (acres) | Volume Required (ac-ft) | Volume Provided (ac-ft) |
|---|---|---|---|---|---|---|---|
| Basin W1 | A2 | Industrial-1 | 0.88 | 0.42 | 18.8 | 6.9 | |
| | A3 | Hillslopes, Sonoran Desert | 0.69 | | 9.3 | 2.7 | |
| | A4 | Hillslopes, Sonoran Desert | 0.69 | | 24.5 | 7.1 | |
| | A5 | Hillslopes, Sonoran Desert | 0.69 | | 26.4 | 7.6 | |
| | A6 | Industrial-1 | 0.88 | | 64.9 | 24.0 | |
| | | | | | **Basin W1 Total** | **48.4** | **49.4** |
| Basin W2 | C2 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 8.3 | 2.4 | |
| | C3 | Hillslopes, Sonoran Desert | 0.69 | | 25.8 | 7.5 | |
| | C4 | Industrial-1 | 0.88 | | 9.9 | 3.6 | |
| | C5 | Hillslopes, Sonoran Desert | 0.69 | | 9.8 | 2.8 | |
| | C6 | Industrial-1 | 0.88 | | 31.9 | 11.8 | |
| | C7 | Industrial-1 | 0.88 | | 3.2 | 1.2 | |
| | | | | | **Basin W2 Total** | **28.1** | **30.8** |
| Basin W3 | D2 | Industrial-1 | 0.88 | 0.42 | 30.1 | 11.1 | |
| | | | | | **Basin W3 Total** | **11.1** | **12.3** |
| Basin W4 | A6 | Industrial-1 | 0.88 | 0.42 | 3.0 | 1.1 | |
| | | | | | **Basin W4 Total** | **1.1** | **2.2** |
| Basin W5 | E1 | Industrial-1 | 0.88 | 0.42 | 18.9 | 7.0 | |
| | | | | | **Basin W5 Total** | **7.0** | **8.4** |
| | | | | | **Onsite Total:** | **84.6** | **103.1** |

1 Source: Drainage Manual (FCD of Maricopa County 2011)
2 C = Runoff Coefficient
3 I = total rainfall depth for the 100-year, 24-hour storm; Source: NOAA 2013

#### *3.2.2.3. Ancillary Facilities*

The Ancillary Facilities are located south of the Concentrator Complex and north of Superior. This area has been historically developed and is a mixture of industrial and natural Sonoran Desert land. No mining activity would occur within the Ancillary Facilities area; therefore, all catchments are considered to be

offsite catchments. See ***Figure 6*** for the stormwater management system design for the future developed locations. The Ancillary Facilities and adjacent upstream areas are subdivided into 13 catchments.

#### 3.2.2.3.1. Non-Contact Water

The stormwater that falls in the Ancillary Facilities catchment areas is considered non-contact water and is retained on site in four separate HDPE-lined retention basins, two combined Sludge Storage Impoundments (SSI North and SSI South), and Indian Pond:

- Non-Contact Water Basin W6 would be north of the mill/vehicle maintenance building and south of the truck wash. It would be constructed to retain approximately 2.4 ac-ft (3,000 $m^3$) of water. This basin would receive all the runoff from the surrounding catchment E1.
- Non-Contact Water Basin W7 would be south of the Administration Building parking lot, and receive surface runoff from catchment F1. This basin would be constructed to contain 3.6 ac-ft (4,400 $m^3$) of water.
- Non-Contact Water Basin W8 would be along Lone Tree Access Road west of Superior. It would contain all surface water flows from the access road (catchment G1) and two small adjacent undeveloped areas (catchments G2 and G3). Basin W8 would be constructed to contain 4.6 ac-ft (5,600 $m^3$) of water.
- Non-Contact Water Basin W9 would be an HDPE-lined basin designed to handle the stormwater flows from the parking areas near the mine entrance (catchment H2) and the adjacent hillsides and open areas (catchments H1 and H3). This basin would be constructed to contain 7.7 ac-ft (9,500 $m^3$) of water.
- Legacy Tailings Ponds 1 and 2 will remain and receive all runoff from the various laydown yards (catchments J1, J2, and J3) and the upstream hillsides (catchment J4). The legacy tailings ponds are sufficiently sized to contain the estimated 15.4 ac-ft (19,000 $m^3$) of runoff generated by the 100-year, 24-hour rainfall event.
- Indian Pond would receive runoff from catchment K1, which would flow under Lone Tree Access Road in culverts to the Indian Pond area near Outfall 1. The volume of stormwater from catchment K1 is estimated to be approximately 12 ac-ft (14,800 $m^3$), and would be completely contained within Indian Pond.

#### 3.2.2.3.2. Ancillary Facilities Runoff Volume Calculations

The offsite and onsite runoff volume calculations for the Ancillary Facilities site are provided in ***Table 7***. These calculations are based on the assumptions described in ***Section 2***.

Table 7. Ancillary Facility Offsite Water Runoff Volume Calculations

| Basin | Catchment | Land Use Category[1] | C[1,2] | I[3] (ft) | Area (acres) | Volume Required (ac-ft) | Volume Provided (ac-ft) |
|---|---|---|---|---|---|---|---|
| Basin W6 | E1 | Industrial-1 | 0.88 | 0.42 | 6.6 | 2.4 | |
| | | | | | **Basin W6 Total** | **2.4** | **2.4** |
| Basin W7 | F1 | Industrial-1 | 0.88 | 0.42 | 10.0 | 3.6 | |
| | | | | | **Basin W7 Total** | **3.6** | **3.7** |
| Basin W8 | G1 | Industrial-1 | 0.88 | 0.42 | 7.9 | 2.9 | |
| | G2 | Hillslopes, Sonoran Desert | 0.69 | | 3.4 | 1.0 | |
| | G3 | Hillslopes, Sonoran Desert | 0.69 | | 2.5 | 0.7 | |
| | | | | | **Basin W8 Total** | **4.6** | **5.6** |
| Basin W9 | H1 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 8.9 | 2.5 | |
| | H2 | Industrial-1 | 0.88 | | 9.6 | 3.5 | |
| | H3 | Hillslopes, Sonoran Desert | 0.69 | | 5.9 | 1.7 | |
| | | | | | **Basin W9 Total** | **7.7** | **8.0** |
| Existing Tailings Ponds | J1 | Industrial-1 | 0.88 | 0.42 | 17.1 | 6.2 | |
| | J2 | Industrial-1 | 0.88 | | 10.8 | 3.9 | |
| | J3 | Industrial-1 | 0.88 | | 5.5 | 2.0 | |
| | J4 | Hillslopes, Sonoran Desert | 0.69 | | 11.6 | 3.3 | |
| | | | | | **Existing Tailings Ponds Total** | **15.4** | **> 15.4** |
| Indian Pond | K1 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 42.3 | 12.0 | |
| | | | | | **Indian Pond Total** | **12.0** | **> 12.0** |
| | | | | | **Onsite Total:** | **45.7** | **> 47.1** |

1 Source: Drainage Manual (FCD of Maricopa County 2011)
2 C = Runoff Coefficient
3 I = total rainfall depth for the 100-year, 24-hour storm; Source: NOAA 2013

## 3.3. FILTER PLANT AND LOADOUT FACILITY

The proposed stormwater management system for the Filter Plant and Loadout Facility is depicted in ***Figure 7***. Runoff from offsite catchment areas upstream of the Filter Plant and Loadout Facility would be routed around or through the site and returned to the existing downstream washes via the north diversion channel and culverts. The majority of the area within the Filter Plant and Loadout Facility would remain undisturbed and the runoff considered non-contact. Contact water from the Filter Plant and Loadout Facility would be contained on site in contact water basins.

### 3.3.1. Non-Contact Water

The North Diversion Channel would convey offsite flows west around catchment A1, following the northern edge of the property. The channel would then turn south along the west edge of the construction

laydown yard to Outfall 1, in the existing wash. Runoff from catchment B1, the construction laydown yard, would be graded to also flow off site via Outfall 1. A low point in the roadway would allow flows in B1 to cross to Outfall 1.

Outfall 2 would collect runoff from offsite catchment areas east of the property and onsite catchments C1, C2, C3, and C4. Flows from the east enter the site over the MARRCO Access Road and through three culverts under the rail loop. The MARRCO Access Road is graded so that stormwater flow is not impeded. Two additional culverts allow flow to continue west under the rail loop from offsite catchments C1 and C2, discharging to catchment C3. Flows from C3 would be directed over the Skyline Access Road into catchment C4 and to Outfall 2. A small catchment in the southeast corner of the property (catchment D1) will be graded to flow off site at Outfall 3. All of these catchments are considered off site because stormwater from them does not come into contact with mining facilities.

### 3.3.2. Contact Water

The Concentrate Filter Plant, Conveyor, Concentrate Loadout, Clarifier, Ancillary Facilities, an SRP Substation, a helipad, and a parking area would be within catchments A1 and A2. These areas would be graded to flow to Contact Water Basin F1. This basin would be constructed to contain approximately 22 ac-ft (27,000 $m^3$) of water. The basin would be lined according to BADCT standards and would be emptied after each storm event for reuse.

The Filter Plant Site, CAP Water Pump Station, and CAP Water Tank would be within catchment E1. These areas would be graded to flow to Contact Water Basin F2. This basin would be constructed to contain 3.4 ac-ft (4,200 $m^3$) of water. The basin would be lined according to BADCT standards and would be emptied after each storm event for reuse.

### 3.3.3. Filter Plant and Loadout Facility Runoff Volume Calculations

The offsite and onsite runoff volume calculations for the Filter Plant and Loadout Facility are provided in ***Table 8***. These calculations are based on the assumptions described in ***Section 2***.

Table 8. Filter Plan and Loadout Facility Offsite Runoff Calculations

| Basin | Catchment | Land Use Category[1] | C[1,2] | I[3] (ft) | Area (acres) | Volume (ac-ft) |
|---|---|---|---|---|---|---|
| Outfall 1 | B1 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 40.0 | 11.6 |
| | | | | | **Outfall 1 Total** | **11.6** |
| Outfall 2 | C1 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 169.5 | 49.1 |
| | C2 | Hillslopes, Sonoran Desert | 0.69 | | 52.0 | 15.1 |
| | C3 | Hillslopes, Sonoran Desert | 0.69 | | 127.0 | 36.8 |
| | C4 | Hillslopes, Sonoran Desert | 0.69 | | 88.4 | 25.6 |
| | | | | | **Outfall 2 Total** | **126.6** |
| Outfall 3 | D1 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 9.4 | 2.7 |
| | | | | | **Outfall 3 Total** | **2.7** |
| | | | | | **Onsite Total:** | **140.9** |

Table 9. Filter Plan and Loadout Facility Onsite Runoff Calculations

| Basin | Catchment | Land Use Category[1] | C[1,2] | I[3] (ft) | Area (acres) | Volume Required (ac-ft) | Volume Provided (ac-ft) |
|---|---|---|---|---|---|---|---|
| Basin F1 | A1 | Hillslopes, Sonoran Desert | 0.69 | 0.42 | 34.0 | 9.9 | |
| | A2 | Industrial-1 | 0.88 | | 28.8 | 10.6 | |
| | | | | | **Basin F1 Total** | **20.5** | **21.6** |
| Basin F2 | E1 | Industrial-1 | 0.88 | E1 | 7.0 | 2.6 | |
| | | | | | **Basin F2 Total** | **2.6** | **3.4** |
| | | | | | **Onsite Total:** | **23.1** | **25.0** |

1 Source: Drainage Manual (FCD of Maricopa County 2011)
2 C = Runoff Coefficient
3 I = total rainfall depth for the 100-year, 24-hour storm; Source: NOAA 2013

## 3.4. TAILING STORAGE FACILITY

The stormwater management system for the TSF was designed by KCB to divert non-contact water around the facility, collect and reclaim surface runoff from the TSF, provide storage for the design storm events without discharge, and protect the TSF and diversion structures from erosion from storm events. Proposed stormwater management structures and upstream catchments in the vicinity of the TSF are shown in ***Figure 8.*** The TSF footprint would impact the Roblas Canyon and Pott's Canyon watersheds. The main flows of Roblas and Pott's canyons will continue to pass without any alteration to the drainage flow paths to the west and east of the TSF, respectively.

### 3.4.1. Non-Contact Water

Three diversion channels would be constructed north of the TSF to route the upstream catchments (S1, S2, and S3) around the facility. (***Figure 8***). These diversion channels would be constructed to convey

the peak PMF flow, which is the greater peak flow of the general probable maximum flood (PMF) 72-hr or local PMF 6-hr storms. The diversion channel design flows range from 3,500 to 12,000 cubic feet per second (100 $m^3/s$ to 340 $m^3/s$) and diversion channel base widths range from 16 feet to 50 feet (5 m to 15 m) with side slopes of 1H:2V. The slopes of the diversion channels would be 1 percent. With construction of the three diversion channels, non-contact water would continue to report to Queen Creek.

### 3.4.2. Contact Water

The stormwater that falls directly on the TSF, or downstream of the diversion channels in early stages of tailings construction, would be contained within the TSF (catchment S4). This water would directly offset supply water needs for tailings void fill and water lost to evaporation. The stormwater that seeps through the tailings would be collected in a series of rockfill underdrains to report to one of 11 seepage collection dams. Each of these dams would have a low permeability core and grout curtain, and would be keyed into bedrock to limit seepage. The seepage dams would also collect all stormwater that runs off of the tailings embankments (catchment S5), and would be constructed to store the runoff from a 200-year 24-hr storm without discharge. The seepage dams are designed with emergency spillways that are sized for the 1,000-year, 24-hr storm. Any collected seepage would be pumped back into the TSF. Excess water in the TSF system would be pumped back to the Concentrator Complex as reclaim water.

The calculations and design of these facilities are provided in the 2014 Klohn Crippen Berger report, *Resolution Copper Mining Near West Tailings Management Mine Plan of Operations Study* (KCB 2014).

## 4. CONCLUSION

All contact water generated from the 100-year, 24-hour storm runoff at the EPS, WPS, and the Filter Plant and Loadout Facility can be contained either within new contact water basins constructed for this purpose or within existing tailings ponds. Additionally, the non-contact stormwater runoff may be routed via berms and channels around mine facilities and back to their original drainage channel without coming into contact with mine facilities, or may be incorporated into contact water basins. These berms and channels may be temporary for construction or operational phasing, or may be maintained over the life of the mine.

More detailed site grading plans and impermeable surface information will be required for final design of the hydraulic structures for peak flows. It is recommended that a full hydrological analysis be performed using hydrologic modeling software (*i.e.*, HEC-1 or HEC-HMS, and HEC-RAS) to size the channels and culverts when the design of the facilities reaches an appropriate level of detail.

## 5. REFERENCES

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Flood Control District of Maricopa County (FCD). 2011. Drainage Design Manual for Maricopa County; Hydrology. February 2011.

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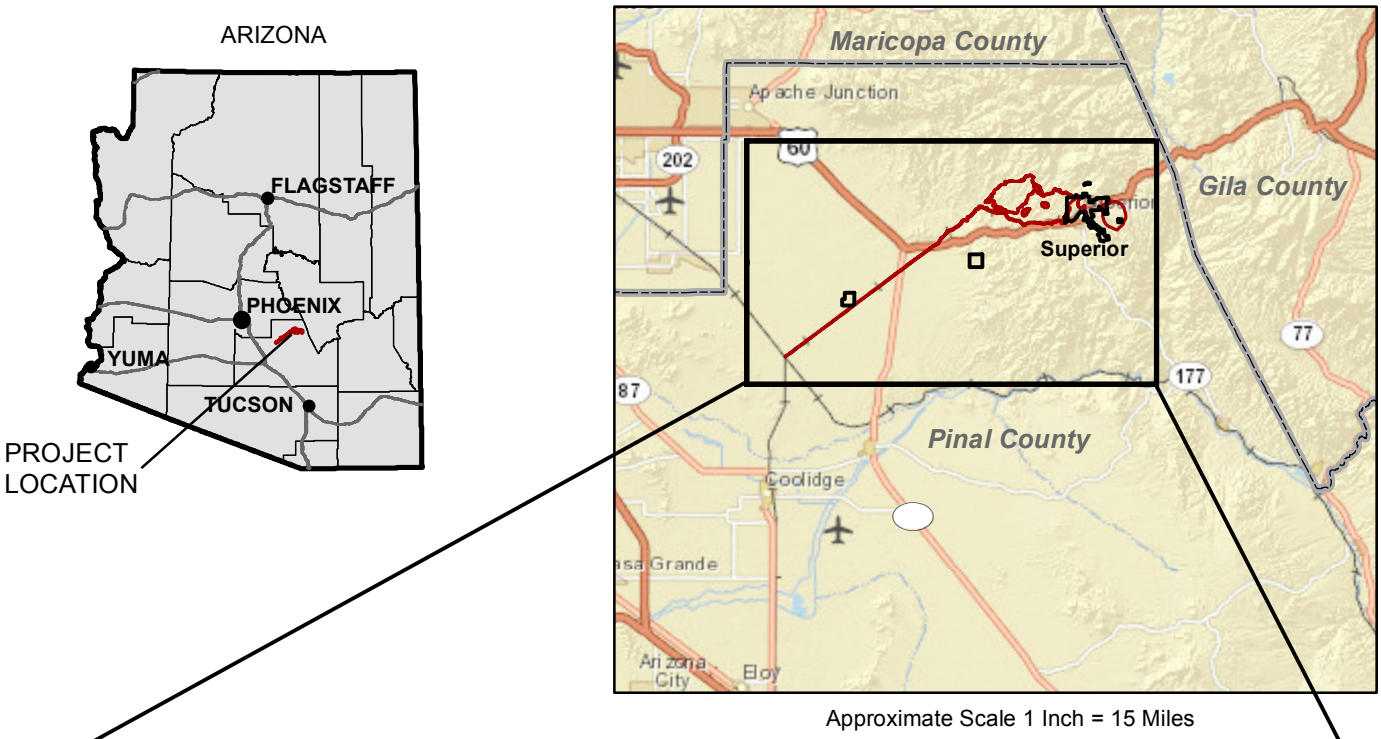
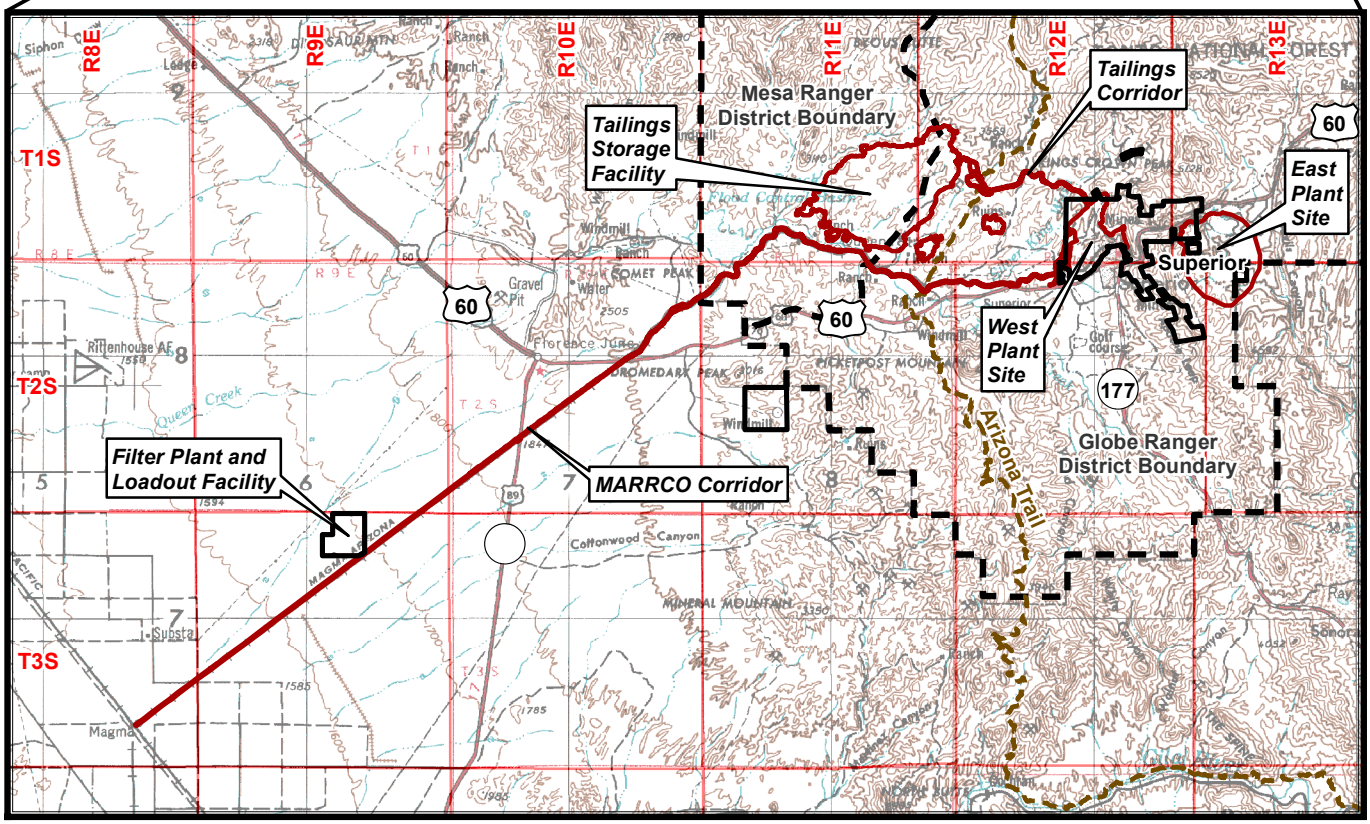
NOAA. 2013. Point Precipitation Frequency Estimates from NOAA Atlas 14, Volume 1, Version 5.

# FIGURES




Approximate Scale 1 Inch = 15 Miles




Portion of Pinal County,
Image Source: Mesa 1:250,000 USGS Quadrangle

## Legend

- Resolution Holdings
- Project Area
- Arizona Trail (ESRI Online Data)
- Tonto National Forest Ranger District Boundary

N

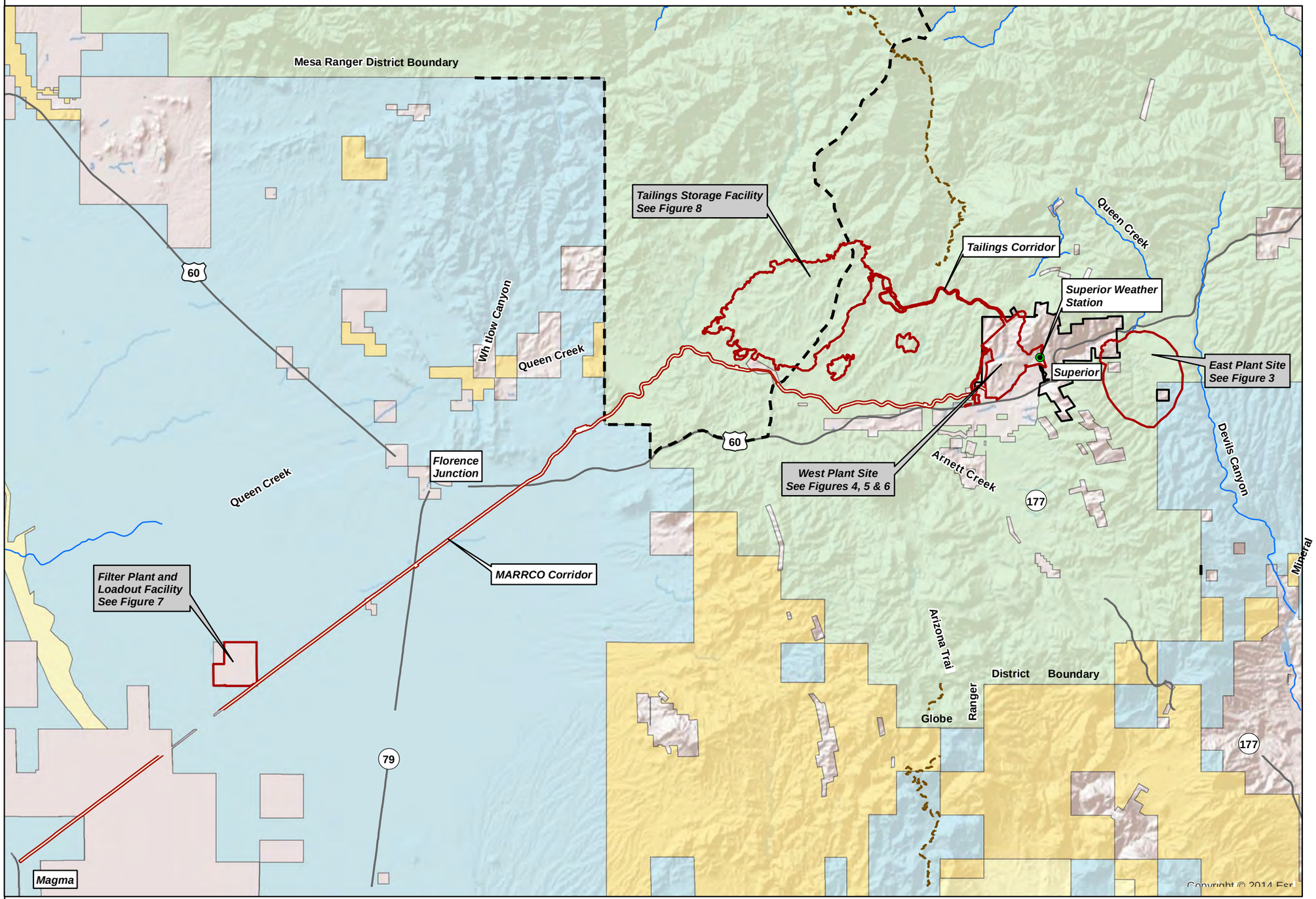
0 2.5 5 Miles

0 4 8 Kilometers

# RESOLUTION COPPER
## Stormwater Drainage Design

VICINITY MAP
Figure 1

Path: M:\Jobs\800's\807.94\ENV\Stormwater_Drainage_Design_GPO_Supplemental_Plan\MXD\Fig2_SW_ProjectOverview.mxd




**Legend**

- Resolution Holdings
- Project Area
- Arizona Trail (ESRI Online Data)
- Tonto National Forest Ranger District Boundary

**Surface Management (Source: BLM 2011)**

- Bureau of Land Management (BLM)
- Bureau of Reclamation
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Image Source: ESRI Online World Shaded Relief

N

0 1 2 Miles

0 2 4 Kilometers

# RESOLUTION COPPER
## Stormwater Drainage Design

PROJECT OVERVIEW
Figure 2

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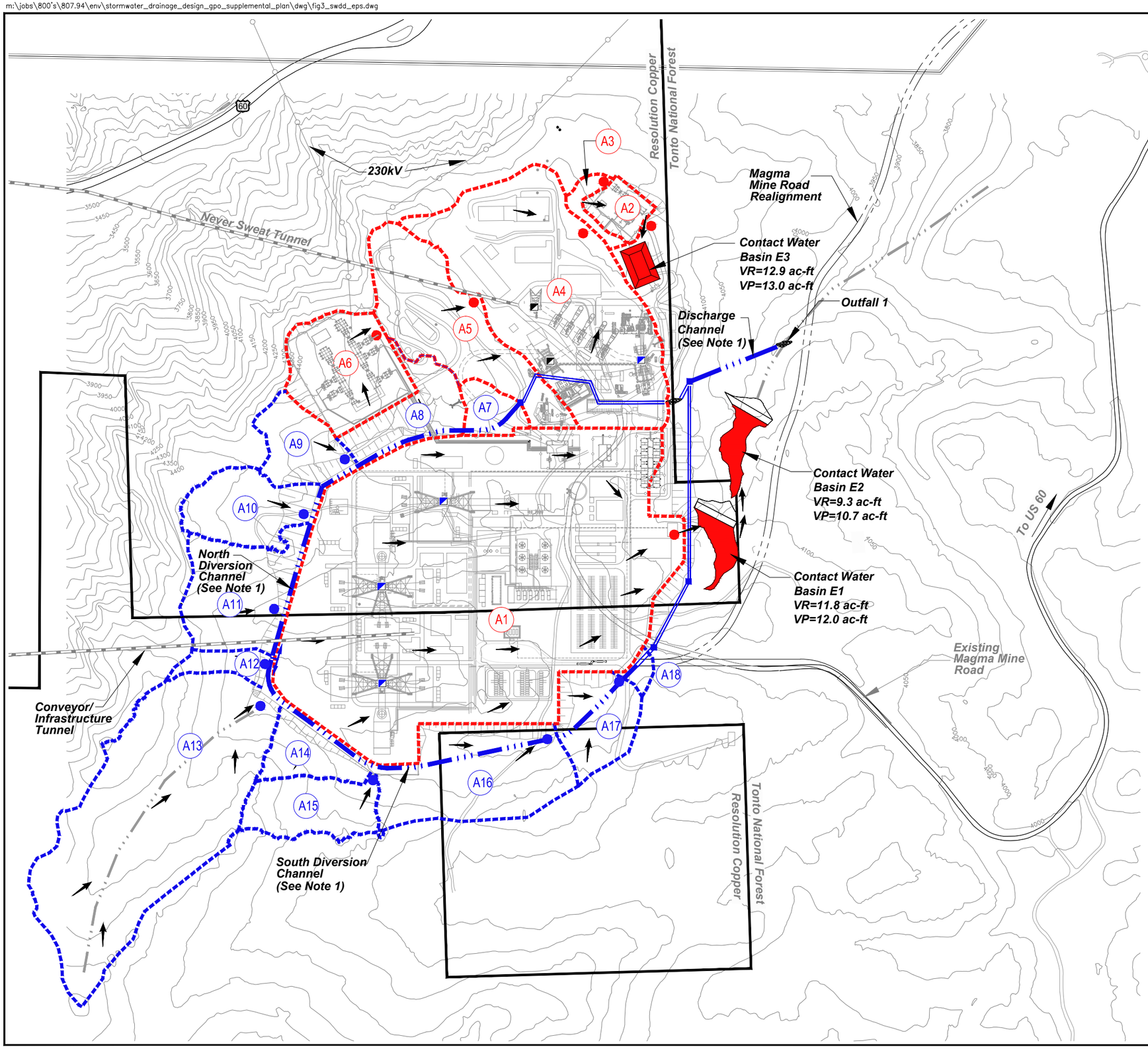


**Legend**

- Resolution Holdings
- Existing Mine Shaft
- Mine Shaft
- Onsite Concentration Point
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Non-Contact Water Channel/Drainage
- Existing Drainage
- Drainage Vault
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 250 500 Feet

0 100 200 Meters

Data Source: East Plant Facilities
Provided by AMEC
2012

Note 1: Route Non-Contact Water to Existing Drainage Downstream of Contact Water Basins E1 & E2

# RESOLUTION COPPER
## Stormwater Drainage Design

EAST PLANT SITE
Figure 3

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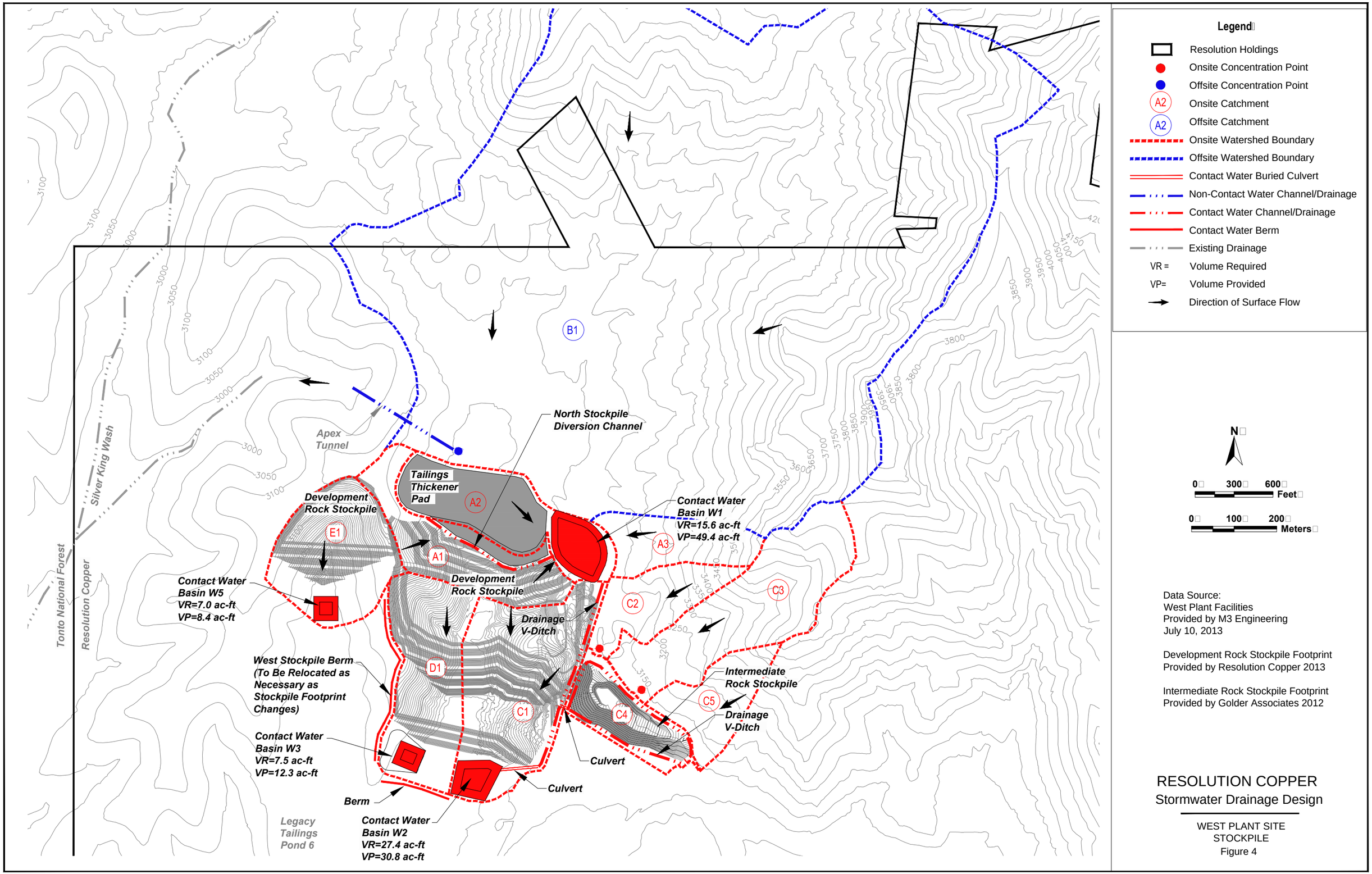


## Legend

- Resolution Holdings
- Onsite Concentration Point
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Contact Water Buried Culvert
- Non-Contact Water Channel/Drainage
- Contact Water Channel/Drainage
- Contact Water Berm
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

Data Source:
West Plant Facilities
Provided by M3 Engineering
July 10, 2013

Development Rock Stockpile Footprint
Provided by Resolution Copper 2013

Intermediate Rock Stockpile Footprint
Provided by Golder Associates 2012

RESOLUTION COPPER
Stormwater Drainage Design

WEST PLANT SITE
STOCKPILE
Figure 4

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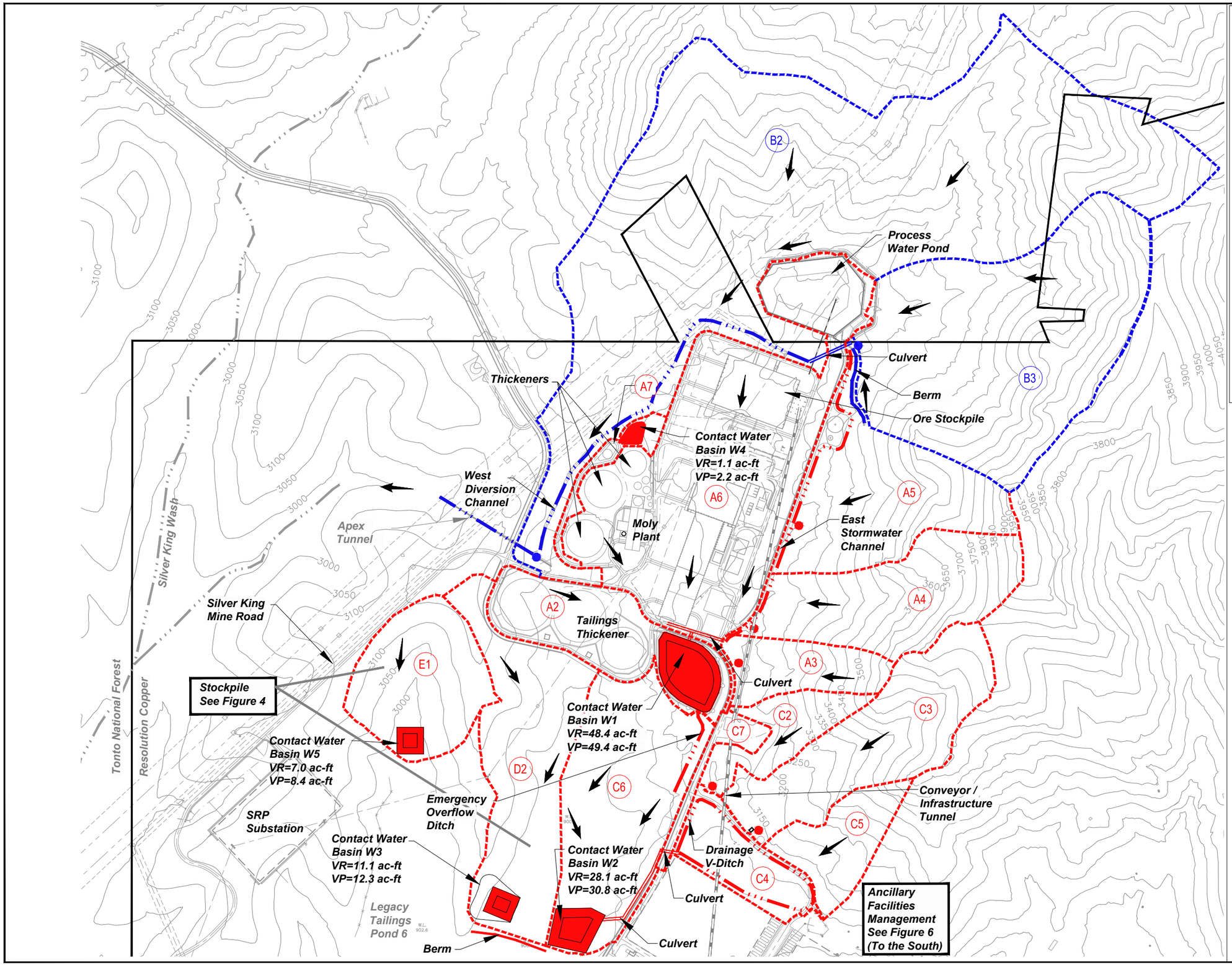


## Legend

- Resolution Holdings
- Onsite Concentration Point
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Contact Water Buried Culvert
- Non-Contact Water Channel/Drainage
- Contact Water Channel/Drainage
- Non-Contact Water Berm
- Contact Water Berm
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

Data Source:
West Plant Site Facilities
Provided by M3 Engineering
July 10, 2013

# RESOLUTION COPPER
## Stormwater Drainage Design

WEST PLANT SITE
CONCENTRATOR COMPLEX MANAGEMENT
Figure 5

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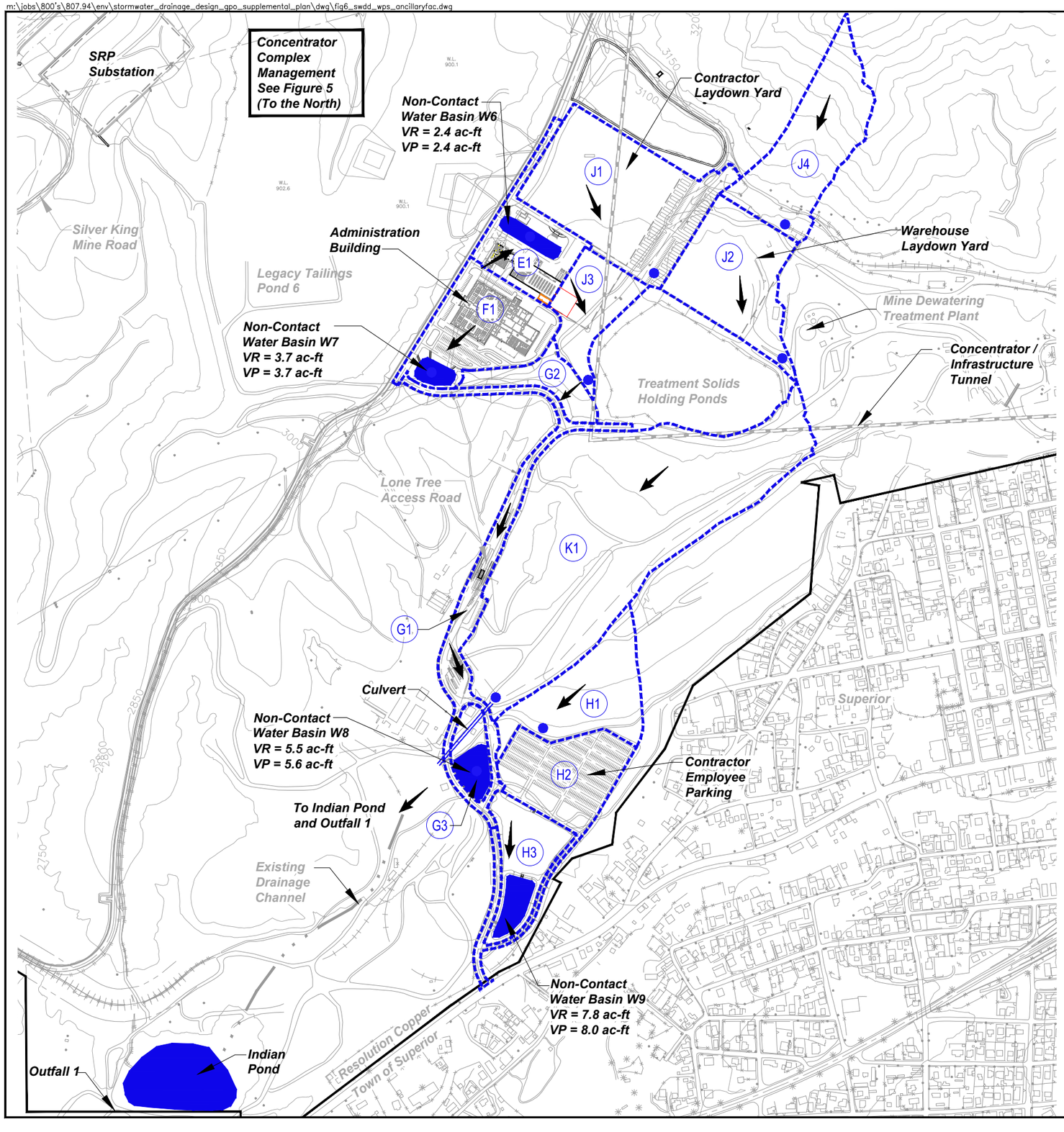



**Legend**

- Resolution Holdings
- Offsite Concentration Point
- A2 — Offsite Catchment
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

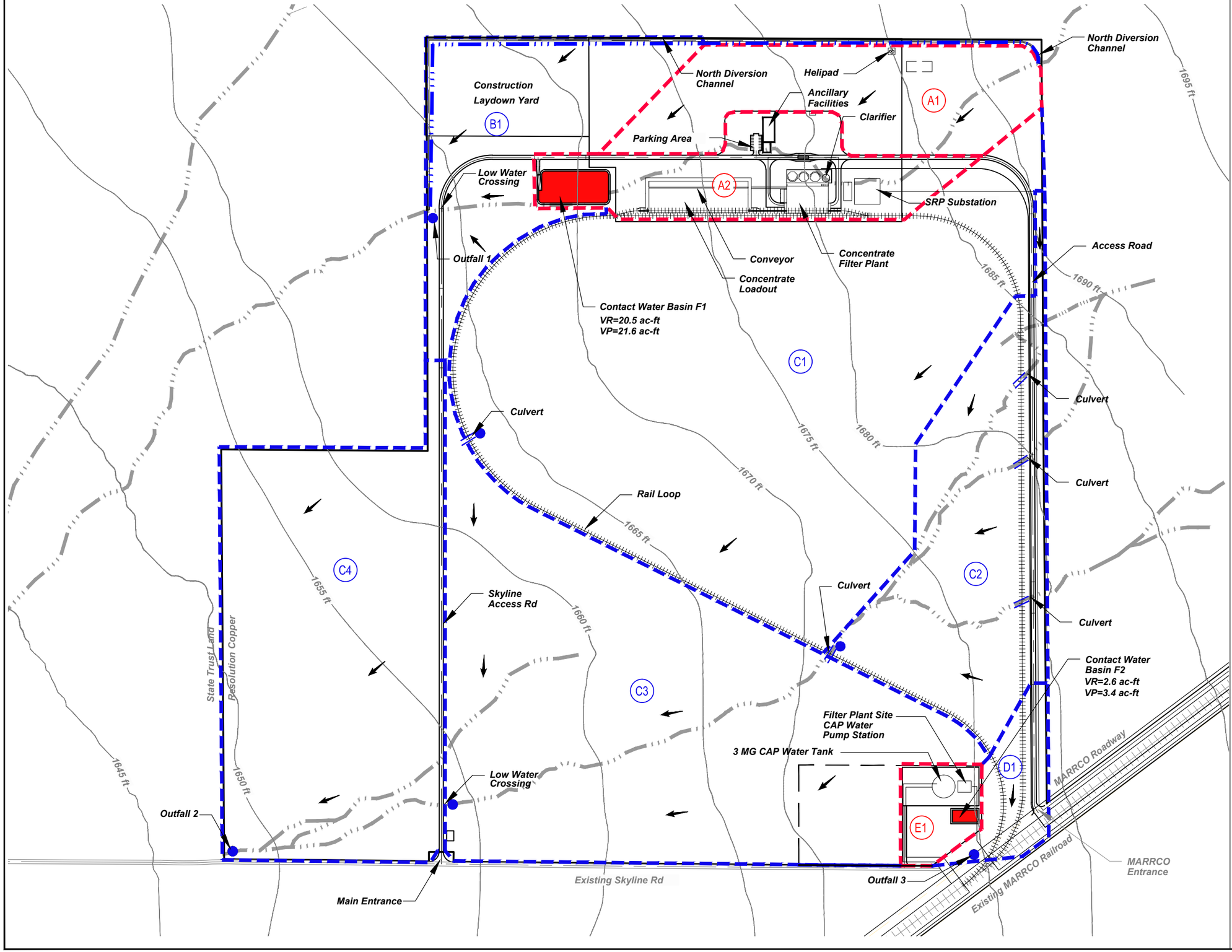
0 100 200 Meters

Data Source:
West Plant Site Ancillary Facilities
Provided by M3 Engineering
July 10, 2013

# RESOLUTION COPPER
## Stormwater Drainage Design

WEST PLANT SITE
ANCILLARY FACILITIES MANAGEMENT
Figure 6

m:\jobs\800's\807.94\env\stormwater_drainage_design_gpo_supplemental_plan\dwg\fig7_filterplant_loadout.dwg




**Legend**

- Resolution Holdings
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Non-Contact Water Channel/Drainage
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

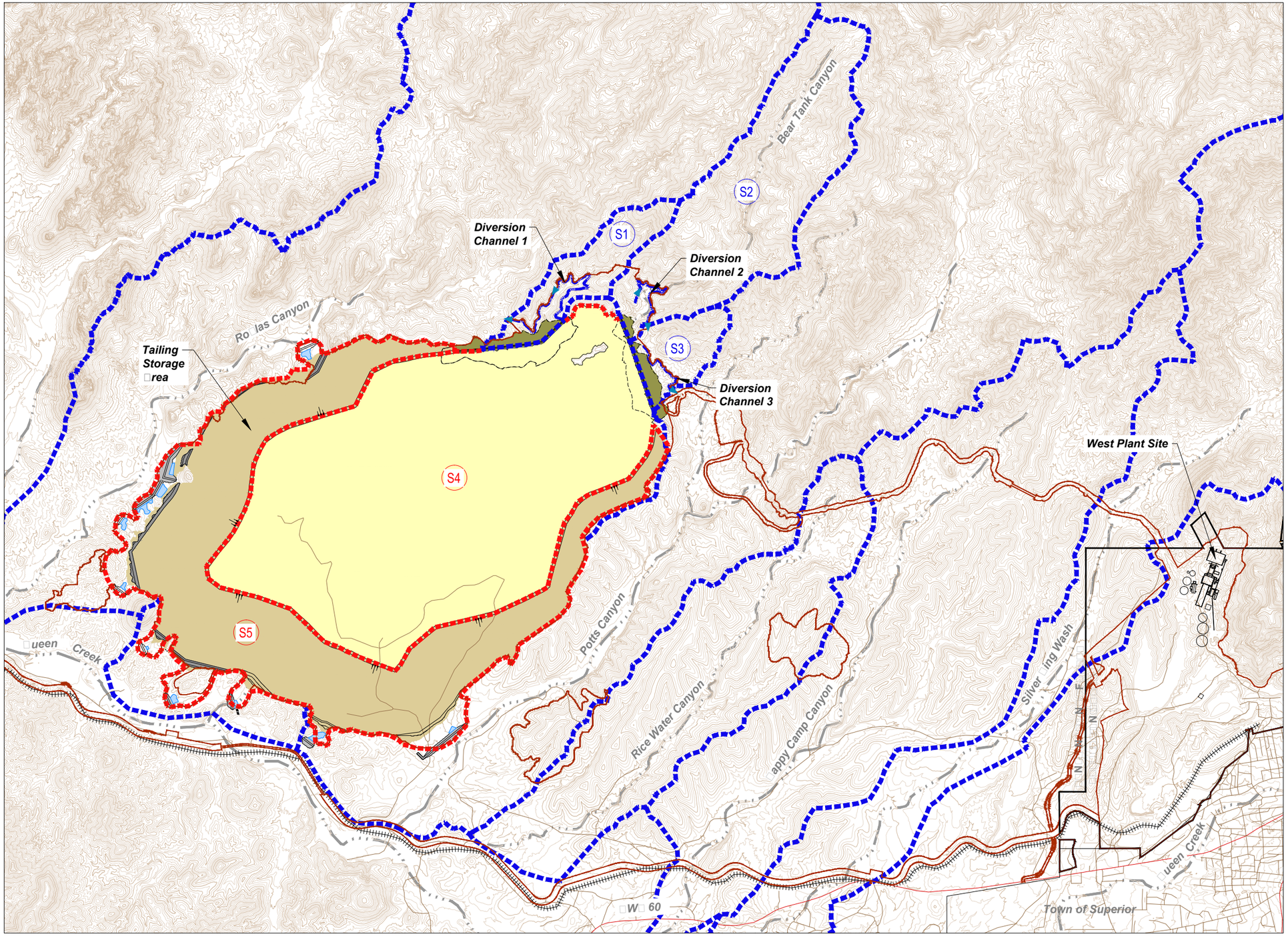
Note:
Existing topography to be verified by current survey. All grades shown are subject to change.

Data Source:
Filter Plant and Loadout Facility
Provided by M3 Engineering
April, 2012

# RESOLUTION COPPER
## Stormwater Drainage Design

FILTER PLANT AND LOADOUT FACILITY

Figure 7




**Legend**

- Resolution Holdings
- Project Area
- A2 Onsite Catchment
- A2 Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Existing Drainage
- Upstream Embankment Raise Fill
- Starter Dam
- Thickened Scavenger Tailings
- North Dams
- Seepage Collection Dam Pond

Topography Based on 1 Meter (3.3 Foot) Interval Contours Received From Resolution January, 2013.

N

0 1,500 3,000 Feet

0 500 1,000 Meters

Klohn Crippen Berger

2013

# RESOLUTION COPPER

## Stormwater Drainage Design

TAILINGS STORAGE FACILITY

Figure 8

# APPENDIX O

Preliminary
Spill Prevention, Control, and Countermeasure Plan (SPCC)

# RESOLUTION COPPER MINING
# GENERAL PLAN OF OPERATIONS

---

## PRELIMINARY SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN

*September 2014*


Prepared by:

**WestLand Resources, Inc.**
4001 East Paradise Falls Drive
Tucson, Arizona 85712
(520) 206-9585

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# 1.0 INTRODUCTION

This preliminary Spill Prevention, Control, and Countermeasure (SPCC) Plan was prepared in support of the Resolution Copper Mining, LLC (Resolution Copper) General Plan of Operations (GPO) for construction of the proposed underground mine, ore processing operation, and associated facilities and infrastructure (collectively, the Resolution Project or Project). The Project is located near Superior, in Pinal County, Arizona.

Once the proposed activities begin it is anticipated that more than 1,320 gallons of oil and petroleum products will be stored in aboveground containers for the Project. This preliminary SPCC Plan describes the procedures which are anticipated to be followed by Resolution Copper to prevent, control, and mitigate releases of oil-based products to the environment for the proposed construction activities. This SPCC Plan is necessarily preliminary and lacks the level of detail required by regulation (see below). This preliminary SPCC Plan will be updated as a final SPCC Plan when the Project is fully permitted.

Resolution Copper has developed this preliminary SPCC Plan to meet the majority of the requirements of the December 5, 2008 revisions of the Title 40, Part 112 of the Code of Federal Regulations (40 CFR Part 112). This SPCC Plan does not follow the exact order presented in 40 CFR Part 112. Section headings identify, where appropriate, the relevant section(s) of the SPCC regulations. Additionally, ***Appendix A*** provides a cross-reference table for the applicable requirements of 40 CFR Part 112 and the corresponding sections in this SPCC Plan where the requirements are addressed. This plan may be substantially revised if changes to the SPCC requirements are promulgated prior to completion of Project permitting.

## 2.0 APPROVAL AND CERTIFICATION [40 CFR 112.3(d)]

### 2.1 Management Approval

Resolution Copper is committed to the prevention of discharges of oil or oily wastewater to navigable waters and the environment. Resolution Copper will maintain the highest standards for spill prevention through regular review, updating, and implementation of this preliminary SPCC Plan for the proposed Project construction activities. Once all environmental permitting is complete and the final locations of the improvements have been decided, Resolution Copper will commit the required equipment, material, and human resources to expeditiously control and remove discharges of oil in harmful quantities.

Name: **To be determined**

Signature: _____

Title: _____

Date: _____

### 2.2 Professional Engineer Certification [40 CFR 112.3(d)]

In order for this SPCC Plan to be effective and meet the requirements of 40 CFR Part 112, a Registered Professional Engineer (PE) must attest the following:

- He/She is familiar with the requirements of 40 CFR Part 112;
- He/She has visited and examined the site, or has supervised examination of the site by appropriately qualified personnel;
- This Spill Prevention, Control, and Countermeasures Plan has been prepared consistent with good engineering practice, including consideration of applicable industry standards and the requirements of 40 CFR Part 112;
- That procedures for required inspections and testing have been established; and
- That this SPCC Plan is adequate for this site.

Name: **To be determined**

Signature: _____

Registration Number: _____

Date: _____

Seal

Based on this preliminary SPCC Plan, a final SPCC Plan will be prepared once all environmental permitting is complete. Once this certification is made it shall in no way relieve Resolution Copper of the responsibility to prepare and fully implement this SPCC Plan for the construction activities in accordance with 40 CFR Part 112.

## 3.0 SUBSTANTIAL HARM EVALUATION [40 CFR 112.20]

In accordance with 40 CFR 112.20, a determination if the proposed activities have the potential to cause substantial harm to the environment by discharging oil into or on navigable waters or adjoining shorelines has been conducted. Based on this determination and as recorded below, Resolution Copper has determined that this site does not pose a risk of substantial harm.

1. Do the proposed activities transfer oil over water to or from vessels and are the proposed activities anticipated to have a total oil storage capacity greater than or equal to 42,000 gallons?

   ☐ Yes ☒ No

2. Are the proposed activities anticipated to have a total oil storage capacity greater than or equal to 1 million gallons and do the proposed activities lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation?

   ☐ Yes ☒ No

3. Are the proposed activities anticipated to have a total oil storage capacity greater than or equal to 1 million gallons and are the proposed activities located at a distance such that a discharge from the activities could cause injury to fish, wildlife, and sensitive environments?

   ☐ Yes ☒ No

4. Are the proposed activities anticipated to have a total oil storage capacity greater than or equal to 1 million gallons and is the site located at a distance such that a discharge from the proposed activities would shut down a public drinking water intake?

   ☐ Yes ☒ No

5. Are the proposed activities anticipated to have a total oil storage capacity greater than or equal to 1 million gallons and have the activities experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?

   ☐ Yes ☒ No

Once all environmental permitting has been completed and the Project planning is finalized, this preliminary SPCC Plan will be updated to reflect the current information and the following certification will be made:

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

Name: **To be determined**

Signature: _____

Title: _____

Date: _____

# 4.0 PLAN MAINTENANCE [40 CFR 112.3 & 112.5]

## 4.1 Location of SPCC Plan [40 CFR 112.3(e)]

A complete controlled copy of this preliminary SPCC Plan and associated records will be kept in the environmental files within the Resolution Copper Environmental Office at 102 Magma Heights, Superior, Arizona. The Environmental Office is attended during normal business hours, Monday through Friday.

## 4.2 Plan Review and Amendments [40 CFR 112.5]

### *4.2.1 Changes in Activity Configuration [40 CFR 112.5(a)]*

The SPCC Plan Coordinator for the proposed activities, identified in Appendix D, will amend the SPCC Plan whenever a change in design, construction, operation, or maintenance materially affects the activities potential for the discharge of oil or petroleum products in quantities that may be harmful. These changes may include, but not be limited to:

- Commissioning or decommissioning containers;
- Replacing, reconstructing, or moving containers;
- Reconstructing, replacing, or installing piping systems;
- Constructing or demolishing that might alter secondary containment structures; or
- Changing product or service, revising standard operation, modifying testing/inspection procedures, and using new or modified industry standards or maintenance procedures.

Technical amendments to the final SPCC Plan must be certified by a registered PE. Decommissioning or removing containers, or replacing a container with a similar type of container, may not necessarily constitute a technical amendment to the SPCC Plan that requires recertification by a registered PE if the change does not materially affect the potential for a discharge. This determination will be made using best professional judgment of the SPCC Plan Coordinator on a case-by-case basis.

The SPCC Plan Coordinator must make the needed revisions to the final SPCC Plan based on changes no later than six months after the changes occur. The revised SPCC Plan must be implemented as soon as possible, but not later than six months following preparation of a revised SPCC Plan.

### *4.2.2 Non-Technical Amendments*

Minor changes (e.g., non-technical amendments) can be made by the SPCC Plan Coordinator and do not require certification by a registered PE. These amendments may include, but not be limited to:

- Change in the name or contact information of individuals responsible for the implementation of the SPCC Plan;
- Change in the name or contact information of spill response or cleanup contractors; or
- Changes in text, tables, figures, forms or other information in the main body and appendices of the final SPCC Plan that do not materially affect the potential for a discharge.

### *4.2.3 Scheduled Plan Reviews [40 CFR 112.5(b)]*

In addition to the requirement (discussed above in ***Section 4.2.1***) to make changes to the final SPCC Plan whenever there are certain changes in design, construction, operation, or maintenance, the final SPCC Plan will be reviewed and evaluated at least once every five years by the SPCC Plan Coordinator or a designated agent. As a result of this review and evaluation, the SPCC Plan Coordinator will amend the SPCC Plan within six months of the review to include more effective prevention and control technology if the technology has been field-proven at the time of the review and will significantly reduce the likelihood of a discharge of oil in quantities that are harmful. Amendments to the plan will be fully implemented as soon as possible, but not later than six months after the date of the amendments. Technical amendments to the final SPCC Plan must be certified by a registered PE. Once environmental permitting is complete and a final SPCC Plan is developed, a plan review will be scheduled to take place on or prior to the five year compliance date.

The SPCC Plan Coordinator will be responsible for initiating and coordinating scheduled SPCC Plan reviews and amendments once it is finalized. Completion of each scheduled SPCC plan review and evaluation will be documented in the log of SPCC plan reviews and amendments found in ***Appendix B***. The documentation will include a signed statement as to whether the SPCC Plan will be amended as a result of the schedule review and evaluation. The statement will include the following words:

"I have completed review and evaluation of the SPCC Plan for the Resolution Project activities on [INSERT DATE] and will (will not) amend the Plan as a result."

## 4.3 Facilities, Procedures, Methods, or Equipment Not Yet Fully Operational [40 CFR 112.7]

Resolution Copper currently has many facilities, procedures, methods or equipment that are regulated by 40 CFR 112 but are not yet fully operational and will ultimately support the Project activities. Once these items are operational the final SPCC Plan will discuss all of these items in separate sections and explain the details of installation and operational start-up.

## 4.4 Deviations and Equivalent Environmental Protection [40 CFR 112.7(a)(2)]

The Environmental Protection Agency's (EPA's) SPCC Guidance for Regional Inspectors (December 16, 2013) states that in lieu of integrity testing, environmental equivalence can be achieved via monthly inspections for elevated drums and elevated shop-built containers with a capacity less than 30,000 gallons, where all sides of the container are visible. In addition, the guidance states that the EPA recognizes that industry standards typically only require visual inspection for single-use bulk storage containers. Resolution Copper containers that meet these criteria will not be integrity tested.

The preamble to the SPCC Rule revisions issued by the EPA on July 17, 2002 lists the Steel Tank Institute (STI) Standard SP001 as an industry standard that may be used to assist with the integrity testing guidelines required by 40 CFR 112.8(c)(6). STI's Standard SP001 does not require integrity testing for certain aboveground storage tank configurations that are inspected on a regular basis. Further, the EPA's SPCC Guidance for Regional Inspectors also notes that certain tank sizes and configurations may only require frequent visual inspection, in lieu of integrity testing. Therefore, regular inspections will be considered equivalent environmental protection for certain bulk storage containers that meet the STI Standard SP001 criteria.

Deviations and equivalent protection associated with integrity testing are outlined in ***Section 16.6.3*** of the SPCC Plan.

# 5.0 SITE DESCRIPTION [40 CFR 112.7(a)(3)]

## 5.1 Site Operations

The Resolution Project is in the planning and environmental review stage. Resolution Copper's administrative headquarters are currently located at Resolution Copper's West Plant Site (WPS). These administrative offices are located immediately north of Superior at 102 Magma Heights. The office is accessed from US 60 by taking the State Route 177 off ramp and going north to the end of Magma Heights to the guard gate. The office building is known as the Verde Building. The East Plant Site (EPS) encompasses the proposed underground mine, associated shafts, and surface support facilities. The support facilities, some of which are already in existence, are located in a previously disturbed area and include a mine site where Shaft 9 was constructed in the 1970s. The EPS is located approximately 6 road miles east of the WPS, and is accessed from US 60 by turning south on Magma Mine Road (also known as Forest Road [FR] 469). Magma Mine Road ends at the EPS guard gate. Project facilities and attendant infrastructure components are located in north-central Pinal County and their proposed locations are herein referred to as the General Project Area (GPA) (***Figures 1 through 8***).

Some information relevant to the SPCC Plan is not yet available as the planning process for the Project has not yet been completed. Current Project-specific plans for proposed activities are summarized in the following paragraphs.

New ore processing facilities (the Concentrator) will be located at the WPS in an area disturbed by legacy mining features (i.e., those related to previous mining activity).

The existing mine site and related surface support facilities at the EPS are currently located on private lands, and during production will largely expand on private lands. The expansion associated with this GPO will be primarily on FS lands, with a smaller portion on state and private lands. Additional area encompassed by the EPS includes the land surface above the ore body, comprised of unpatented mining claims on lands administered by the FS, specifically Tonto National Forest (TNF).

A copper concentrate filtration plant and concentrate loadout facility (the Filter Plant and Loadout Facility) will be constructed near Magma Junction (Magma), proximate to the existing Magma Arizona Railroad Company (MARRCO) right-of-way. The MARRCO right-of-way crosses lands owned by Resolution Copper and the FS, as well as state trust lands administered by the Arizona State Land Department (ASLD) and will be the site of connecting infrastructure, such as water supply pipelines, dewatering pipelines, concentrate pipelines, and power lines; these features and the existing rail line are referred to collectively as the MARRCO Corridor.

A Tailings Storage Facility (TSF) will be situated west of the WPS and north of Queen Station within the TNF. Tailings will be delivered to the TSF from the WPS via a pipeline that traverses the intervening area (along with other infrastructure) along the Tailings Corridor. Linear infrastructure elements of the Project are primarily located within the Tailings Corridor, within the MARRCO Corridor on private land alongside existing infrastructure, or underground, and include ore conveyors, roads, power lines, copper concentrate pipelines, tailings pipelines, the MARRCO Railroad, and water supply pipelines. These elements connect the Project features and traverse multiple jurisdictions, representing several land ownership types, including private, state, and federal lands.

Oil-based products will primarily be used to fuel and maintain equipment supporting the planned construction activities. This equipment will include earth moving equipment, materials transportation equipment, generators, water trucks, and other support vehicles. Used oil will transported off site for recycling in accordance with Resolution Copper policies.

## 5.2 Oil Storage

Oil storage facilities associated with the proposed construction activities are anticipated to be located in designated laydown yards, the Filter Plant and Loadout Facility area, the tailings storage area, and in the construction area utilized for the Concentrator.

Once the environmental permitting process is complete a table listing all oil storage containers and capacities will be provided in ***Appendix C-2***. All containers with capacity of 55 gallons or more will be included including transformers. Containment and drainage patterns for each of these areas are generally discussed in ***Section 8.0*** and included in ***Appendix C***. To support the continual update of quickly changing sites, daily in most instances, the existing daily checklist for drilling contractors will be updated to include SPCC Plan concerns.

Any out-of-service containers will remain in the SPCC Plan inventory and will require periodic inspections per ***Section 9.0*** until they are "permanently closed" or removed from the site. "Permanently closed" is defined by the SPCC regulations as a container for which:

- All liquid and sludge has been removed from the container and connecting lines
- All connecting lines and piping have been disconnected and blanked off
- All valves (except ventilation valves) have been closed and locked,
- Conspicuous signs have been posted on each container stating that it is a permanently closed container and noting the date of closure.

The SPCC Plan Coordinator will be informed of any "permanent closure" activities at the proposed project so that the SPCC Plan may be updated accordingly.

Mobile tanks and service vehicles will be used for the Project construction activities; a complete list will be maintained in ***Appendix C***. The mobile tanks and service vehicles will be typically stationed in the laydown yards but will travel throughout the proposed Project areas as needed. They will be filled in the laydown yards.

## 5.3 Routine Handling Procedures

Proposed procedures for petroleum product loading and unloading at bulk storage tanks are discussed in ***Section 12.0***. Small, incidental releases that may result from transfer operations will be handled by SPCC Plan-trained Resolution Copper employees or contractors employees using an appropriate absorbent. Spill kits, absorbent materials, empty drums, and shovels will be located throughout the Project for this purpose. Inventories of spill control materials will be checked periodically during routine SPCC Plan inspections (see ***Section 9.0***).

Resolution Copper or contractors personnel responsible for receiving/accepting bulk petroleum product containers (i.e., drums and totes) will be trained in visual inspection procedures. Drums and totes containing petroleum products which will be delivered to the appropriate portion of the Project

area by outside vendors will be visually inspected for signs of leaks and corrosion prior to acceptance. Petroleum products in damaged containers will not be accepted.

Resolution Copper or contractors employees that handle drums will be instructed to keep lids on drums closed except when adding or removing product. Resolution Copper or contractors' employees will not be permitted to transport used oil off of the proposed Project area or on public roads.

# 6.0 RELEASE RESPONSE [40 CFR 112.7(a)(3-5)]

## 6.1 Release Response Procedures

The following release response procedures were developed to assist Resolution Copper or contractors employees in responding to releases in an efficient manner, while providing for the protection of employees, facilities, and the surrounding environment. No employee will be required to respond to any type of release if conditions are unsafe. A list of contact names and phone numbers will be provided in ***Appendix D***.

Response procedures are listed below:

1. Identify the character, source, amount, and extent of the release. ***Do not enter*** a hazardous area until hazards have been assessed and controlled. ***Stay upwind/uphill*** of any release.
2. Evaluate the situation from a distance and assess whether a fire or explosion is possible. If there is a risk of fire or explosion, move a safe distance away from the area and evacuate personnel in the area. Turn off nearby sources of ignition (***if this can be done safely***).
3. ***Immediately notify the front desk at 520-689-9374 or security at 520-689-0115 for any of the following discharges of any quantity that:***
   - Poses an imminent danger or involves injured personnel;
   - Reaches a wash, creek, or stream; or
   - Is not contained by a secondary containment basin or diversionary structure.
4. If you have not been trained to respond to releases, take no further action and wait for emergency responders.
5. If you have been trained to respond to releases, take active measures to contain the release ***without undue risk of personal injury***. Make sure that proper Personal Protective Equipment (PPE) is worn to provide skin and respiratory protection from the hazards involved with spill containment, cleanup and disposal. PPE may include hard hat, boots, safety glasses, gloves, and respirators (as necessary).
   - Attempt to extinguish any incipient stage fires.
   - Shut off pumps, close valves, etc. if material is still being released.
   - For releases in a diked area, make sure any valves in the containment wall are closed.
   - For small releases in undiked areas, place absorbent materials directly on the spilled oil.
   - For large releases in undiked areas, develop a security perimeter around the impacted area, construct makeshift dikes of absorbent materials, booms, or other available materials around the release.

A flow chart outlining release response procedures is included in ***Appendix E***.

## 6.2 Disposal of Recovered Materials

Sorbent material, temporary earthen berms, and/or heavy equipment may be utilized by Resolution Copper or its contractors to contain and recover the released oil. Used absorbent material and contained oil from releases will be placed in 55-gallon metal drums or appropriate containers and stored in an appropriate containment. Drums will be appropriately labeled and kept closed except when adding waste. If necessary, Resolution Copper may also contract a disposal company to assist

with waste recovery and removal. **The Environmental Department will coordinate all waste disposal** and will ensure that a shipping receipt or manifest is received from the disposal contractor and properly filed. Resolution Copper or contractor employees may not transport used oil off of the site or on public roads.

### 6.3 Incidental Releases

Small, incidental releases resulting from transfer operations will be cleaned up by Resolution Copper or contractors employees using an appropriate absorbent. Spill kits will be located throughout the site for this purpose. Notification of the front desk or security is required for incidental releases.

Any release that poses an imminent danger, involves injured personnel, reaches a wash, creek, or stream; or is not contained by a secondary containment basin or diversionary structure, ***regardless of quantity***, is not considered an incidental release and must be reported to the front desk or security and site manager.

# 7.0 RELEASE NOTIFICATIONS [40 CFR 112.7(a)(3-5)]

## 7.1 Verbal Notifications to Government Agencies

Government agencies may need to be notified of oil releases that are not contained within a dike, berm, or other containment structure. **All verbal and written notifications to government agencies are to be made by the Site Manager (or designate) only**. The following notifications must be made as soon as possible after learning of an oil discharge.

### *7.1.1 Verbal Notifications to Local Agencies*

Notification to Pinal County Emergency Management (520-509-3555) must be made if the discharge is released off-site.

### *7.1.2 Verbal Notifications to State Agencies*

Notify the Arizona Department of Environmental Quality (ADEQ) at 800-234-5677 for reportable discharges of petroleum.

### *7.1.3 Verbal Notifications to Federal Agencies*

The National Response Center (NRC) will be verbally notified following a discharge of oil ***of any quantity*** that meets ***any*** of the following conditions:

- Violates applicable water quality standards,
- Causes a film or sheen upon or discoloration of the surface of navigable waters. (e.g., a wash, creek, or stream) or adjoining shorelines, or
- Causes a sludge or emulsion to be deposited beneath the surface of navigable waters or upon adjoining shorelines.

Notifications are to be made as soon as possible.

The telephone number for NRC notifications is 800-424-8802.

**Refer to the internal notification requirements outlined in *Appendix E* prior to any release notifications to the NRC.**

## 7.2 Information to Provide During Verbal Notifications

When notifying a government agency of a release, the following information should be gathered as soon as possible and provided:

1. Name and location of the site.
2. Specific location where the oil discharge occurred.
3. Your name, position, and telephone number.
4. Date and time of the oil discharge.
5. Information on the oil discharge:
   - Type of material discharged (e.g., diesel fuel);
   - Source of discharge (e.g., aboveground storage tank);

- Estimated total quantity discharged, including the estimated total quantity of oil discharged to navigable waters or adjoining shorelines;
- Cause of discharge;
- Affected media (e.g., soil, surface water);
- Damages or injuries caused by the discharge;
- Response actions being used to stop, contain, or clean-up the discharge;
- Whether the discharge has been stopped; and
- Whether an evacuation may be needed.

6. Names of other individuals or agencies that were contacted.

Record the following information when making a notification:

- Name and position of person contacted.
- Agency contacted.
- Date and time of notification.
- Information provided to agency.

## 7.3 Written Notifications to Government Agencies

In addition to verbal notifications, written follow-up reports may need to be submitted to state and federal agencies.

### *7.3.1 Written Notifications to State Agencies*

Refer to written notifications to federal agencies in ***Section 7.3.2*** below.

### *7.3.2 Written Notifications to Federal Agencies*

A spill report will be submitted to the EPA Region VI Administrator if either of the following conditions are met:

- A single discharge of more than 1,000 gallons of oil which could reasonably be expected to discharge into or upon ***navigable waters or adjoining shorelines*** in a single event.
- A discharge of more than 42 gallons of oil in each of two events within any 12 month period which could reasonably be expected to discharge into or upon ***navigable waters or adjoining shorelines***.

The spill report to the EPA must be submitted ***within 60 days of the release*** and contain the following information:

- Name of the site.
- Name of the owner/operator of the site.
- Location of the site.
- Maximum storage or handling capacity of the site and normal daily throughput.
- Corrective actions and countermeasures taken, including a description of equipment repairs and replacements.

- An adequate description of the site, including maps, flow diagrams, and topographic maps, as necessary.
- The cause of the discharge, including a failure analysis of the system or subsystem in which the failure occurred.
- Additional preventive measures taken or contemplated to minimize the possibility of recurrence.
- Such other information as the U.S. EPA Regional Administrator may reasonably require pertinent to the SPCC Plan or discharge.

A copy of the above information also must be submitted to ADEQ in accordance with 40 CFR 112.4(c).

### 7.4 Incident Termination

Once a release has been contained and cleaned-up, and any required verbal notifications have been made, the SPCC Plan Coordinator will take the following actions:

1. If the spill was a reportable release, complete the spill report form in Appendix F and file it with the SPCC Plan in the environmental files (General Office).
2. Verify that spill kits have been re-stocked.
3. Verify that the used oil is properly containerized, labeled, and stored for disposal.
4. Review the cause of and response to the release with supervisors, witnesses, and contractors, if appropriate. Determine additional requirements necessary to prevent recurrence of the incident. Amend the SPCC Plan if necessary (refer to ***Section 4.0***).

# 8.0 EVALUATION OF DISCHARGE POTENTIAL [40 CFR 112.7(b)&(c)]

## 8.1 Potential Discharge Volumes [40 CFR 112.7(b)]

For potential releases due to containment failure, it will be conservatively assumed that the worst case scenario would result in the entire contents of a container being released within one hour. Container contents, volumes, secondary containment systems, as well as the resultant flow direction, will be listed in ***Appendix C-2***.

## 8.2 Direction of Flow [40 CFR 112.7(b)]

The proposed Project area consists of widely spaced construction areas and associated access roads. Drainages occurring in the proximity of proposed activities include Devils Canyon, Queen Creek, Rancho Rio Creek, and other unnamed drainages; none of which are considered navigable waters but are considered tributaries. As the Project undergoes NEPA review with the FS and the location of construction disturbance areas are confirmed, detailed information regarding topography, drainage and receiving waters will be provided.

## 8.3 Discharge Containment [40 CFR 112.7(c)]

Methods of secondary containment for the Project will include a combination of control structures, land-based spill response equipment, and backup containment areas to prevent petroleum from reaching navigable waters.

### *8.3.1 Containment and Diversionary Structures*

Secondary containment and diversionary structures for the proposed construction activities include:

- Engineered secondary containment structures
- Double walled tanks
- Earthen berms (high fines content; sufficiently impervious to oil)
- Culverts/drainage trenches
- Spill pallets

Containment and diversionary structures which will be associated with each bulk oil storage vessel planned for the proposed construction activities will be presented in ***Appendix C-1***.

### *8.3.2 Spill Response Equipment*

Spill response equipment which will be available for the proposed construction activities may include:

- 55-gallon steel drums
- Sorbent pads
- Sorbent socks
- Sorbent granular materials
- Sorbent diapers
- Heavy equipment (e.g., backhoes, front-end loaders, etc.) for temporary berm construction

Spill kits will be located throughout the site to contain or clean-up releases from portable containers. Once all locations are selected, the SPCC Plan figures will be updated with all the locations of spill kits.

Due to the potential for discharges during tank truck loading and unloading operations, Resolution Copper has established minimum "active" containment measures or procedures for petroleum transfer operations. These operations are outlined in ***Appendix I***. The procedures will also be posted at each loading/unloading area. The procedures were developed to safeguard against potential discharges associated with poor connections, overfilling, and premature departure. Fuel delivery training will be provided to all drivers to ensure that drivers understand the site layout and know the protocol for entering the site and unloading the product.

Delivery drivers will be required to visually inspect all drains, outlets, and valves for leaks prior to filling and departing the loading/unloading areas. Should there be a spill, appropriate equipment will be available at the site to dike and absorb the spill.

## 8.4 Practicability of Secondary Containment [40 CFR 112.7(d)]

Resolution Copper management has determined that secondary containment will be practicable at this site and will implement appropriate secondary containment as needed.

## 8.5 Alternative Requirements to General Secondary Containment for Qualified Oil-Filled Equipment [40 CFR 112.7(k)]

This section does not apply to the Resolution Copper proposed construction activities. Oil-filled equipment (e.g., transformers) will meet the general secondary containment requirements of §§112.7(c).

# 9.0 INSPECTIONS, TESTS, AND RECORDS [40 CFR 112.7(e)]

## 9.1 Inspection Frequency

External visual inspections of oil storage containers, associated piping and valves, spill kits, and general housekeeping will be conducted on a variable schedule. The inspection schedule considers the potential for a release from a bulk storage container to reach navigable waters and the frequency of bulk storage container usage. The planned storage container inspection frequency for the planned construction activities is described in the following sections.

### *9.1.1 Daily Inspections*

Resolution Copper or contractor employees will perform daily inspections of their work area on each shift, if operational. This inspection does not need to be physically documented. This daily visual inspection includes:

- Tank/piping damage or leakage
- Stained or discolored soils
- Excessive accumulation of water or solution in containment areas

Currently Resolution Copper or contractor employees are required to conduct daily inspections of drilling activities. It is anticipated that SPCC Plan inspection items will be added to this existing form to better document daily changes in equipment or bulk storage. This form will be included in the final SPCC Plan as an attachment once it has been developed.

### *9.1.2 Quarterly Inspections*

Bulk storage containers located within secondary containment structures will be visually inspected on a quarterly basis. Refer to ***Appendix G*** for the form.

### *9.1.3 Annual Inspections*

Visual inspections will be performed on an annual basis for operational-use containers, which include oil-filled transformers. In addition, out-of-service tanks that have not been "permanently closed" will be inspected on an annual basis until permanent closure is complete and the containers are removed from the site's inventory.

The inspection checklists are in ***Appendix G***. If deficiencies in equipment or in procedures are discovered during the inspections, they will be recorded on the checklist and relayed to the appropriate manager. Signed and dated inspection checklists will be maintained with the SPCC Plan in the Environmental Office. The SPCC Plan Coordinator will be responsible for ensuring that deficiencies noted on the checklist are addressed and that corrective actions are noted.

## 9.2 Certified Inspections

An additional inspection of field-erected steel tanks with a storage capacity greater than 50,000 gallons, if one is required onsite, that could potentially discharge to navigable waters will be conducted by a certified inspector at intervals of 10 years, as specified in API 653. If the tank bottom thickness can be determined externally, an external inspection by a certified inspector may be used in lieu of the internal inspection. No containers in excess of 50,000-gallon capacity are anticipated for the proposed construction activities.

## 9.3 Recordkeeping

Inspection records and other documentation related to oil release prevention, such as training records, corrective actions, spill reports, and maintenance records will be maintained with the SPCC Plan in the Environmental Office. The SPCC Plan Coordinator will be responsible for ensuring that records are properly filed and retained for at least three years.

## 10.0 EMPLOYEE TRAINING [40 CFR 112.7(f)]

Resolution Copper and contractor employees that will handle oil will be required to attend release prevention and response training prior to working in areas where petroleum products are stored or handled. The objective of the training program will be to reduce the likelihood and impact of oil releases.

### 10.1 SPCC Training

The SPCC training program for new employees and/or existing employees assigned to oil-handling duties includes the following:

- Overview of the SPCC Plan contents;
- Overview of applicable pollution control laws, rules, and regulations;
- Operation and maintenance of equipment to prevent discharges;
- General site operations;
- Review of oil management activities at the site;
- Spill response procedures;
- Release notification procedures; and
- Disposal procedures for spilled materials.

Training for fuel delivery drivers is anticipated to be provided during the initial Hazard Recognition training. The training will focus on loading and unloading operations, spill response procedures, and emergency notification procedures. If fuel delivery drivers do not participate in the training, then they must be accompanied by a trained Resolution Copper or contractor's employee during the fuel loading/unloading activities.

### 10.2 Discharge Prevention Briefings

At least once a year, oil-handling employees will be briefed on any known discharges that have occurred at the site over the past year as well as a review of any failures, malfunctioning components, or recently developed precautionary measures.

On-the-job discharge prevention briefings will also be provided to site personnel handling petroleum whenever there is a change in equipment or procedures relating to any element of this preliminary SPCC Plan.

### 10.3 Training Records

Attendance at SPCC training classes and discharge prevention briefings will be recorded on the SPCC training attendance forms in ***Appendix H*** and maintained with this SPCC Plan for a period of three years. Training records will be maintained with the SPCC Plan in the Environmental Office.

## 11.0 SECURITY [40 CFR 112.7(g)]

### 11.1 Fencing

The proposed construction activities will occur largely on existing and planned dirt access roads. Unauthorized access to the proposed construction areas where SPCC related materials will be stored will be restricted by Resolution Copper or contractors employees who will secure the area prior to leaving the site.

### 11.2 Valves

Master flow, drain and any other valves that would permit flow of oil out of a bulk storage container will be kept locked in the closed position when in a non-operating, non-standby mode. All outward flow control valves associated with bulk storage containers will be within a secure area (i.e., restricted public access) and will be accessible only by authorized personnel.

### 11.3 Starter Controls

Oil storage tanks and pumps equipped with starter controls will be kept locked when not in use. Pumps equipped with electric motor drives will be within a secure area (i.e., restricted public access) and will be accessible only by authorized personnel.

### 11.4 Pipeline Connections

Pipeline connections will be securely capped when they are not in use and when they are in standby service for an extended period of time. All out-of-service pipelines will be evacuated of their contents and capped.

### 11.5 Lighting

Adequate lighting will be present at the contractor yards and at each construction area. Discharges discovered during hours of darkness will be handled using the Release Response Procedures outlined in ***Section 6.1***.

## 12.0 LOADING AND UNLOADING RACKS [40 CFR 112.7(h)]

There will be no loading/unloading racks associated with the proposed construction activities. The December 16, 2013 EPA "*SPCC Guidance for Regional Inspectors*" (Chapter 4 Section 4.7.3) states that "Equipment present at a loading/unloading area where a pipe stand connects to a tank car or tank truck via a flexible hose is not a loading/unloading rack because there is no loading or unloading arm."

Due to the potential for discharges during tank truck loading and unloading operations, Resolution Copper has established minimum procedures for petroleum transfer operations. These operations are outlined in ***Appendix I*** and discussed in ***Section 8.3.2*** (Spill Response Equipment) and ***Section 18*** (site Transfer Operations). The procedures were developed to safeguard against potential discharges associated with poor connections, overfilling, and premature departure.

Delivery drivers will be required to deliver during daylight work hours and visually inspect all drains, outlets, and valves for leaks prior to filling and departing the loading/unloading areas. Should there be a spill, appropriate equipment will be available at the site to dike and absorb the spill.

## 13.0 BRITTLE FRACTURE EVALUATION [40 CFR 112.7(i)]

Brittle fracture evaluation will be performed on field-erected aboveground containers undergoing repair, alteration, reconstruction or a change-in-service that might affect the risk of failure prior to being returned to service. Field-erected tanks are not anticipated for the proposed construction activities.

## 14.0 CONFORMANCE WITH REGULATIONS [40 CFR 112.7(j)]

There are no anticipated applicable more stringent state, federal or local rules, regulations or guidelines.

## 15.0 SITE DRAINAGE [40 CFR 112.8(b)]

Most bulk storage containers will be stored within an engineered secondary containment structure (see ***Section 16.2*** below). Any containers that are not within an engineered secondary containment structure will be stored either within a laydown yard or within a bermed containment at the construction sites to prevent discharge offsite.

Rainwater that collects in secondary containment areas will typically be allowed to evaporate. Most secondary containment areas do not have valves, piping, or other outlets. If secondary containment areas are installed for the proposed construction activities that have outlets, they will be manually released if necessary.

If rainwater accumulation within a secondary containment area is excessive, the accumulated rainwater in will be inspected, prior to evacuation, to ensure no oil will be discharged offsite. The procedures for rainwater discharge from secondary containment areas are summarized in ***Section 16.3***.

# 16.0 BULK STORAGE CONTAINERS [40 CFR 112.8(c)]

## 16.1 Material of Construction [40 CFR 112.8(c)(1)]

The design and construction of all bulk storage containers at the site will be compatible with the characteristics of the oil product they contain, and with temperature and pressure conditions.

## 16.2 Secondary Containment [40 CFR 112.8(c)(2)]

Bulk storage containers will be provided with secondary containment designed to hold the entire contents of the largest container with sufficient freeboard to contain the rainfall from a 25-year, 24-hour storm event. Secondary containment features plastic containment pallets, double walled tanks, engineered metal structures, and earthen berms (lined and unlined). The earthen bermed areas will be constructed of native soils with a plastic (HDPE) liner and would retain an oil discharge long enough to allow for spill response and cleanup. Secondary containment systems are listed in ***Appendix C-2*** for bulk storage containers.

## 16.3 Rainwater Discharge from Diked Areas [40 CFR 112.8(c)(3)]

Rainwater that collects in containment areas will typically be allowed to evaporate. If rainwater accumulation is excessive, uncontaminated rainwater will be pumped out onto the ground. Prior to discharge, the SPCC Plan Coordinator will be notified and the rainwater will be visually observed for sheen, discoloration, and any sludge or oil. If rainwater will be discharged to a storm drain, open watercourse, lake or pond, these observations are to be recorded on the form in ***Appendix J***. Completed records will be maintained with the SPCC Plan in the General Office. Any discharges of uncontaminated rainwater to the storm sewer system must comply with all applicable Arizona Pollutant Discharge Elimination System (AZPDES) permitting requirements.

If the water has a sheen or other signs of contamination, it will be pumped into drums for disposal off site or the oil will be removed using an absorbent prior to discharge.

## 16.4 Completely Buried Metallic Storage Tanks [40 CFR 112.8(c)(4)]

There will be no completely buried metallic storage tanks associated with the Project.

## 16.5 Partially Buried Metallic Storage Tanks [40 CFR 112.8(c)(5)]

There will be no partially buried metallic storage tanks associated with the Project.

## 16.6 Integrity Testing [40 CFR 112.8(c)(6)]

In addition to the visual inspections described in ***Section 9.0***, bulk storage containers will be regularly tested for integrity in accordance with the schedule outlined in ***Section 16.6.1***. Integrity testing will also be performed when material repairs are made to bulk storage containers. The SPCC Plan Coordinator must be notified whenever material repairs to bulk storage containers are complete. The purpose of integrity testing is to detect cracks, leaks, corrosion, or wall thinning to ensure sufficient structural strength. Integrity testing is accomplished through ultrasonic thickness tests, acoustic emission tests, or another type of non-destructive shell testing. Should the results of an integrity test indicate a significant reduction in structural strength; the container will be repaired or removed from service.

### *16.6.1 Integrity Testing Guidelines*

Integrity testing will be performed by qualified outside contractors. Integrity testing for bulk storage containers with a capacity greater than 50,000 gallons shall follow guidelines established by the American Petroleum Institute (API) in Standard 653, Tank Inspection, Repair, Alteration, and Reconstruction. There are no bulk storage containers with a capacity in excess of 50,000 gallons anticipated for the proposed construction activities. Integrity testing of bulk storage tanks with a capacity less than 50,000 gallons shall follow the guidelines established by the STI Standard SP001 Standard for the Inspection of Aboveground Storage Tanks. Records of integrity tests will be maintained in the environmental files located in the General Office until the subsequent test is performed, but not for less than three years.

### *16.6.2 Integrity Testing Exclusions*

Integrity testing is not required for operational use containers, such as oil-filled transformers. Operational use containers will be visually inspected in accordance with ***Section 9.0***.

Environmental equivalence guidelines can be implemented in lieu of integrity testing for some bulk storage containers at the site. Environmental equivalence guidelines are discussed in the next section.

### *16.6.3 Environmental Equivalence*

The following guidelines will be used by Resolution Copper to determine which containers satisfy the integrity testing requirement through environmental equivalence:

- Drums and totes - Drums and totes are not subject to integrity testing if the following measures are implemented to provide environmental equivalence.

  Environmental equivalence measures for multi-use drums and totes (i.e., containers that are refilled/reused; not intended for single-use) management may include:

  - Perform visual inspections of multi-use drums and totes monthly.
  - Elevate multi-use totes so that all sides can be visually inspected.
  - Replace the multi-use drums and totes within 10 years of use, or sooner if they are not in good condition or have been damaged.

  Environmental equivalence measures for single-use drums and totes management may include:

  - Perform visual inspections of single-use drums and totes during the regular site inspections outlined in this preliminary SPCC plan.
  - Elevate single-use drums and totes (using pallets or other support structures).

- Elevated tanks - Integrity testing will not be performed on tanks that are elevated high enough off the ground to allow visual inspection of all sides. To provide environmental equivalence, these tanks will have secondary containment and will be visually inspected for leaks and signs of corrosion on a monthly basis. The visual inspection includes observation of the bottom of the tank. Tanks with a capacity of more than 30,000 gallons will undergo integrity testing regardless of whether they are elevated.
- Tanks with capacities less than 5,000 gallons - The STI Standard SP001, 5$^{th}$ Edition, classifies shop-built aboveground storage tanks (ASTs) with a secondary containment

dike/berm as a Category 1 AST. Category 1 ASTs with capacities less than or equal to 5,000 gallons only require periodic inspection. The guidance does not recommend formal external/internal inspections (which include integrity testing) by certified inspectors or leak testing for Category 1 ASTs.

#### *16.6.4 Integrity Testing Schedule*

Integrity testing will be performed when reasonable suspicion of structural integrity is raised by deficiencies identified during inspections, by maintenance records, or by age or design life. At minimum, bulk storage containers that are not exempt from integrity testing requirements as described in the previous sections above will be tested every 10 years.

### 16.7 Heating Coils [40 CFR 112.8(c)(7)]

There are no internal heating coils in storage tanks anticipated for the proposed construction activities.

### 16.8 Discharge Warning Devices [40 CFR 112.8(c)(8)]

Bulk storage tanks at this site will be equipped with overfill warning devices, such as vision gauges, warning lights, and/or audible alarms. Electronic liquid level sensing devices (e.g., float switches, ultrasonic sensors, etc.) will be tested during the routine inspections for proper operation. Any deficiencies noted during the testing will be recorded on the inspection checklist. Dip sticks are not considered to provide adequate overfill warning.

### 16.9 Effluent Treatment Facilities [40 CFR 112.8(c)(9)]

There are no effluent treatment facilities anticipated for the proposed construction activities.

### 16.10 Visible Discharges [40 CFR 112.8(c)(10)]

Visible discharges of oil from any container or appurtenance, including seams, gaskets, piping, pumps, valves, rivets, and bolts, will be noted during inspections so that repairs can be promptly made. Additionally, any accumulation of oil will be removed from diked areas and managed by properly trained Resolution Copper employees following the procedures listed in ***Section 6.0***. The SPCC Plan Coordinator will be notified of petroleum discharges, as necessary, according to the release response procedures.

## 17.0 PORTABLE OIL STORAGE CONTAINERS [40 CFR 112.8(c)(11)]

Mobile tanks and service vehicles will be used for the Project; a complete list will be provided in ***Appendix C-2***. The mobile tanks and service vehicles will typically be stationed in the laydown yards, but will travel throughout the Project as needed. When not in use, these portable containers will be parked in locations where a discharge would be contained by compacted earthen berms in the laydown yards. These secondary containment structures will be sufficient to contain the capacity of the largest single compartment or container with sufficient freeboard to contain precipitation. The normal parking locations will also be listed in ***Appendix C***.

To help prevent discharges, portable containers will be regularly inspected (refer to ***Section 9.0***), employees will be required to attend annual training (refer to ***Section 10.0***), and specific procedures must be followed during loading and unloading (refer to ***Section 12.0***). Additionally, spill kits will be located throughout the site to contain or clean-up releases from portable containers.

## 18.0 SITE TRANSFER OPERATIONS [40 CFR 112.8(d)]

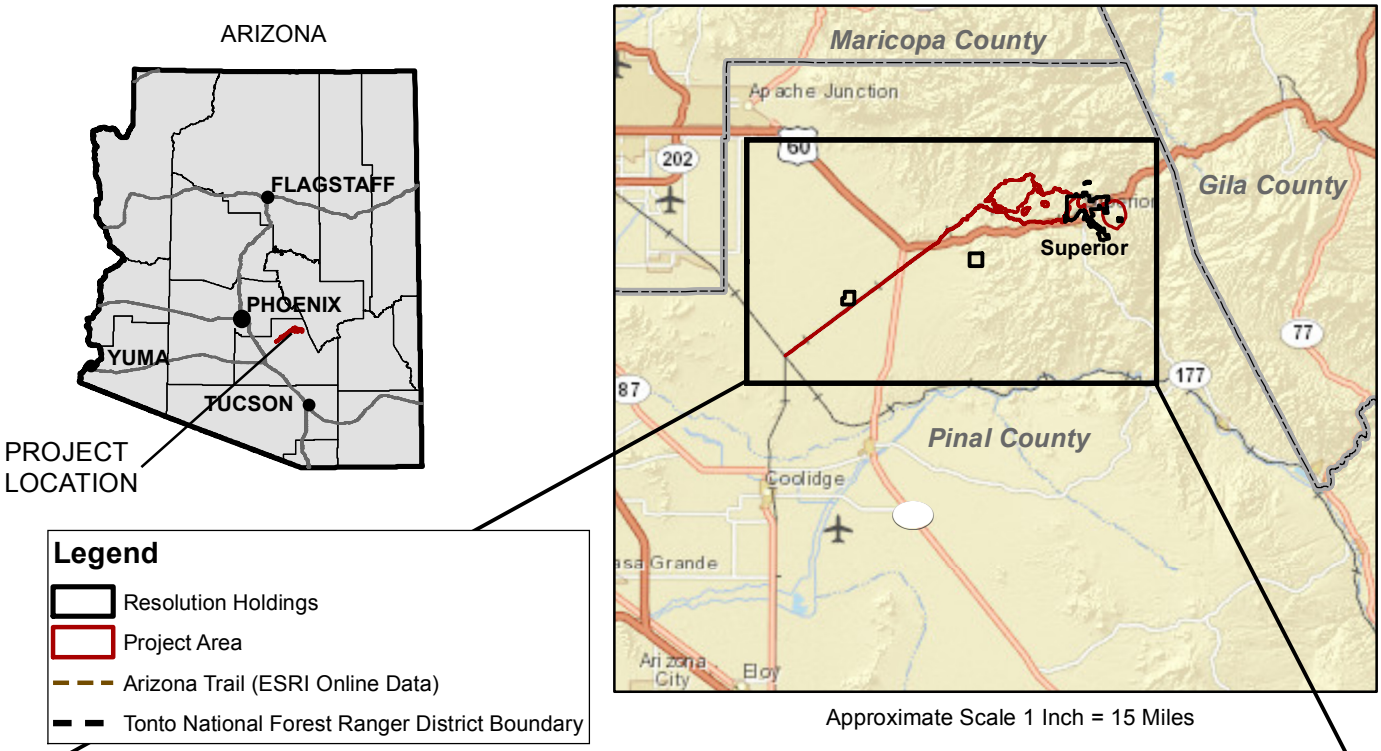
Buried oil piping is not anticipated to be used for the proposed construction activities. Oil and oil product transfer lines that are not in service or are on standby for an extended period of time will be capped or blank-flanged and marked as to their origin.

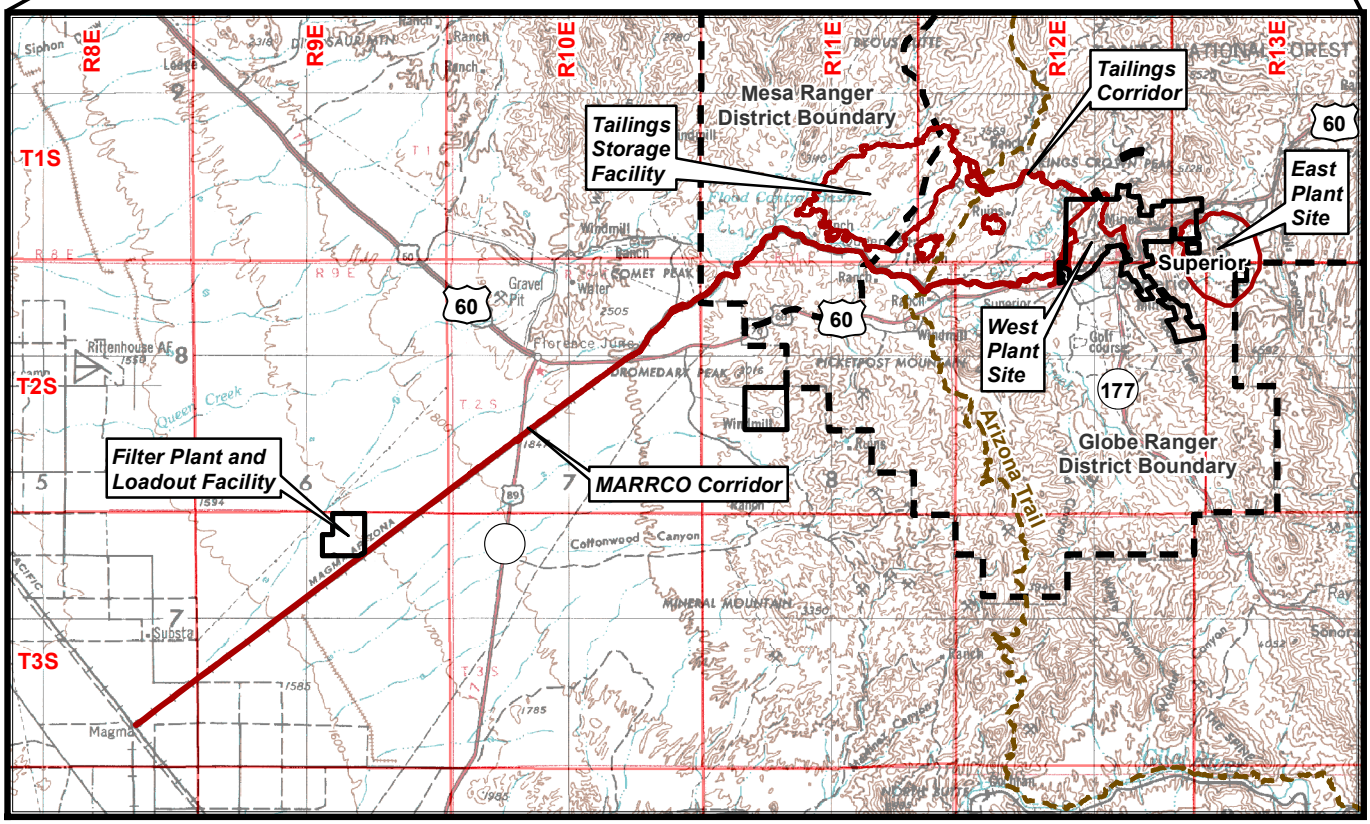
Aboveground piping and valves will be visually inspected as described in ***Section 9.0*** at the same frequency as the tanks to which they are connected. Inspection checklists are provided in ***Appendix G*** for this purpose. During such inspections, the general conditions of items such as flange joints expansion joints, valve glands and bodies, catch pans, pipeline supports, locking of valves, and metal surfaces will be noted. Inspection records will be maintained with the SPCC Plan in the Environmental Office.

In addition to external visual inspections, employees will be trained to look for potential oil-related problems on a day-to-day basis in their respective work areas and to report these to their supervisor or the SPCC Coordinator. Examples of potential problems include aboveground pipes that are continually submerged in water or in contact with soil.

Resolution Copper employees and contractors accessing oil storage locations in a vehicle will be notified to proceed with caution so as to not endanger aboveground oil piping and other oil transfer operations. Appropriate precautions are also discussed in the training provided to delivery drivers (refer to ***Section 10.0***).

# FIGURES




GPO found within the following Township & Ranges:
T1S, R13E & T2S, R13E, T1S, R12E & T2S, R12E,
T1S, R11E & T2S, R11E, T2S, R10E & T2S, R9E,
T3S, R9E & T3S, R8E, Portions of Pinal County, Arizona.
Mesa 1:250,000 USGS Quadrangle.

N

0 2.5 5 Miles

0 4 8 Kilometers

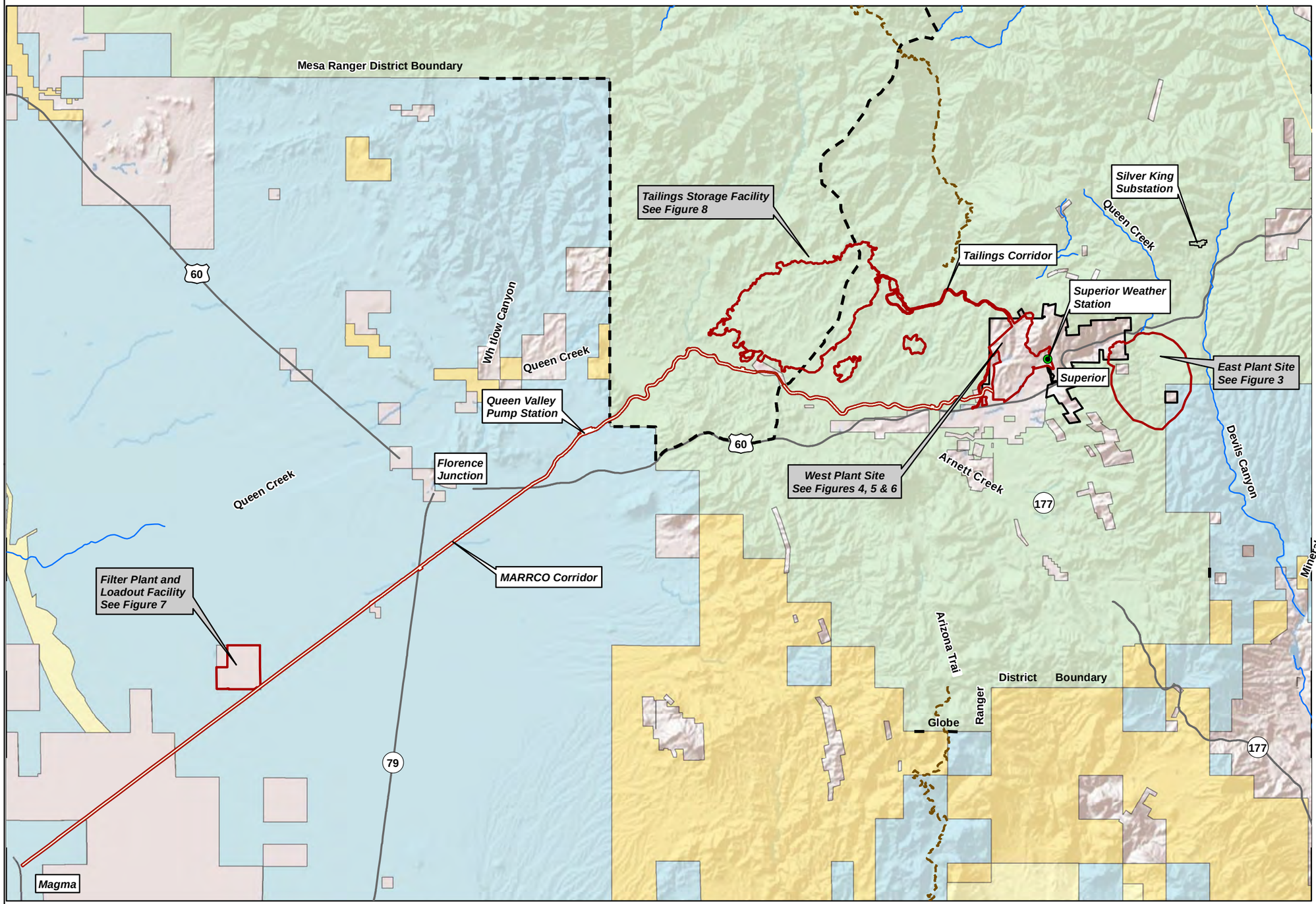
PRELIMINARY

# RESOLUTION COPPER

General Plan of Operations
Spill Prevention, Control and Countermeasure Plan

VICINITY MAP
Figure 1

Path: M:\Jobs\800's\807.94\ENV\SWPPP&SpillPlan\SPCC\Fig2_SPCC_Overview.mxd




**Legend**

- Resolution Holdings
- Project Area
- Arizona Trail (ESRI Online Data)
- Tonto National Forest Ranger District Boundary

**Surface Management (Source: BLM 2011)**

- Bureau of Land Management (BLM)
- Bureau of Reclamation
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

GPO found within the following Township & Ranges:
T1S, R13E & T2S, R13E, T1S, R12E & T2S, R12E,
T1S, R11E & T2S, R11E, T2S, R10E & T2S, R9E,
T3S, R9E & T3S, R8E, Portions of Pinal County, Arizona.
Mesa 1:250,000 USGS Quadrangle.

Image Source: ESRI Online World Shaded Relief

N

0 6,000 12,000 Feet

PRELIMINARY

# RESOLUTION COPPER
## General Plan of Operations
## Spill Prevention, Control and Countermeasure Plan

OVERVIEW MAP

Figure 2

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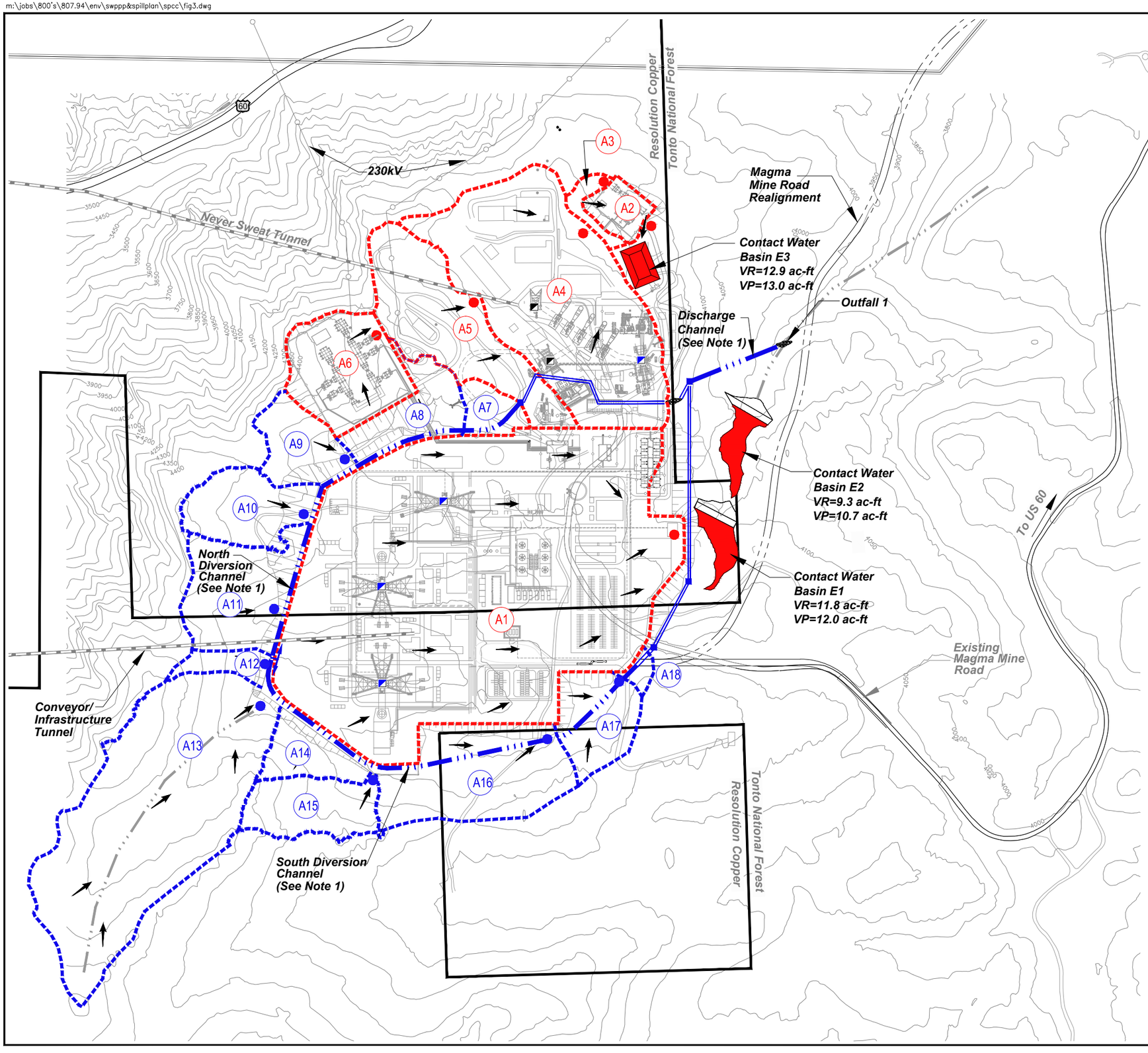


**Legend**

- Resolution Holdings
- Existing Mine Shaft
- Mine Shaft
- Onsite Concentration Point
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Non-Contact Water Channel/Drainage
- Existing Drainage
- Drainage Vault
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 250 500 Feet

0 100 200 Meters

**Data Source: East Plant Facilities Provided by AMEC 2012**

**Note 1: Route Non-Contat Water to Existing Drainage Downstream of Contact Water Basin E1 & E2**

PRELIMINARY

# RESOLUTION COPPER
## General Plan of Operations Spill Prevention, Control and Countermeasure Plan

EAST PLANT SITE
Figure 3

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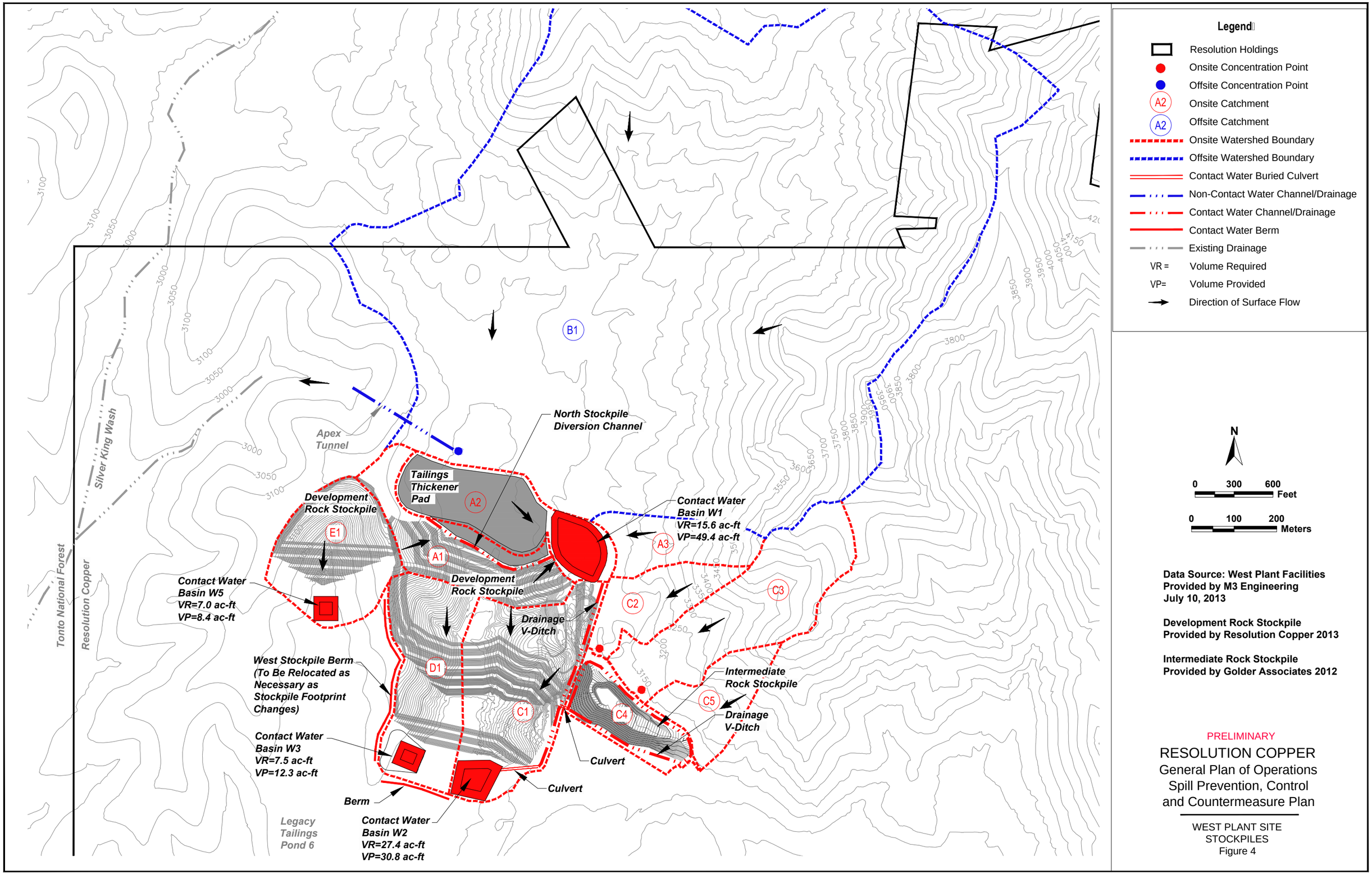


Data Source: West Plant Facilities
Provided by M3 Engineering
July 10, 2013

Development Rock Stockpile
Provided by Resolution Copper 2013

Intermediate Rock Stockpile
Provided by Golder Associates 2012

PRELIMINARY

# RESOLUTION COPPER
General Plan of Operations
Spill Prevention, Control and Countermeasure Plan

WEST PLANT SITE STOCKPILES
Figure 4

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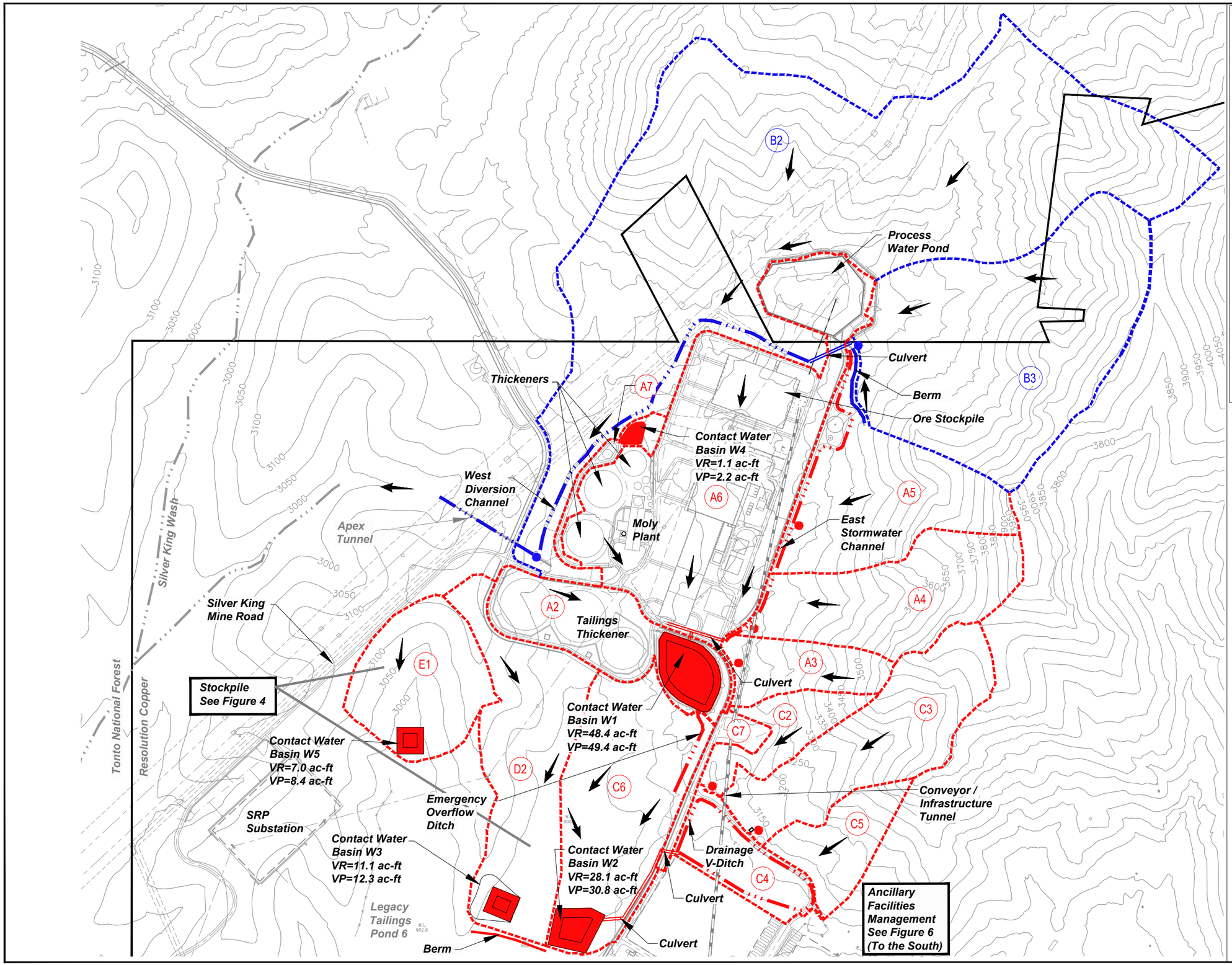


## Legend

- Resolution Holdings
- Onsite Concentration Point
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Contact Water Buried Culvert
- Non-Contact Water Channel/Drainage
- Contact Water Channel/Drainage
- Non-Contact Water Berm
- Contact Water Berm
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

Data Source:
West Plant Site Facilities
Provided by M3 Engineering
July 10, 2013

PRELIMINARY

# RESOLUTION COPPER
## General Plan of Operations
## Spill Prevention, Control and Countermeasure Plan

WEST PLANT SITE
CONCENTRATOR COMPLEX
Figure 5

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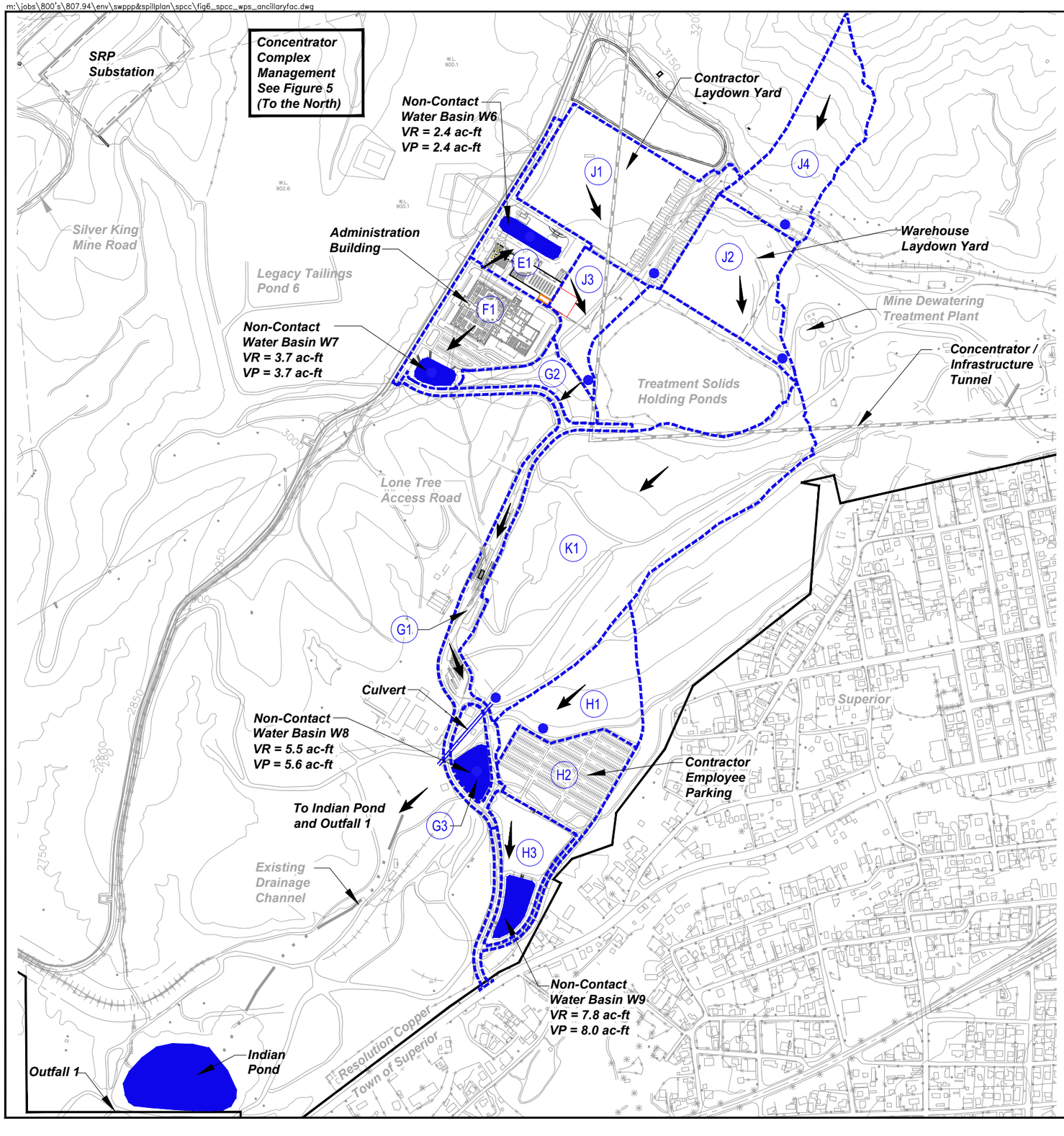


**Legend**

- Resolution Holdings
- Offsite Concentration Point
- A2 — Offsite Catchment
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

Data Source:
West Plant Site Ancillary Facilities
Provided by M3 Engineering
July 10, 2013

PRELIMINARY

# RESOLUTION COPPER
## General Plan of Operations Spill Prevention, Control and Countermeasure Plan

WEST PLANT SITE
ANCILLARY FACILITIES

Figure 6

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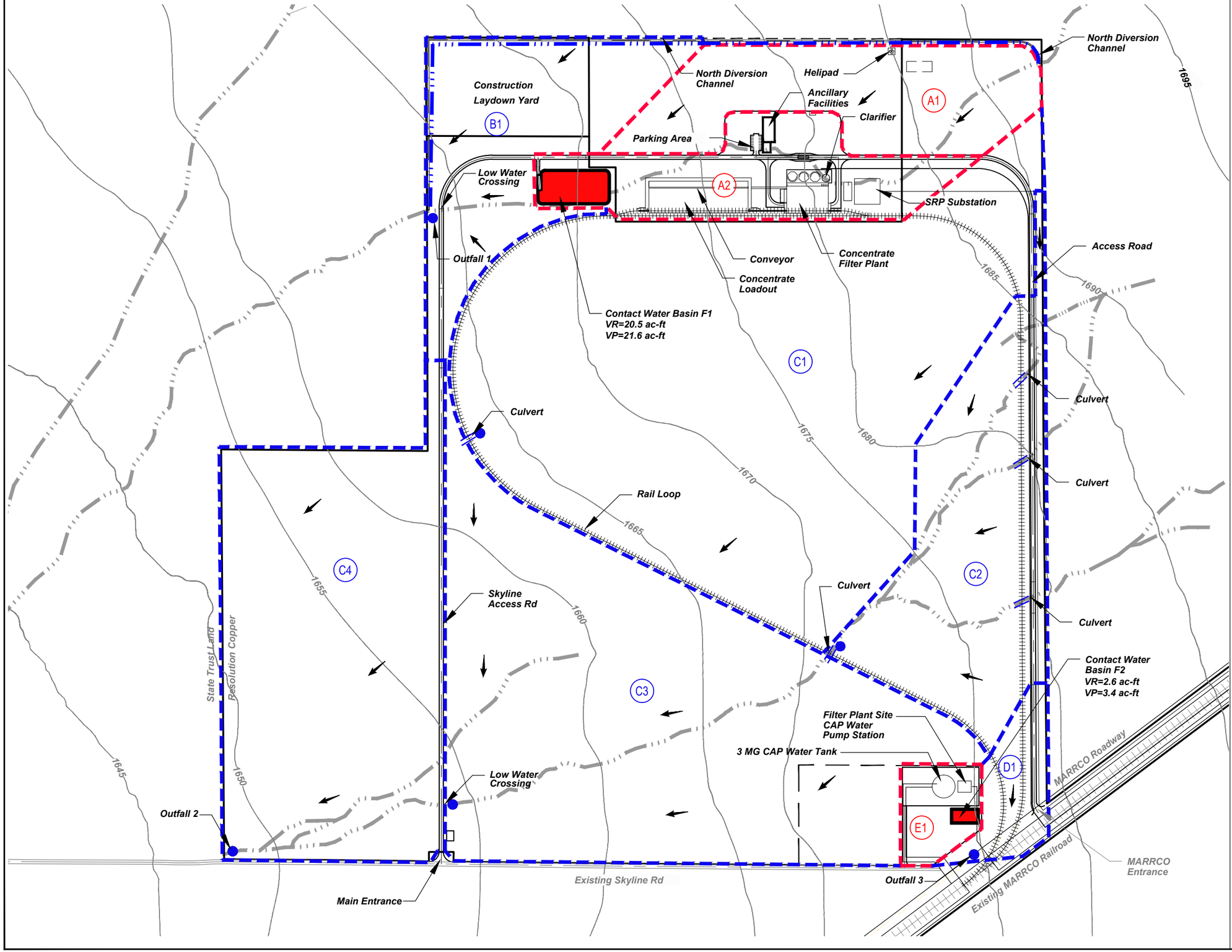



**Legend**

- Resolution Holdings
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Non-Contact Water Channel/Drainage
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

Note:
Existing topography to be verified by current survey. All grades shown are subject to change.

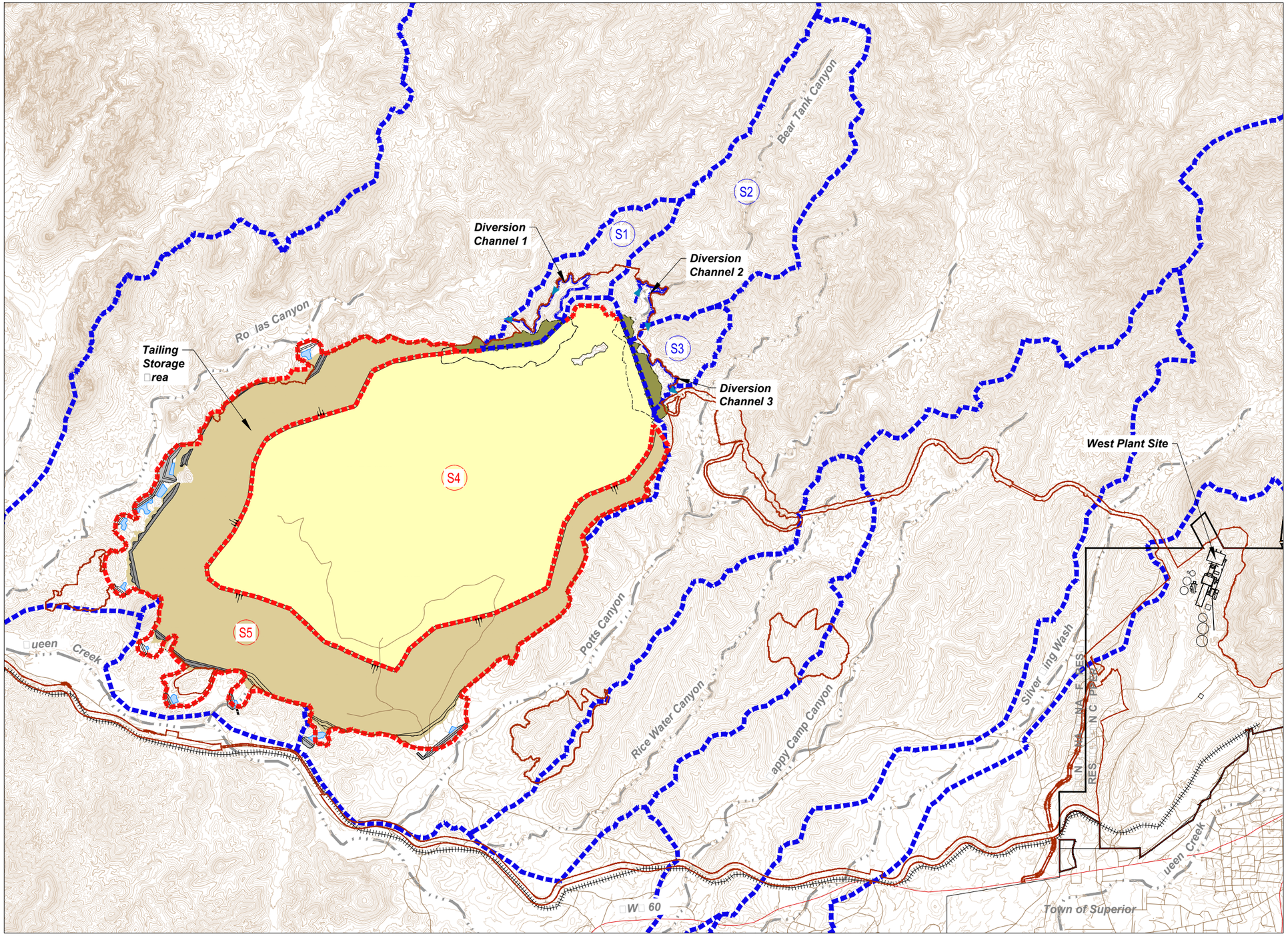
Data Source:
Filter Plant and Loadout Facility
Provided by M3 Engineering
April, 2012

PRELIMINARY

# RESOLUTION COPPER
## General Plan of Operations
## Spill Prevention, Control and Countermeasure Plan

FILTER PLANT AND LOADOUT FACILITY

Figure 7




**Legend**

- Resolution Holdings
- Project Area
- A2 Onsite Catchment
- A2 Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Existing Drainage
- Upstream Embankment Raise Fill
- Starter Dam
- Thickened Scavenger Tailings
- North Dams
- Seepage Collection Dam Pond

Topography Based on 1 Meter (3.3 Foot) Interval Contours Received From Resolution January, 2013.

N

0 1,500 3,000 Feet

0 500 1,000 Meters

Klohn Crippen Berger

201

PRELIMINARY

# RESOLUTION COPPER

General Plan of Operations
Spill Prevention, Control and Countermeasure Plan

TAILINGS STORAGE FACILITY
Figure 8

# APPENDICES

**Resolution Copper Mining – East Plant Site**
**Appendix A – Regulatory Requirement Cross-Reference Table**
**Spill Prevention, Control, and Countermeasures Plan**

| Requirement | SPCC Reference Section | SPCC Page No. | N/A |
|---|---|---|---|
| § 112.3 Requirement to prepare and implement a Spill Prevention, Control, and Countermeasure Plan. | | | |
| (a)(1) Except as otherwise provided in this section, if your facility, or mobile or portable facility, was in operation on or before August 16, 2002, you must maintain your Plan, but must amend it if necessary, to ensure compliance with this part, and implement the amended Plan no later than November 10, 2011. | | | X |
| (a) If such a facility becomes operational after August 16, 2002, through November 10, 2011, and could reasonably be expected to have a discharge as described in §112.1(b), you must prepare and implement a Plan on or before November 10, 2011. If such a facility (excluding oil production facilities) becomes operational after November 10, 2011, and could reasonably be expected to have a discharge as described in §112.1(b), you must prepare and implement a Plan before you begin operations. You are not required to prepare a new Plan each time you move a mobile or portable facility to a new site; the Plan may be general. When you move the mobile or portable facility, you must locate and install it using the discharge prevention practices outlined in the Plan for the facility. The Plan is applicable only while the mobile or portable facility is in a fixed (non-transportation) operating mode. | | | X |
| (b) If your oil production facility as described in paragraph (a)(1) of this section becomes operational after November 10, 2011, or as described in paragraph (a)(2) of this section becomes operational after November 10, 2010, and could reasonably be expected to have a discharge as described in §112.1(b), you must prepare and implement a Plan within six months after you begin operations. | | | X |
| (c) If your facility has milk and milk product containers, associated piping and appurtenances constructed according to current applicable 3–A Sanitary Standards, and subject to current applicable Grade "A" Pasteurized Milk Ordinance (PMO) or a State dairy regulatory requirement equivalent to current applicable PMO, do not include these milk and milk product containers when either determining the aggregate oil storage capacity of your facility or as part of your Plan. The date in paragraph (a)(1), by which you must comply with the provisions of this part for these milk and milk product containers, is delayed by one year from the effective date of a final rule addressing these milk and milk product containers, or until a rule that otherwise establishes a compliance date. You must maintain and amend, or prepare your Plan to address any other oil containers at the facility otherwise subject to the requirements of this part by the compliance date in paragraph (a)(1) of this section if your facility meets any of the aggregate oil storage capacity thresholds of §112.1 of this part. | | | X |
| (d) A licensed Professional Engineer must review and certify a Plan for it to be effective to satisfy the requirements of this part. | Section 2.2 | 2 | |
| (e) If you are the owner or operator of a facility for which a Plan is required under this section, you must:<br><br>(1) Maintain a complete copy of the Plan at the facility if the facility is normally attended at least four hours per day, or at the nearest field office if the facility is not so attended, and<br><br>(2) Have the Plan available to the Regional Administrator for on-site review during normal working hours. | Section 4.1 | 4 | |

**Resolution Copper Mining – East Plant Site**
**Appendix A – Regulatory Requirement Cross-Reference Table**
**Spill Prevention, Control, and Countermeasures Plan**

| Requirement | SPCC Reference Section | SPCC Page No. | N/A |
|---|---|---|---|
| § 112.3 Requirement to prepare and implement a Spill Prevention, Control, and Countermeasure Plan. | | | |
| (f) Extension of time.<br><br>(1) The Regional Administrator may authorize an extension of time for the preparation and full implementation of a Plan, or any amendment thereto.<br><br>(2) If you are an owner or operator seeking an extension of time under paragraph (f)(1) of this section, you may submit a written extension request to the Regional Administrator.<br><br>(3) The submission of a written extension request under paragraph (f)(2) of this section does not relieve you of your obligation to comply with the requirements of this part. | | | X |
| (g) Qualified Facilities. The owner or operator of a qualified facility as defined in this subparagraph may self-certify his or her facility's Plan, as provided in §112.6. A qualified facility is one that:<br><br>(1) Has an aggregate aboveground storage capacity of 10,000 gallons or less; and<br><br>(2) Has had no single discharge as described in §112.1(b) exceeding 1,000 U.S. gallons or no two discharges as described in §112.1(b) each exceeding 42 U.S. gallons within any twelve month period in the three years prior to the SPCC Plan self-certification date, or since becoming subject to this part if the facility has been in operation for less than three years (other than discharges as described in §112.1(b) that are the result of natural disasters, acts of war, or terrorism). | | | X |
| § 112.4 Amendment of Spill Prevention, Control, and Countermeasure Plan by Regional Administrator. | | | |
| (a) Notwithstanding compliance with § 112.3, whenever your facility has discharged more than 1,000 U.S. gallons of oil in a single discharge as described in § 112.1(b), or discharged more than 42 U.S. gallons of oil in each of two discharges as described in § 112.1(b), occurring within any twelve month period, submit the following information to the Regional Administrator within 60 days from the time the facility becomes subject to this section:<br><br>(1) Name of the facility;<br>(2) Your name;<br>(3) Location of the facility;<br>(4) Maximum storage or handling capacity of the facility and normal daily throughput;<br>(5) Corrective action and countermeasures you have taken, including a description of equipment repairs and replacements;<br>(6) An adequate description of the facility, including maps, flow diagrams, and topographical maps, as necessary;<br>(7) The cause of such discharge as described in § 112.1(b), including a failure analysis of the system or subsystem in which the failure occurred;<br>(8) Additional preventive measures you have taken or contemplated to minimize the possibility of recurrence; and<br>(9) Such other information as the Regional Administrator may reasonably require. | Section 7.3.2 | 12 | |

**Resolution Copper Mining – East Plant Site**
**Appendix A – Regulatory Requirement Cross-Reference Table**
**Spill Prevention, Control, and Countermeasures Plan**

| Requirement | SPCC Reference Section | SPCC Page No. | N/A |
|---|---|---|---|
| § 112.4 Amendment of Spill Prevention, Control, and Countermeasure Plan by Regional Administrator. | | | |
| (c) Send to the appropriate agency or agencies in charge of oil pollution control activities in the State in which the facility is located a complete copy of all information you provided to the Regional Administrator. | Section 7.3.2 | 12 | |
| (d & e) Regional Administrator requirements for SPCC Plan amendment. | | | X |
| (f) Appeal of amendment by facility. | | | X |
| § 112.5 Amendment of Spill Prevention, Control, and Countermeasure Plan by owners or operators. | | | |
| (a) Amend the SPCC Plan for your facility when there is a change in the facility design, construction, operation, or maintenance that materially affects its potential for a discharge. | Section 4.2.1 | 4 | |
| (b) Complete a review and evaluation of the SPCC Plan at least once every five years. As a result of this review and evaluation, you must amend your SPCC Plan within six months of the review. | Section 4.2.3 | 5 | |
| (c) Have a Professional Engineer certify any technical amendment to your Plan. | Sections 4.2.1 and 4.2.3 | 4 and 5 | |
| § 112.6 Qualified Facility Plan Requirements. | | | |
| (a) Preparation and Self-certification of Plan. If you are the owner or operator of a facility that meets the qualified facility qualification criteria in §112.3(g), you may choose to self-certify your Plan. | | | X |
| § 112.7 General requirements for Spill Prevention, Control, and Countermeasure Plans. | | | |
| (First Paragraph:) | | | |
| - Full approval of management with authority to commit resources. | Section 2.1 | 2 | |
| - Discuss additional facilities or procedures, methods, or equipment not yet fully operational. | Section 4.3 | 5 | |
| - Plan follows sequence of '112.7, or is supplemented with a section cross-referencing the location of requirements. | Section 1.0 and ***Appendix A*** | 1 | |
| (a) | | | |
| (1) Include a discussion of your facility's conformance with the requirements listed in this part. | Section 1.0 | 1 | |
| (2) Comply with all applicable requirements listed, or state the reasons for nonconformance in your Plan and describe in detail alternate methods and how you will achieve equivalent environmental protection. | Section 4.4 | 5 | |
| (3) Describe in your Plan the physical layout of the facility and include a facility diagram, which must mark the location and contents of each container. You must also address in your Plan: | Section 5.0 and ***Figures Section*** | 6 and 7 | |
| (i) The type of oil in each container and its storage capacity; | Section 5.2 and ***Appendix C*** | 7 | |

**Resolution Copper Mining – East Plant Site**
**Appendix A – Regulatory Requirement Cross-Reference Table**
**Spill Prevention, Control, and Countermeasures Plan**

| Requirement | SPCC Reference Section | SPCC Page No. | N/A |
|---|---|---|---|
| § 112.7 General requirements for Spill Prevention, Control, and Countermeasure Plans. | | | |
| (ii) Discharge prevention measures including procedures for routine handling of products (loading, unloading, and facility transfers, etc.); | Section 5.3 | 7 and 8 | |
| (iii) Discharge or drainage controls such as secondary containment around containers and other structures, equipment, and procedures for the control of a discharge; | ***Appendix C*** | | |
| (iv) Countermeasures for discharge discovery, response, and cleanup (both the facility's capability and those that might be required of a contractor); | Section 6.0 and ***Appendix E*** | 9 and 10 | |
| (v) Methods of disposal of recovered materials in accordance with applicable legal requirements; | Section 6.2 | 9 and 10 | |
| (vi) Contact list and phone numbers for the facility response coordinator, National Response Center, cleanup contractors with whom you have an agreement for response, and all appropriate Federal, State, and local agencies who must be contacted in case of a discharge. | Section 7.0 and ***Appendix D*** | 11 - 13 | |
| (4) Unless you have submitted a response plan under § 112.20, provide information and procedures in your Plan to enable a person reporting a discharge to relate the required information. | Section 7.2 | 11 and 12 | |
| (5) Unless you have submitted a response plan under § 112.20, organize portions of the Plan describing procedures you will use when a discharge occurs in a way that will make them readily usable in an emergency, and include appropriate supporting material as appendices. | Section 6.0 and ***Appendix E*** | 9 and 10 | |
| (b) Where experience indicates a reasonable potential for equipment failure, include in your Plan a prediction of the direction, rate of flow, and total quantity of oil which could be discharged from the facility as a result of each type of major equipment failure. | Section 8.1; Section 8.2; and ***Appendix C*** | 14 | |
| (c) Provide appropriate containment and/or diversionary structures or equipment to prevent a discharge. At a minimum, you must use one of the following prevention systems or its equivalent:<br>(1) For onshore facilities:<br>(i) Dikes, berms, or retaining walls sufficiently impervious to contain oil;<br>(ii) Curbing;<br>(iii) Culverting, gutters, or other drainage systems;<br>(iv) Weirs, booms, or other barriers;<br>(v) Spill diversion ponds;<br>(vi) Retention ponds; or<br>(vii) Sorbent materials. | Section 8.5 | 15 | |
| (2) For offshore facilities: | | | X |
| (i) Curbing or drip pans; or | | | |
| (ii) Sumps and collection systems. | | | |
| (d) If you determine that the installation of any of the structures or pieces of equipment to prevent a discharge is not practicable, you must clearly explain in your Plan why such measures are not practicable; for bulk storage containers, conduct both periodic integrity testing of the containers and periodic integrity and leak testing of the valves and piping; and, unless you have submitted a response plan under § 112.20, provide in your Plan the following: | Section 8.5 | 15 | |

**Resolution Copper Mining – East Plant Site**
**Appendix A – Regulatory Requirement Cross-Reference Table**
**Spill Prevention, Control, and Countermeasures Plan**

| Requirement | SPCC Reference Section | SPCC Page No. | N/A |
|---|---|---|---|
| (1) An oil spill contingency plan following the provisions of part 109 of this chapter. | | | X |
| § 112.7 General requirements for Spill Prevention, Control, and Countermeasure Plans. | | | |
| (2) A written commitment of manpower, equipment, and materials required to expeditiously control and remove any quantity of oil discharged that may be harmful. | | | X |
| (e) Conduct inspections and tests required by this part in accordance with written procedures that you or the certifying engineer develop for the facility. You must keep these written procedures and a record of the inspections and tests, signed by the appropriate supervisor or inspector, with the SPCC Plan for a period of three years. | Section 9.0 and ***Appendix C*** | 16 and 17 | |
| (f) Personnel, training, and discharge prevention procedures. | Section 10.0 | 18 | |
| (1) At a minimum, train your oil-handling personnel in the operation and maintenance of equipment to prevent discharges; discharge procedure protocols; applicable pollution control laws, rules, and regulations; general facility operations; and, the contents of the facility SPCC Plan | Section 10.1 | 18 | |
| (2) Designate a person at each applicable facility who is accountable for discharge prevention and who reports to facility management. | Section 10.1 | 18 | |
| (3) Schedule and conduct discharge prevention briefings for your oil-handling personnel at least once a year to assure adequate understanding of the SPCC Plan for that facility. | Section 10.2 | 18 | |
| (g) Security (excluding oil production facilities). | | | |
| (1) Fully fence each facility handling, processing, or storing oil, and lock and/or guard entrance gates when the facility is not in production or is unattended. | Section 11.1 | 19 | |
| (2) Ensure that the master flow and drain valves and any other valves permitting direct outward flow of the container's contents to the surface have adequate security measures so that they remain in the closed position when in non-operating or non-standby status. | Section 11.2 | 19 | |
| (3) Lock the starter control on each oil pump in the "off" position and locate it at a site accessible only to authorized personnel when the pump is in a non-operating or non-standby status. | Section 11.3 | 19 | |
| (4) Securely cap or blank-flange the loading/unloading connections of oil pipelines or facility piping when not in service or when in standby service for an extended time. This security practice also applies to piping that is emptied of liquid content either by draining or by inert gas pressure. | Section 11.4 | 19 | |
| (5) Provide facility lighting commensurate with the type and location of the facility that will assist in the: | Section 11.5 | 19 | |
| (i) Discovery of discharges occurring during hours of darkness, both by operating personnel, if present, and by non-operating personnel (the general public, local police, etc.); and | Section 11.5 | 19 | |
| (ii) Prevention of discharges occurring through acts of vandalism. | Section 11.0 | 19 | |

| Requirement | SPCC Reference Section | SPCC Page No. | N/A |
|---|---|---|---|
| (h) Facility tank car and tank truck loading/unloading rack (excluding offshore facilities). | | | X |
| § 112.7 General requirements for Spill Prevention, Control, and Countermeasure Plans. | | | |
| (1) Where loading/unloading area drainage does not flow into a catchment basin or treatment facility designed to handle discharges, use a quick drainage system for tank car or tank truck loading and unloading areas. You must design any containment system to hold at least the maximum capacity of any single compartment of a tank car or tank truck loaded or unloaded at the facility. | | | X |
| (2) Provide an interlocked warning light or physical barrier system, warning signs, wheel chocks, or vehicle break interlock system in loading/unloading areas to prevent vehicles from departing before complete disconnection of flexible or fixed oil transfer lines. | Section 12.0 and ***Appendix I*** | 20 | |
| (3) Prior to filling and departure of any tank car or tank truck, closely inspect for discharges the lowermost drain and all outlets of such vehicles, and if necessary, ensure that they are tightened, adjusted, or replaced to prevent liquid discharge while in transit. | Section 12.0 and ***Appendix I*** | 20 | |
| (i) If a field-constructed aboveground container undergoes a repair, alteration, reconstruction, or a change in service that might affect the risk of a discharge or failure due to brittle fracture or other catastrophe, or has discharged oil or failed due to brittle fracture failure or other catastrophe, evaluate the container for risk of discharge or failure, and as necessary, take appropriate action. | Section 13.0 | 21 | |
| (j) In addition to the minimal prevention standards listed under this section, include in your Plan a complete discussion of conformance with the applicable requirements and other effective discharge prevention and containment procedures listed in this part or any applicable more stringent State rules, regulations, and guidelines. | Section 14.0 | 22 | |
| (k) Qualified Oil-filled Operational Equipment. The owner or operator of a facility with oil-filled operational equipment that meets the qualification criteria in paragraph (k)(1) of this sub-section may choose to implement for this qualified oil-filled operational equipment the alternate requirements as described in paragraph (k)(2) of this sub-section in lieu of general secondary containment required in paragraph (c) of this section. | | | X |
| § 112.8 Spill Prevention, Control, and Countermeasure Plan requirements for onshore facilities (excluding production facilities). | | | |
| (a) Meet the general requirements for the Plan listed under § 112.7, and the specific discharge prevention and containment procedures listed in this section. | See individual requirements | | |
| (b) Facility drainage requirements. | Section 15.0 | 23 | |
| (1) Restrain drainage from diked storage areas by valves to prevent a discharge into the drainage system or facility effluent treatment system, except where facility systems are designed to control such discharge. | Section 15.0 | 23 | |
| (2) Use valves of manual, open-and-closed design, for the drainage of diked areas. | Section 15.0 | 23 | |
| (3) Design facility drainage systems from undiked areas with a potential for a discharge to flow into ponds, lagoons, or catchment basins designed to retain oil or return it to the facility. | Section 15.0 | 23 | |

**Resolution Copper Mining – East Plant Site**
**Appendix A – Regulatory Requirement Cross-Reference Table**
**Spill Prevention, Control, and Countermeasures Plan**

| Requirement | SPCC Reference Section | SPCC Page No. | N/A |
|---|---|---|---|
| § 112.8 Spill Prevention, Control, and Countermeasure Plan requirements for onshore facilities (excluding production facilities). | | | |
| (4) If facility drainage is not engineered as in paragraph (b)(3) of this section, equip the final discharge of all ditches inside the facility with a diversion system that would, in the event of an uncontrolled discharge, retain oil in the facility. | | | X |
| (5) Where drainage waters are treated in more than one treatment unit and such treatment is continuous, and pump transfer is needed, provide two "lift" pumps and permanently install at least one of the pumps. | | | X |
| (c) Bulk storage containers. | | | |
| (1) Not use a container for the storage of oil unless its material and construction are compatible with the material stored and conditions of storage such as pressure and temperature. | Section 16.1 | 24 | |
| (2) Construct all bulk storage container installations so that you provide a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation. You must ensure that diked areas are sufficiently impervious to contain discharged oil. Dikes, containment curbs, and pits are commonly employed for this purpose. You may also use an alternative system consisting of a drainage trench enclosure that must be arranged so that any discharge will terminate and be safely confined in a facility catchment basin or holding pond. | Section 16.2 | 24 | |
| (3) Not allow drainage of uncontaminated rainwater from the diked area into a storm drain or discharge of an effluent into an open watercourse, lake, or pond, bypassing the facility treatment system unless you: | Section 16.3 | 24 | |
| (i) Normally keep the bypass valve sealed closed. | Section 16.3 | 24 | |
| (ii) Inspect the retained rainwater to ensure that its presence will not cause a discharge as described in § 112.1(b). | Section 16.3 | 24 | |
| (iii) Open the bypass valve and reseal it following drainage under responsible supervision; and | Section 16.3 | 24 | |
| (iv) Keep adequate records of such events, for example, any records required under permits issued in accordance with §§ 122.41(j)(2) and 122.41(m)(3) of this chapter. | Section 16.3 | 24 | |
| (4) Protect any completely buried metallic storage tank installed on or after January 10, 1974 from corrosion by coatings or cathodic protection compatible with local soil conditions. You must regularly leak test such completely buried metallic storage tanks. | Section 16.4 | 24 | |
| (5) Not use partially buried or bunkered metallic tanks for the storage of oil, unless you protect the buried section of the tank from corrosion. You must protect partially buried and bunkered tanks from corrosion by coatings or cathodic protection compatible with local soil conditions. | Section 16.5 | 24 | |

**Resolution Copper Mining – East Plant Site**
**Appendix A – Regulatory Requirement Cross-Reference Table**
**Spill Prevention, Control, and Countermeasures Plan**

| Requirement | SPCC Reference Section | SPCC Page No. | N/A |
|---|---|---|---|
| § 112.8 Spill Prevention, Control, and Countermeasure Plan requirements for onshore facilities (excluding production facilities). | | | |
| (6) Test each aboveground container for integrity on a regular schedule, and whenever you make material repairs. The frequency of and type of testing must take into account container size and design (such as floating roof, skid-mounted, elevated, or partially buried). You must combine visual inspection with another testing technique such as hydrostatic testing, radiographic testing, ultrasonic testing, acoustic emissions testing, or another system of non-destructive shell testing. You must keep comparison records and you must also inspect the container's supports and foundations. In addition, you must frequently inspect the outside of the container for signs of deterioration, discharges, or accumulation of oil inside diked areas. Records of inspections and tests kept under usual and customary business practices will suffice for purposes of this paragraph. | Section 16.6 | 24 through 26 | |
| (7) Control leakage through defective internal heating coils by monitoring the steam return and exhaust lines for contamination from internal heating coils that discharge into an open watercourse, or pass the steam return or exhaust lines through a settling tank, skimmer, or other separation or retention system. | Section 16.7 | 26 | |
| (8) Engineer or update each container installation in accordance with good engineering practice to avoid discharges. You must provide at least one of the following devices: | | | |
| (i) High liquid level alarms with an audible or visual signal at a constantly attended operation or surveillance station. In smaller facilities an audible air vent may suffice. | Section 16.8 | 26 | |
| (ii) High liquid level pump cutoff devices set to stop flow at a predetermined container content level. | Section 16.8 | 26 | |
| (iii) Direct audible or code signal communication between the container gauger and the pumping station. | Section 16.8 | 26 | |
| (iv) A fast response system for determining the liquid level of each bulk storage container such as digital computers, telepulse, or direct vision gauges. If you use this alternative, a person must be present to monitor gauges and the overall filling of bulk storage containers. | Section 16.8 | 26 | |
| (v) You must regularly test liquid level sensing devices to ensure proper operation. | Section 16.8 | 26 | |
| (9) Observe effluent treatment facilities frequently enough to detect possible system upsets that could cause a discharge as described in § 112.1(b). | Section 16.9 | 26 | |
| (10) Promptly correct visible discharges which result in a loss of oil from the container, including but not limited to seams, gaskets, piping, pumps, valves, rivets, and bolts. You must promptly remove any accumulations of oil in diked areas. | Section 16.10 | 26 | |
| (11) Position or locate mobile or portable oil storage containers to prevent a discharge as described in § 112.1(b). You must furnish a secondary means of containment, such as a dike or catchment basin, sufficient to contain the capacity of the largest single compartment or container with sufficient freeboard to contain precipitation. | Section 17.0 | 27 | |
| (d) Facility transfer operations, pumping, and facility process. | Section 18.0 | 28 | |

| Requirement | SPCC Reference Section | SPCC Page No. | N/A |
|---|---|---|---|
| (1) Provide buried piping that is installed or replaced on or after August 16, 2002, with a protective wrapping and coating. You must also cathodically protect such buried piping installations or otherwise satisfy the corrosion protection standards for piping in part 280 of this chapter or a State program approved under part 281 of this chapter. If a section of buried line is exposed for any reason, you must carefully inspect it for deterioration. If you find corrosion damage, you must undertake additional examination and corrective action as indicated by the magnitude of the damage. | Section 18.0 | 28 | |
| (2) Cap or blank-flange the terminal connection at the transfer point and mark it as to origin when piping is not in service or is in standby service for an extended time. | Section 18.0 | 28 | |
| (3) Properly design pipe supports to minimize abrasion and corrosion and allow for expansion and contraction. | Section 18.0 | 28 | |
| (4) Regularly inspect all aboveground valves, piping, and appurtenances. During the inspection you must assess the general condition of items, such as flange joints, expansion joints, valve glands and bodies, catch pans, pipeline supports, locking of valves, and metal surfaces. You must also conduct integrity and leak testing of buried piping at the time of installation, modification, construction, relocation, or replacement. | Section 18.0 and ***Appendix G*** | 28 | |
| (5) Warn all vehicles entering the facility to be sure that no vehicle will endanger aboveground piping or other oil transfer operations. | Section 18.0 | 28 | |

**Appendix B – Plan Review Log**
**Resolution Copper Mining**
**General Plan of Operations**
**Preliminary Spill Prevention, Control, and Countermeasures Plan**

Plan Reviews

| Review Date | Reviewed by | Revision Required? | Signature / Date | Comments |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

By signing this review log, the SPCC Plan reviewer certifies that the following statement is true on the date that it is signed:
"I have completed a review and evaluation of the SPCC Plan for the Resolution Copper General Plan of Operations construction activities and will (or will not) amend the plan as a result".

Plan Revisions

| Revision Date | Revision Scope | P.E. certification required? | Certifying Engineer | Licensing State and Registration No. |
|---|---|---|---|---|
| | | | | |
| | | | | |

**Appendix C-1 Photograph Pages**
**Resolution Copper Mining**
**General Plan of Operations**
**Preliminary Spill Prevention, Control, and Countermeasure Plan**

| | |
|---|---|
| **Tank Name** | |
| **Facility Area** | |
| **Watershed** | |
| **Tank Contents** | |
| **Material Of Construction** | |
| **Nominal Tank Capacity (gallons)** | |
| **Type of Secondary Containment** | |
| **Overfill Sensing Device** | |
| **Approximate Secondary Containment Capacity (gallons)** | |

**[Insert Photo Here]**

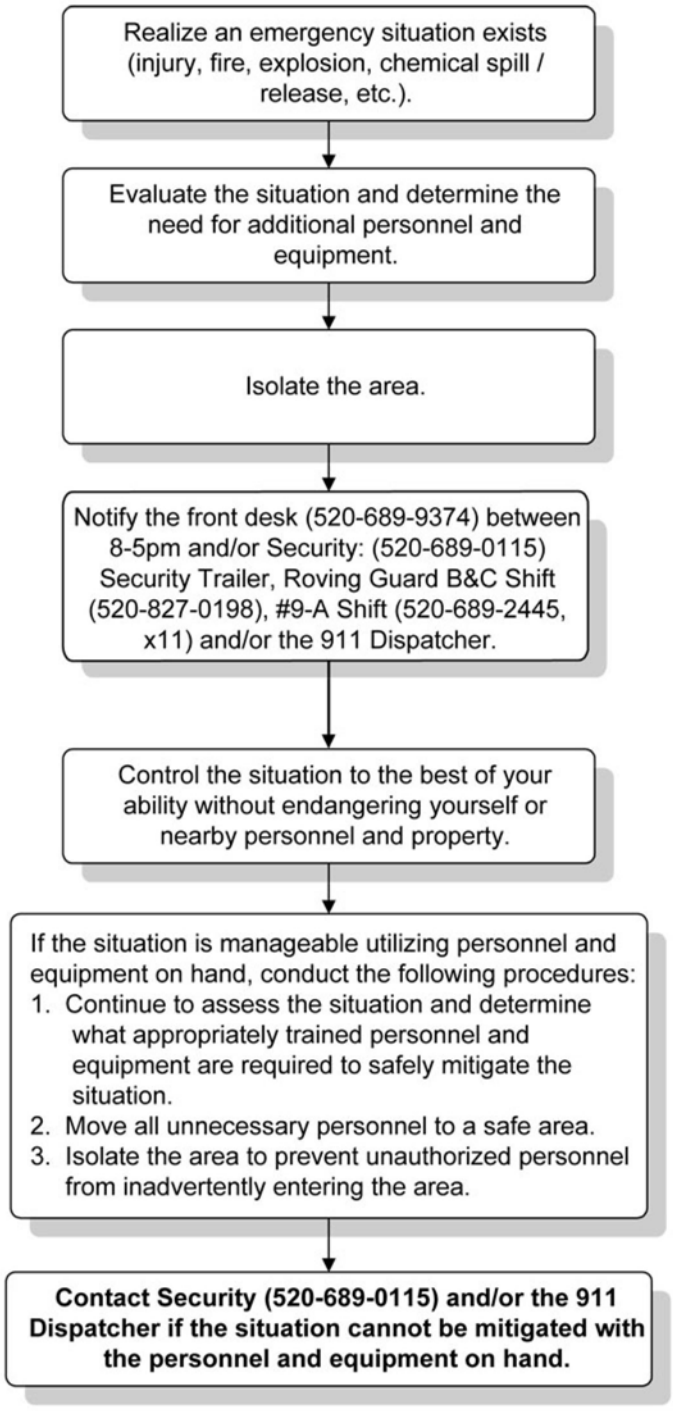
**Photo Reference**: 1

**Appendix D – Emergency Contact List**
**Resolution Copper Mining**
**General Plan of Operations**
**Preliminary Spill Prevention, Control, and Countermeasures Plan**

| EMERGENCY CONTACTS | |
|---|---|
| **Contact:** | **Number:** |
| Site Manager:<br>*is the designated person accountable to management for spill prevention.* | office:<br>mobile:<br>after hours: |
| SPCC Plan Coordinator: | office:<br>mobile: |
| Spill Response and Disposal Contractors: | office:<br>mobile: |
| **OUTSIDE AGENCY NOTIFICATIONS FOR RELEASES** | |
| Fire, Police, Ambulance | 911 |
| Superior Fire Department:<br>Hazardous Materials Response Team | 911 |
| Arizona Department of Public Safety (DPS):<br>release reporting (emergencies) | 602-255-7744<br>602-223-2212<br>602-255-8133 (after hours) |
| Pinal County Emergency Management | 520-509-3555 |
| Arizona Department of Environment Quality (ADEQ):<br>release reporting (non-emergencies) | 800-234-5677 |
| National Response Center (NRC) | 1-800-424-8802<br>1-202-267-2675 |

Note: This page may be updated without re-certification by a Professional Engineer.

**Appendix E - Quick Reference Emergency Procedures Flowchart**
**Resolution Copper Mining**
**General Plan of Operations**
**Preliminary Spill Prevention, Control, and Countermeasures Plan**




**NOTIFY THE FRONT DESK (520-689-9374) BETWEEN 8-5PM AND/OR SECURITY: (520-689-0115) SECURITY TRAILER, ROVING GUARD B&C SHIFT (520-827-0198), #9-A SHIFT (520-689-2445, X11) AND/OR THE 911 DISPATCHER.**

**Appendix F - Spill Report Form**
**Resolution Copper Mining**
**General Plan of Operations**
**Preliminary Spill Prevention, Control, and Countermeasures Plan**

| | |
|---|---|
| Name (print) | |
| Signature | |

| | |
|---|---|
| Date & Time of Release | |
| Location of Release | |
| Substance Released | |
| Estimated Volume | released: recovered: |
| Release Discharged to: | ❑ ground ❑ intermittent stream (dry) ❑ stream or surface water<br>❑ open pit ❑ stormwater ponds (on site) ❑ containment area<br>❑ sanitary sewer<br>describe: |
| Weather Conditions | |
| Suspected Cause | |
| Corrective Actions Taken | |
| Any Injuries? | |
| First Reported by | |
| Witnesses | |

| AGENCIES CONTACTED BY TELEPHONE | | |
|---|---|---|
| **Agency:** | **Name of Contact:** | **Date & Time of Call:** |
| | | |
| | | |
| | | |
| | | |
| | | |
| Comments made by agency contacts: | | |

**Appendix G-1 Quarterly Tank Inspection**
**Resolution Copper Mining**
**General Plan of Operations**
**Preliminary Spill Prevention, Control, and Countermeasure Plan**

**Tank:**

**Date:**

**Inspector:**

**[Insert Photo Here]**

**New Tank:** ☐ Yes ☐ No
☐ Secondary containment[1]
☐ Professional engineer notified[2]

**Tank in Service:**
☐ Yes
☐ No

**If *not* in service:**
☐ Blank Flanged
☐ Marked "Not in Service"

**Drainage**
☐ No noticeable oil sheen on runoff
☐ Containment area drainage valves are closed and locked (*if applicable*)
☐ No visible oil sheen in containment area
☐ No standing water in containment area
☐ No localized dead vegetation

**Piping** ☐ NA
☐ No signs of corrosion damage to pipelines supports
☐ Signs/barriers to protect pipelines from vehicles are in place (*if applicable*)
☐ No bowing of pipe between supports
☐ No discoloration of piping
☐ No droplets of stored material
☐ No evidence of stored material seepage from valves or seals
☐ No localized dead vegetation

**Tank**
☐ Tank surfaces checked for signs of leakage
  ☐ No drip marks
  ☐ No discoloration of tanks
☐ Tank condition good (no rusting, corrosion, cracks, pitting, dents or leakage)
☐ Bolts, rivets, or seams are not damaged.
☐ Tank foundation intact
☐ Valves, flanges, and gaskets are free from leaks.
☐ Containment walls are intact
☐ No localized dead vegetation.
☐ Liquid level sensing device is operating effectively.

**Containment**
☐ Surface flow into non-discharging containment basin / area is functional
☐ No apparent leaks in interstitial space of double-walled tanks (*if applicable*)
☐ No cracks in containment
☐ No discoloration of containment area
☐ No puddles containing spilled or leaked material
☐ No apparent settling
☐ No gaps between tank and foundation
☐ No apparent damage caused by vegetation roots

**COMMENTS:**

The tank inspection checklist presented above is based on Appendix F to 40 CFR 112. During inspection, make note of any discrepancies in any of the above-mentioned items and report them immediately to the proper facility personnel.

[1] Capacity of secondary containment area should be sufficient for 100 percent of the volume of the largest tank and sufficient freeboard for anticipated precipitation.

[2] Modifications to tanks and/or secondary containment require a technical review by a professional engineer.

**Appendix G-2 Annual Transformer Inspection**
**Resolution Copper Mining**
**General Plan of Operations**
**Preliminary Spill Prevention, Control, and Countermeasure Plan**

**Tank: Transformer**

**Date:**

**Inspector:**

**New Tank:** ☐ Yes ☐ No
☐ Secondary containment[1]
☐ Professional engineer notified[2]

**Tank in Service:**
☐ Yes
☐ No

**If *not* in service:**
☐ Blank Flanged
☐ Marked "Not in Service"

**Drainage**
☐ No noticeable oil sheen on runoff
☐ Containment area drainage valves are closed and locked (*if applicable*)
☐ No visible oil sheen in containment area
☐ No standing water in containment area
☐ No localized dead vegetation

**Piping** ☐ NA
☐ No signs of corrosion damage to pipelines supports
☐ Signs/barriers to protect pipelines from vehicles are in place (*if applicable*)
☐ No bowing of pipe between supports
☐ No discoloration of piping
☐ No droplets of stored material
☐ No evidence of stored material seepage from valves or seals
☐ No localized dead vegetation

**Tank**
☐ Tank surfaces checked for signs of leakage
  ☐ No drip marks
  ☐ No discoloration of tanks
☐ Tank condition good (no rusting, corrosion, cracks, pitting, dents or leakage)
☐ Bolts, rivets, or seams are not damaged.
☐ Tank foundation intact
☐ Valves, flanges, and gaskets are free from leaks.
☐ Containment walls are intact
☐ No localized dead vegetation.

**Containment**
☐ Surface flow into non-discharging containment basin / area is functional
☐ No apparent leaks in interstitial space of double-walled tanks (*if applicable*)
☐ No cracks in containment
☐ No discoloration of containment area
☐ No puddles containing spilled or leaked material
☐ No apparent settling
☐ No gaps between tank and foundation
☐ No apparent damage caused by vegetation roots

**COMMENTS:**

The tank inspection checklist presented above is based on Appendix F to 40 CFR 112. During inspection, make note of any discrepancies in any of the above-mentioned items and report them immediately to the proper facility personnel.

[1] Capacity of secondary containment area should be sufficient for 100 percent of the volume of the largest tank and sufficient freeboard for anticipated precipitation.
[2] Modifications to tanks and/or secondary containment require a technical review by a professional engineer.

## Appendix H – Training Attendance Form
## Resolution Copper Mining
## General Plan of Operations
## Preliminary Spill Prevention, Control, and Countermeasures Plan

(check which type of training conducted)

**___ PRELIMINARY TRAINING TOPICS**: Overview of the SPCC plan contents; overview of applicable pollution control laws, rules, and regulations; operation and maintenance of equipment to prevent discharges; general facility operations; review of oil management activities at the facility; spill response procedures; release notification procedures; and disposal procedures for spilled materials.

**___ BRIEFING TOPICS**: Review of known discharges at the facility; review of any failures, malfunctioning components, or any recently developed precautionary measures; review of any changes to the SPCC plan procedures and/or requirements.

**REFERENCES:** 40 CFR 112.7 (f) & Facility SPCC Plan

**DATE:_____**

**INSTRUCTOR(s) / COMPANY: _____**

**INSTRUCTOR SIGNATURE: _____**

**SPCC COORDINATOR SIGNATURE: _____**

| EMPLOYEE NAME (Please Print) | EMPLOYEE ID # |
|---|---|
| 1. | |
| 2. | |
| 3. | |
| 4. | |
| 5. | |
| 6. | |
| 7. | |
| 8. | |
| 9. | |
| 10. | |
| 11. | |
| 12 | |
| 13. | |
| 14. | |

**Appendix I – Fuel Loading/Unloading Procedures**
**Resolution Copper**
**General Plan of Operations**
**Preliminary Spill Prevention, Control, and Countermeasures Plan**

## PRIOR TO UNLOADING

- If a spill containment apron is present the truck must be inside the containment.
- Visually check all hoses for leaks and wet spots.
- Verify that there is sufficient volume in the storage tank.
- Lock in the closed position any drainage valves for the secondary containment structure.
- Secure the tank vehicle with chocks and interlocks.
- Ensure the vehicle's parking brake is set.
- Verify proper alignment of valves and proper functioning of the pumping system.
- Establish adequate bonding/grounding prior to connecting to the fuel transfer point.
- Turn off cell phone.

## DURING UNLOADING

- Driver must stay with the vehicle at all times during unloading activities.
- Periodically inspect all systems, hoses and connections.
- Ensure that no leaks are detected by sight, sound or smell during fuel unloading.
- When loading, keep internal and external valves on the receiving tank open along with the pressure relief valves.
- When making a connection, shut off the engine. When transferring Class 3 materials, shut off the vehicle engine unless it is used to operate a pump.
- Monitor the liquid level in the receiving tank to prevent overflow.
- Monitor flow meters to determine rate of flow.
- When topping off the tank, reduce flow rate to prevent overflow.
- Report and clean up any spills according to the Resolution Copper Mining SPCC Plan.
- Call **520-689-3254** to report any spills.

## AFTER UNLOADING

- Make sure the transfer is complete.
- Close all tank and loading valves before disconnecting.
- Securely close all vehicle internal, external and dome cover valves before disconnecting.
- Secure all hatches.
- Disconnect grounding/bonding wires.
- Make sure the hoses are drained to remove the remaining fuel before moving them away from the connection. Use a drip pan.
- Cap the end of the hose and other connecting devices before moving them to prevent uncontrolled leakage.
- Remove wheel chocks and interlocks.
- Inspect the lowermost drain and all outlets on the tank truck prior to departure. If necessary tighten, adjust, or replace caps, valves, or other equipment to prevent fuel leakage while in transit.

**Appendix J - Rainwater Discharge Form**
**Resolution Copper Mining**
**General Plan of Operations**
**Preliminary Spill Prevention, Control, and Countermeasures Plan**

| | |
|---|---|
| Name (print) | |
| Signature | |
| Date & Time of Observation | |

| | |
|---|---|
| Location of Containment Area | |
| Was Sheen Observed? | ❑ YES ❑ NO |
| Appearance of Water | |
| Location of Discharge | |

Notes:

Contact the SPCC Coordinator prior to ***any*** discharge of collected rainwater from a diked area.

This form is to be completed before discharging any collected rainwater from a diked area ***to a storm sewer system or an open water course only***.

If the water has an oily sheen, is discolored, or contains any oil or sludge, ***do not pump out or discharge the contents***. Contact the SPCC Coordinator for further assistance.

# APPENDIX P

Explosives Management Plan




## General Plan of Operations

# Explosives Management Plan

**September 2014**

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# 1. OBJECTIVES

The overall objective of the Resolution Copper Mining (Resolution) Explosives Management Plan (EMP) is to provide comprehensive standards to control the risks associated with the storage, handling, transporting, use, and disposal of explosives at Resolution. It is to ensure that Resolution is compliant with the law and provides the safest possible working environment for its employees, contractors and surrounding neighbors.

The intent of the EMP is to describe how Resolution will manage explosives on site. Currently Cementation USA is the holder of Federal Explosives License 9-AZ-021-33-3E-00299. The receiving, storage, transportation, use, and disposal of explosives are the responsibility of the license holder. The current vision is that contractors will perform the future development work at Resolution. Resolution will manage the EMP by ensuring that the contractor's policies and procedures comply with ATF 27 CFR Regulations, MSHA 30 CFR Regulations, and Arizona State Mining Code, manufacture's recommendations as well as the EMP.

The EMP is established using risk management principles and is designed to meet the Rio Tinto D01.9 standards. The plan follows the Design-Implementation-Verification cycle, providing standards pertaining to the storage, handling, transporting, use, and disposal of explosives. The EMP will also ensure compliance with the relevant MSHA and State of Arizona regulations. It is to be applied in conjunction with all other management plans and standard operating procedures established at Resolution Copper.

# 2. SCOPE

The Explosives Management Plan provides the systems, processes, and procedures to establish and maintain safe work practices when dealing with explosives. This document sets out requirements for:

- Roles, Responsibilities and Competencies
- Transporting
- Security and Storage
- Explosives Use
- Disposal
- Exclusion Zones
- Segregation
- Proximity to Extraneous Ignition Sources
- Inventory Management
- Risk Assessment
- Training

- Site Licensee Information
- Document Control, History, and Revisions

The EMP applies to all Resolution employees, contractors and subcontractors who work at Resolution. It is the responsibility of the contractor holding the Federal Explosives License to prepare all necessary site-specific explosives policies and procedures in order to be in compliance with this EMP.

# 3. ROLES AND RESPONSIBILITIES

Any contractor holding a Federal Explosives License will prepare and implement site-specific explosive management plans and procedures that comply with ATF 27 CFR Regulations, MSHA 30 CFR Regulations, and the Arizona State Mining Code as well as the manufacturer's recommendations. Accountabilities, roles, and responsibilities of the key personnel involved with the EMP are outlined as follows:

## 3.1. RESOLUTION SITE GENERAL MANAGER

The Site General Manager shall ensure that:

- risk assessments are performed for all aspects of managing, storing, handling, transporting and using explosives on site, and approve these assessments;
- the EMP is developed by a competent person;
- the EMP is reviewed by an independent, competent person—or group—at least every two years, or more frequently if determined by a risk assessment;
- this EMP is implemented and all regulatory requirements are met;
- adequate resources are allocated to fulfill the requirements of the EMP;
- contractors and subcontractors are fully aware of their responsibilities in the EMP;
- safe work procedures and standards are implemented and abided by at all times;
- adequate training is given to all personnel accessing or working with explosive materials; and
- any deficiencies with the EMP system are promptly reported to the site manager.

All change requests related to storing, handling, transporting, and using explosives shall be submitted to and authorized by the Site Manager.

## 3.2. CONTRACTOR'S SITE MANAGER

The Contractor's Site Manager shall ensure that:

- site-specific explosives policies and procedures are implemented and all regulatory requirements are met;
- an up-to-date list of personnel licensed and authorized to handle explosives is maintained;
- adequate resources are allocated to fulfill the policy and procedural requirements;
- safe work procedures and standards are implemented and abided by at all times;

- adequate training is given to all personnel accessing or working with explosive materials;
- blasting clearance procedures are posted and followed;
- blasting schedules are posted and followed; and
- any other pertinent blasting information is provided to employees.

### 3.3. HEALTH AND SAFETY AND ENVIRONMENTAL MANAGER(S)

The Health and Safety and Environmental Manager(s) must ensure that:

- standard operating procedures are available and updated for all activities related to explosive materials; and
- all personnel working around explosives receive appropriate training to protect them from safety hazards.

### 3.4. ALL EMPLOYEES

All employees accessing or working around explosive materials shall ensure that:

- they have received Bureau of Alcohol, Tobacco, Firearms and Explosives (BATF) clearance;
- they are properly trained to work with explosives and complete their work in accordance with the standards; and
- any identified hazard is immediately reported to the contractor's supervisor or site general manager.

### 3.5. CURRENT APPOINTMENTS

As of the date of release of this EMP, the current persons are appointed to the listed functions are shown in ***Table 1***. These persons shall assume their roles and responsibilities and be held accountable as outlined in this EMP.

**Table 1. List of Current Appointees**

| Appointed Positions | Appointed Persons |
|---|---|
| D01.9 Explosives Champion | John Geyer |
| Health and Safety Manager | Tim Fox |
| Environmental Manager | Casey McKeon |
| Cementation Project Manager | Hector Denogean |
| Site General Manager | Tom Goodell |

## 4. TRANSPORTATION

Any Contractor holding a Federal Explosives License will prepare and implement site-specific explosive management plans and procedures that comply with ATF 27 CFR Regulations, MSHA 30 CFR Regulations, and the Arizona State Mining Code as well as the manufacturer's recommendations. Transportation of

explosives to the mine site by the explosives distributor, shall meet the provisions of US Department of Transportation regulations contained in 46 CFR Parts 171-179 and 390-397. The following outlines the General policies and procedures.

## 4.1. ON SITE VEHICLES

All vehicles transporting explosives must be equipped, maintained, and inspected to manage the risk of fire or explosion.

All vehicles equipped to transport explosives on site must be:

- in sound mechanical condition and repair;
- equipped with sides and enclosures higher than the explosive materials being transported or have the explosive material secured to a non-conductive pallet;
- equipped with a cargo space that shall contain the explosive material—the passenger areas shall not be considered cargo space;
- equipped with at least two multi-purpose dry-chemical fire extinguishers or one such fire extinguisher and an automatic fire suppression system;
- posted with warning signs that indicate the contents and are visible from each approach;
- occupied only by persons necessary for handling the explosive material;
- attended or the cargo compartment locked, except when parked at the blast site and loading is in progress;
- not taken into a shop or repair facility while containing explosive materials; and
- secured while parked by having the brakes set, the wheels chocked, and the engine shut off unless powering a device being used in the loading operation.

Vehicles containing explosives shall have:

- no sparking material exposed in the cargo space; and
- only properly secured non-sparking equipment in the cargo space with the explosives.

Vehicles used for dispensing bulk explosive material shall:

- have no zinc or copper exposed in the cargo space;
- provide any enclosed screw-type conveyors with protection against internal pressure and friction heat.

## 4.2. HOISTS

- Before explosive materials are to be transported in shaft conveyances, the hoist operator shall be notified.

- Explosive material transported in a shaft conveyance shall be placed within a container that prevents shifting of the cargo that could cause detonation. Explosives shall be secured so as not to contact any sparking material.
- No explosive material shall be transported during a mantrip.

### 4.3. LOCOMOTIVES

- Explosive materials shall not be transported on a locomotive.
- Explosive materials shall be pulled behind the locomotive.

### 4.4. DELIVERY

- Explosives shall be transported without delay to the storage area or blast site.

### 4.5. SEPARATION OF EXPLOSIVES

Detonators shall not be transported on the same vehicle or conveyance with other explosives except for the following.

Detonators in quantities of more than 1000 may be transported in a vehicle or conveyance with explosives or blasting agents provided the detonators are:

- maintained in the original packaging as shipped from the manufacturer; and
- separated from explosives or blasting agents by 4-inches of hardwood or equivalent, or a laminated partition. The hardwood or equivalent shall be fastened to the vehicle or conveyance. When a laminated partition is used, the provisions of the Institute of Makers of Explosives (IME) Safety Library Publication No. 22, “Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials” (May 1993) and the “Generic Loading Guide for the IME-22 Container”, (October 1993) must be used.

Detonators in quantities of fewer than 1000 may be transported in a vehicle or conveyance with explosives or blasting agents provided the detonators are:

- kept in closed containers; and
- separated from explosives or blasting agents by 4-inches of hardwood or equivalent, or a laminated partition. The hardwood or equivalent shall be fastened to the vehicle or conveyance. When a laminated partition is used, the provisions of the Institute of Makers of Explosives (IME) Safety Library Publication No. 22, “Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials” (May 1993) and the “Generic Loading Guide for the IME-22 Container”, (October 1993) must be used.

# 5. STORAGE AND SECURITY

Any Contractor holding a Federal Explosives License will prepare comprehensive Storage and Security Plans and Procedures that comply with ATF 27 CFR Regulations, MSHA 30 CFR Regulations, and the Arizona State Mining Code as well as the manufacturer's recommendations. Current explosives storage facilities are temporary units leased by the license holder, Cementation USA, from Orica USA Inc. the explosives vender. Any maintenance or repair to the facilities will be performed by Orica USA, following ATF 27 CFR Regulations, MSHA 30 CFR Regulations, and the Arizona State Mining Code. Explosive storage quantities will be determined by ATF 27 CFR Regulations, §555.218, Table of distances for storage of explosive materials (see ***Appendix A***). The following outlines general policies and procedures.

## 5.1. EXPLOSIVE STORAGE FACILITIES

- Detonators and explosives shall be stored in magazines.
- Packaged blasting agents shall be stored in a magazine or other facility that is ventilated to prevent dampness and excessive heating, weather resistant, and locked or attended. Facilities other than magazines used to store blasting agents shall contain only blasting agents.
- Bulk blasting agents shall be stored in weather-resistant bins or tanks that are locked, attended, or otherwise inaccessible to unauthorized entry.
- Facilities, bins, or tanks shall be posted with the appropriate United States Department of Transportation placards or other appropriate warning signs that indicate the contents and are visible from each approach.
- Areas surrounding explosives storage facilities shall be clear of rubbish, brush, dry grass and trees for 25 feet in all directions, except that live trees 10 feet or taller need not be removed.
- Other combustibles shall not be stored or allowed to accumulate within 50 feet of the explosive storage facility. Combustible liquids shall be stored in a manner that ensures drainage will occur away from the explosive storage facility in case of tank rupture.
- Surface Magazine Requirements Magazine shall be structurally sound.
- Magazine shall be non-combustible, or the exterior covered with fire-resistant material.
- Bullet resistant.
- Interior made of non-sparking material.
- Ventilated to control dampness and excessive heating.
- Posted with the appropriate United States Department of Transportation placards or other appropriate warning signs that indicate the contents and are visible from each approach, so located that a bullet passing through any of the signs will not strike the magazine.
- Kept clean and dry inside.
- Lighted only with devices that do not create a fire or explosion hazard and which are specifically designed for use in magazines.

- Heated only with devices that do not create a fire or explosion hazard.
- Locked when unattended.
- Used exclusively for the storage of explosive material except for essential non-sparking equipment used for the operation of the magazine.
- Metal magazines shall be equipped with electrical bonding connections between all conductive portions so the entire structure is at the same electrical potential. Conductive portions of non-metal magazines shall be grounded.
- Electrical switches and outlets shall be located outside of the magazine.

Management of small quantities of explosives for use underground includes the following:

- delivered in non-sparking material on the inside
- kept clean, suitably dry, and orderly;
- kept in repair;
- located out of the line of blasts, so they will not be subject to damaging shock or flyrock;
- posted with warning signs that indicate the contents and are visible from any approach;
- located at least 15 feet from all haulage ways and electrical equipment, or placed entirely within a mined-out recess in the rib used exclusively for explosive material;
- contain no more than a one-week supply of explosive material;
- separated by at least 25 feet from short-term detonator storage facilities; and
- kept securely locked.

Powder boxes (day boxes) shall be:

- structurally sound, weather-resistant, equipped with a lid or cover and with only non-sparking material on the inside;
- posted with the appropriate united states department of transportation placards or other appropriate warning signs that indicate the contents and are visible from each approach
- located out of the blast area once loading has been completed;
- locked or attended when containing explosive materials;
- emptied at the end of each shift, with the contents returned to a magazine or other facility, or attended; and
- detonators shall be kept in boxes separate from explosives or blasting agents by 4-inches of hardwood or equivalent, or a laminated partition. when a laminated partition is used, the provisions of the institute of makers of explosives (ime) safety library publication no. 22, “recommendations for the safe transportation of detonators in a vehicle with other explosive

materials" (may 1993) and the "generic loading guide for the ime-22 container", (October 1993) must be used.

### 5.2. EXPLOSIVE STORAGE PRACTICES

- Detonators shall not be stored in the same magazine with other explosive materials.
- Blasting agents, when stored in the same magazine, will be separated from explosives, safety fuse, and detonating cord to prevent contamination.
- Detonating cord (Primacord®) is an explosive and shall be stored, transported and handled according to explosives regulations. Detonating cord must be stored in the explosives magazine, not in the primer magazine.
- Explosive material shall be stored in a manner to facilitate the use of oldest stocks first.
- Explosive material shall be stored according to brand and grade in such a manner as to facilitate identification.
- Explosive material shall be stacked in a stable manner, but not more than 8 feet high.
- Explosives and detonators shall be stored in closed non-conductive containers except that non-electric detonating devices may be stored on non-conductive racks provided the case insert instructions and the date-plant-shift code are maintained with the product.
- Unusable (B O) explosives and detonators shall be stored in a designated location within their respective magazines prior to disposal.

## 6. EXPLOSIVES USE

Any contractor holding a Federal Explosives License will prepare comprehensive task specific Blasting Plans and Procedures, which comply with ATF 27 CFR Regulations, MSHA 30 CFR Regulations, and the Arizona State Mining Code as well as the manufacturer's recommendations. General policies and procedures are outlined as follows:

### 6.1. GENERAL EXPLOSIVES REQUIREMENTS

- Only persons trained and experienced in the handling and use of explosive materials shall direct blasting operations and related activities.
- Trainees and inexperienced persons shall work only in the immediate presence of persons trained and experienced in the handling and use of explosive materials.
- Smoking and use of open flames shall not be permitted within 50 feet of explosive materials except when separated by permanent noncombustible barriers.
- Explosives and blasting agents shall be kept separated from detonators until loading begins.

### 6.2. NON-ELECTRIC INITIATION SYSTEM

- Non-Electric detonators, initiated by an IKON detonating system, are the system currently used in the shaft sinking blasting operations. Use of non-electric detonators shall be in compliance with 30 CFR 57.6500 - 6501.

### 6.3. ELECTRIC INITIATION SYSTEM

- Electric detonators are used only in non-shaft sinking blasting operations, such as blasting hang-ups in the raise. Use of electrical detonators shall be in compliance with 30 CFR 57.6400 - 6407.

### 6.4. SAFETY FUSE

- Safety fuse is not currently used on site. In the event a contractor re-introduces them, the contractor shall prepare procedures in compliance with 30 CFR 57.6502.

### 6.5. BLACK POWDER

- Black powder shall not be used nor stored on site.

### 6.6. HOT HOLE BLASTING

- Where heat could cause premature detonation, contractor shall prepare written procedures and training in conjunction with the explosives manufacturer that is in compliance with 30 CFR 57.6902.

## 7. DISPOSAL

Any Contractor holding a Federal Explosives License will prepare comprehensive Explosives Disposal Plans and Procedures that comply with ATF 27 CFR Regulations, MSHA 30 CFR Regulations, Federal and state environmental provisions, and the Arizona State Mining Code as well as the manufacturer's recommendations.

## 8. EXCLUSION ZONES

The surface magazines have been located according to the provisions of the ATF Federal Explosives Law and Regulations, 2012, §555.218 Table of distances for storage of explosive materials. §555.207 of the ATF Federal Explosives Law and Regulations outline the specifications for Type 1 magazines. Both magazines have been constructed such that the explosives and detonators are segregated and the magazines are in areas where they are not at risk of ignition from extraneous sources such as electricity, projectiles, fire, and impact by mobile equipment. See ***Appendix A*** for site map showing magazine locations.

## 9. SEGREGATION

Storage sites for the explosive magazine and detonator magazine have been located as to reduce to acceptable levels the risk of sympathetic detonation between the different magazines. The magazines are separated by a natural ridge barrier. The current designated magazine capacities are the maximum allowed under ATF Regulations §555.218 Table of distances for storage of explosive materials. Current inventories are significantly below the maximum.

## 10. PROXIMITY TO EXTRANEOUS IGNITION SOURCES

Due consideration was made when locating the storage magazines in relation to the proximity of extraneous sources of electricity, fire, or the impact of projectiles or mobile equipment. The locations are naturally sparsely vegetated and a naturally occurring rock ridges separate the magazines. Magazines locations were designed to be segregated from ignition sources including refueling locations, shop areas, electrical installations, or oxy-acetylene equipment.

## 11. INVENTORY MANAGEMENT

Any Contractor holding a Federal Explosives License will prepare comprehensive Inventory Plans and Procedures, which comply with ATF 27 CFR Regulations, MSHA 30 CFR Regulations, and the Arizona State Mining Code as well as the manufacturer's recommendations. Cementation currently complies with the Inventory Management Standard through the use of a Surface Powder Magazine - General Inspection Report and an Explosives/Cap Inventory Procedure dated 10 June 2013. All records shall be kept according to Title 27, Part 555, Subpart G. Explosive MSDS sheets are found on the MSDS Online system located in the PASS room.

# 12. RISK ASSESSMENT

A risk assessment for all aspects of managing, storing, handling, transporting and using explosives at Resolution Copper is detailed below.

**Table 2. Risk Assessment for all Aspects of Managing, Storing, Handling, Transporting and Using Explosives**

| SCENARIO DESCRIPTION | RISK RATING | CONTROL COMMENTS |
|---|---|---|
| Brush fire engulfs magazine, causing detonation | Low | • Housekeeping<br>• Regular inspection of magazines and surrounding area<br>• Brush control and spray<br>• Compliance with MSHA and BATF rules and regulations<br>• Engineered Type 2 magazine construction following BATF guidelines<br>• Surface fire emergency evacuation procedures<br>• Signage<br>• No smoking/open flame policy<br>• Secured/controlled access |
| Lightning strikes magazine | Low | • Magazines are grounded<br>• No personnel near magazines during lightning storms-SOP<br>• Weather monitoring/lightning detectors<br>• Secured magazines/controlled access<br>• Table of distance storage limitations |
| Lightning strikes explosives during transportation | High | • No transportation of explosives during lightning storms-SOP<br>• Weather monitoring/lightning detectors |
| Detonation of explosives while loading | Low | • Use of Nonel caps and Ikon detonating system<br>• Blasting procedures<br>• Use of non-static inducing equipment<br>• Clearing area and verification prior to blasting<br>• Tying in of circuit occurs just prior to blasting<br>• Electronic initiator design (IKON)<br>• No sleeping rounds<br>• Reserved |

**Table 2. Risk Assessment for all Aspects of Managing, Storing, Handling, Transporting and Using Explosives**

| SCENARIO DESCRIPTION | RISK RATING | CONTROL COMMENTS |
|---|---|---|
| Someone vandalizing magazine causing an explosion | Low | • Engineered magazine designed to be bullet resistant<br>• Signage<br>• Security guards/controlled access<br>• Detonators/Explosives stored separately<br>• Compliance with BATF regulations |
| Detonation of misfired cap | Moderate | • Post blast inspection SOP<br>• Clean bench/conduct inspection prior to drilling SOP<br>• Off set drill holes/paint locations<br>• Identification and marking of missed holes<br>• Prohibited from drilling through boot-legs SOP<br>• Handling of misfires SOP |
| Detonator ends up in the Grandby dump | Low | • Post-blast inspection SOP<br>• Wetting down the muck pile<br>• Built in wait time for mucking<br>• Mucking practice – 80 percent of time conducted with no personnel on bottom |
| Personnel not following procedures | Moderate | • Training<br>• Supervision<br>• Job observations<br>• Risk assessments/JHA's<br>• Disciplinary actions (Company/MSHA)<br>• Controlled access/secured areas<br>• BATF clearance/background checks |
| Excessive rock temperature causing pre-mature detonation while loading | Moderate | • Measure hole temperatures<br>• Use manufacturer's Blasting Plan<br>• Use high heat tolerance explosives<br>• Drill with chilled water<br>• Manage ground water<br>• No sleeping rounds<br>• Use collar pipes |

**Table 2. Risk Assessment for all Aspects of Managing, Storing, Handling, Transporting and Using Explosives**

| SCENARIO DESCRIPTION | RISK RATING | CONTROL COMMENTS |
|---|---|---|
| Collision of light/medium vehicle with forklift transporting explosives | Moderate | • Speed limits<br>• Signage<br>• Limited access<br>• Red strobe light on transport vehicle<br>• Transporting explosives SOP<br>• Explosives container is engineered |

## 13. TRAINING

Any Contractor holding a Federal Explosives License will prepare comprehensive Training Plans and Procedures that comply with ATF 27 CFR Regulations, MSHA 30 CFR Regulations, and the Arizona State Mining Code as well as the manufacturer's recommendations.

Resolution employees receive training regarding explosives during their annual MSHA Refresher Training. The topics covered include:

- Regulatory Agencies
- Classes of Explosives
- Storage of Explosives
- Transportation of Explosives
- Safe Handling and Use of Explosives

See ***Appendix B*** for 2012 MSHA Annual Refresher – Explosives Training Syllabus

Resolution employees are not cleared by the Federal Explosives Licensing Center to transport, ship, receive, or possess explosive materials.

## 14. SITE LICENSEE INFORMATION

Any Contractor working at Resolution Copper must possess a valid Federal Explosives License See ***Appendix C*** for Contractor's (Cementation USA Inc.) Federal Explosives License.

## 15. DOCUMENT CONTROL, HISTORY, AND REVISIONS

The Explosives Management Plan (EMP) version 1.0 is the current version.

The EMP is to be:

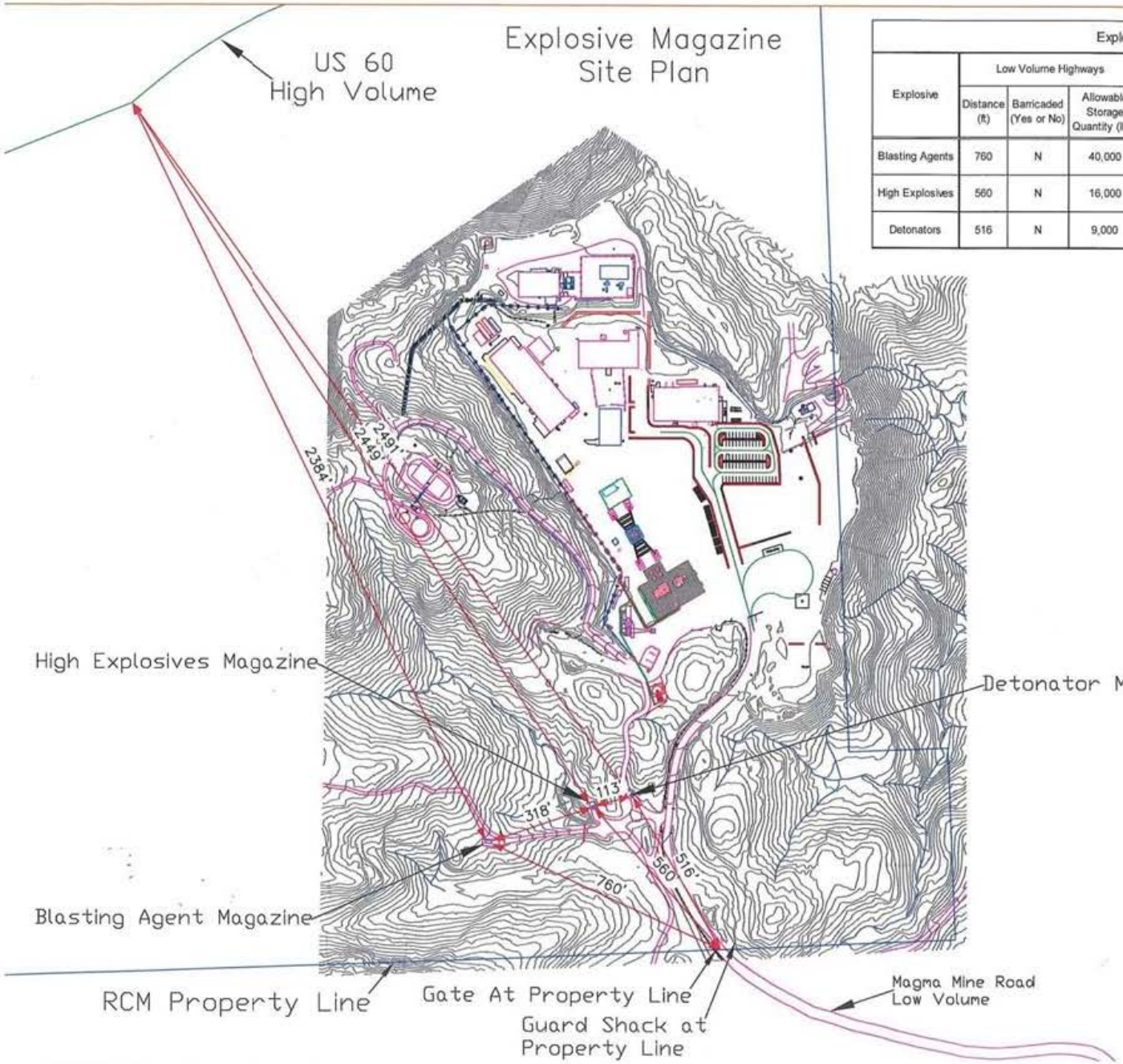
- reviewed at least every two years by an independent competent person or group; and
- reviewed and updated as needed if determined by a risk assessment. A formal management of change shall be completed and approved any time the document is altered. The revisions shall be approved and communicated to all affected personnel before implementation of the change.

The review process encourages continual improvement of the EMP and highlights new or relevant sections to be communicated to relevant personnel in a timely and correct manner.

# APPENDIX A

## SITE PLAN WITH TABLE OF DISTANCES

# Explosive Magazine Site Plan




| Explosive Storage Distances and Quantities | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Explosive | Low Volume Highways | | | High Volume Highways | | | Separation of Magazines | | | Permissable Storage Quantity (lbs) |
| | Distance (ft) | Barricaded (Yes or No) | Allowable Storage Quantity (lbs) | Distance (ft) | Barricaded (Yes or No) | Allowable Storage Quantity (lbs) | Distance (ft) | Barricaded (Yes or No) | Allowable Storage Quantity (lbs) | |
| Blasting Agents | 760 | N | 40,000 | 2,384 | Y | 300,000 | 318 | N | 70,000 | 40,000 |
| High Explosives | 560 | N | 16,000 | 2,449 | Y | 300,000 | 113 | Y | 30,000 | 16,000 |
| Detonators | 516 | N | 9,000 | 2,491 | Y | 300,000 | 113 | Y | 30,000 | 9,000 |

| Resolution Copper Mining | |
|---|---|
| PROJECT | UNDERGROUND EXPLORATION PROJECT |
| LOCATION | East Plant Surface |
| AREA | No. 10 Shaft |
| SUB-AREA | Explosive Storage |
| TITLE | Explosives Magazine Layout |
| SCALE: | |
| RESOLUTION FILE No. | |

M:\Jobs\800's\807.94\ENV\EPS_Explosives_6_2014\EPS_Plan_Layout_AMEC_w_RevisedMagLoc.dwg 23/06/2014

| Explosive Storage Disturbances and Quantities | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Explosive | Low Volume Highways | | | High Volume Highways | | | Separation of Magazines | | | Permissable Storage Quantity (lbs) |
| | Distance (Ft) | Barricades (Yes or No) | Allowable Storage Quantity (lbs) | Distance (Ft) | Barricades (Yes or No) | Allowable Storage Quantity (lbs) | Distance (Ft) | Barricades (Yes or No) | Allowable Storage Quantity (lbs) | |
| Blasting Agents | 413 | N | 40,000 | 3896 | Y | 300,000 | 320 | N | 70,000 | 40,000 |
| High Explosives | 718 | N | 16,000 | 3830 | Y | 300,000 | 113 | Y | 30,000 | 16,000 |
| Detonators | 831 | N | 9,000 | 3799 | Y | 300,000 | 113 | Y | 30,000 | 9,000 |

**Legend**

- Resolution Holdings
- Project Area
- Existing Mine Shaft
- Mine Shaft

N

0 250 500 Feet

# RESOLUTION COPPER
## General Plan of Operations

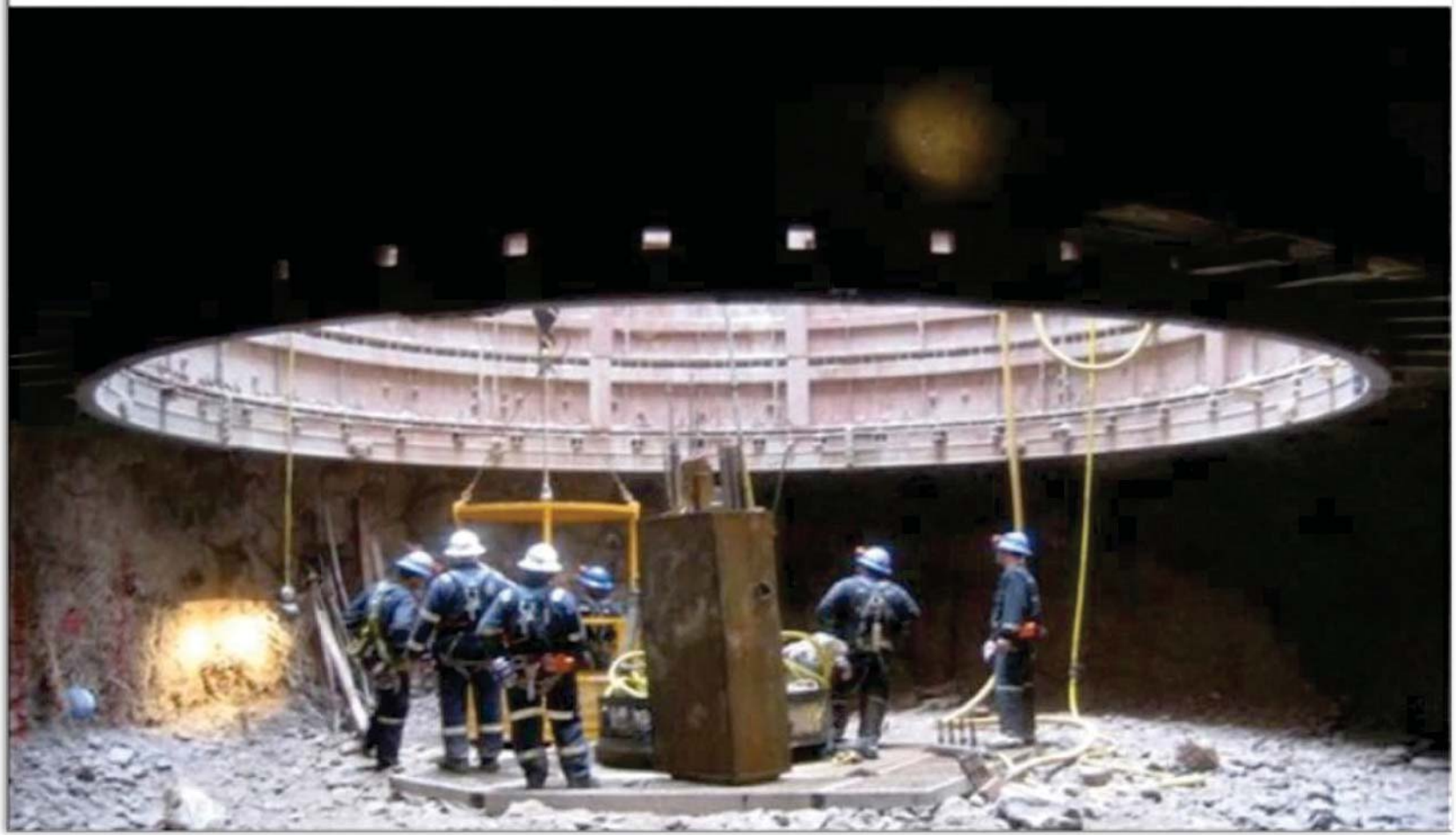
**EAST PLANT SITE**
**EXPLOSIVES STORAGE LAYOUT**
**Figure 2**

# APPENDIX B

## MSHA Annual Refresher – Explosives Training Syllabus

Resolution Copper Mining

# Annual Refresher
# Explosives and Blasting






## INTRODUCTION

### Topics:

- Regulatory Agencies
- Classes of Explosives
- Storage of Explosives
- Transportation of Explosives
- Safe Handling and Use of Explosives




## REGULATORY AGENCIES

- **Department of Transportation (DOT)**
  - Regulates the transportation of explosives on the highways, railways, waterways and by air
- **Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)**
  - Regulates the storage, importation, manufacture, distribution, onsite transportation and use of explosives
- **Mine Safety and Health Administration (MSHA)**
  - Regulates the storage, onsite transportation and use of explosives in all mines. MSHA recognizes DOT and ATF regulations
- **Arizona State Mine Inspector's Office (ASMI)**
  - Regulates the storage, onsite transportation and use of explosives in mines in the state of Arizona




## CLASSES OF EXPLOSIVES

- **High Explosives**
  - Explosive materials which can be caused to detonate by means of a blasting cap when confined
  - Used at RCM: Emulsion cartridges, detonator cord, primers
- **Low Explosives**
  - Explosive materials which can be caused to deflagrate when confined, i.e. – safety fuse, igniter cord (not used at RCM)
- **Blasting Agents**
  - ANFO (ammonia nitrate-fuel oil) and bulk emulsion slurry
  - At RCM, bulk emulsion is used in the shaft, ANFO used in drifts

# Emulsion Cartridges



Resolution Copper Mining

# Detonator Cord



# BOOSTERS



# NONEL DETONATORS






## STORAGE OF EXPLOSIVES

**Explosives must be stored in ATF approved magazines**

- **Type 1 Magazines: Permanent storage of high explosives**
- **Type 2 Magazines: Mobile and portable magazines for the storage of high explosives**
- **Type 3 Magazines: Portable magazines for the storage of high explosives while attended (day boxes)**
- **Type 4 Magazines: For the storage of low explosives**
- **Type 5 Magazines: For the storage of blasting agents**

# HIGH EXPLOSIVES MAGAZINE
# TYPE 2



# EMULSION TANK AND ANFO TRAILER
# TYPE 5



# DETONATOR MAGAZINE
# TYPE 2



# STORAGE OF EXPLOSIVES

- **MSHA REGULATIONS**
  - Locations of magazines are prescribed by the ATF "American Table of Distances"
  - At the East Plant, the magazine location and layout has been approved by the ATF. Storage quantities are monitored and managed to comply with the maximum allowable storage quantities based on distances to the access road and guard shack






# STORAGE OF EXPLOSIVES

- **MSHA REGULATIONS**
  - **Magazines shall be kept locked when not attended**
  - **Magazine construction will:**
    - Include non-combustible material or covered with fire-resistant material
    - Be reasonably bullet-resistant
    - Incorporate interiors of non-sparking materials
    - Provide adequate screened ventilation near the floor and ceiling
  - **Detonators shall not be stored in the same magazine with other explosive materials**
  - **ANFO must be separated from other explosives, safety fuses and detonating cord so as not to cause contamination**




## STORAGE OF EXPLOSIVES

- **MSHA REGULATIONS**
  - Magazines storing detonators must be at least 25 feet away from magazines storing explosives
  - Areas surrounding storage facilities for explosive material shall be clear of rubbish, brush, dry grass and trees for 25 feet in all directions, except that live trees 10 feet or taller need not be removed
  - Warning signs shall be posted for all facilities indicating the contents of such facilities. These signs must be visible from all approaches to the storage location, such that a bullet passing through a sign shall not strike the storage facility




# STORAGE OF EXPLOSIVES

- **MSHA REGULATIONS**
  - **Underground Magazines: At this time there are no underground magazines at RCM**
  - **Powder Chests (Day Boxes): For temporary storage and transportation. Used for blasting in #10 shaft and occasionally on the NSL for blasting the load out chute. Day boxes must be:**
    - Structurally sound, weather resistant, equipped with a lid or cover, non-sparking material on the inside.
    - Locked or attended when containing explosive material
    - Emptied at the end of each with the contents returned to the magazine, or attended

# EXPLOSIVES TRANSPORT BOX (DAY BOX)
# HIGH EXPLOSIVES & DETONATORS FOR #10 SHAFT






# TRANSPORTATION OF EXPLOSIVES

## MSHA REGULATIONS

- **Explosives and detonators may be transported together if they are separated by 4 inches of hardwood or equivalent**
- **Closed, nonconductive containers shall be used to carry explosives and detonators to and from blast sites. Separate containers shall be used for explosives and detonators**
- **Explosive material shall not be transported on a locomotive**
- **Before explosive material is transported in hoist conveyances:**
  - The hoist operator shall be notified
  - Hoisting in adjacent shaft compartments, except for empty conveyance or counterweights, shall be stopped until transportation of the explosive material is completed




# SAFE HANDLING AND USE OF EXPLOSIVES

- **ATF LICENSES AND PERMITS**
  - **Contractors using explosives must have their own ATF license or permit and must be in compliance with SEA (Safe Explosives Act)**
  - **All responsible persons and employees who handle explosives for the purpose of production, shipping, transport or use are required to pass an ATF background check to ensure that all employees and persons so identified are not "prohibited persons". A prohibited person is one that is:**
    - Under the age of 21
    - An alien
    - Someone who has been dishonorably discharged from the military
    - A citizen of the United States who has renounced his or her citizenship
    - A convicted felon or fugitive
    - An unlawful user of marijuana or other depressant, stimulant or narcotic drug
    - A mental defective or someone who has been committed to a mental institution




# SAFE HANDLING AND USE OF EXPLOSIVES

- **MSHA REGULATIONS**
  - Only persons trained and experienced in the handling and use of explosive material shall direct blasting operations and related activities
  - Explosives and blasting agents shall be kept separated from detonators until loading begins
  - Primers shall be made up only at the time of use and as close to the blast site as conditions allow
  - Tamping shall not be done directly on a primer
  - When explosive materials or initiating systems are brought to the blast site, the blast site shall be attended, barricaded and posted with warning signs
  - Once loading begins, the only activities permitted within the blast site shall be those activities directly related to the blasting operation

# PRIMER BOX

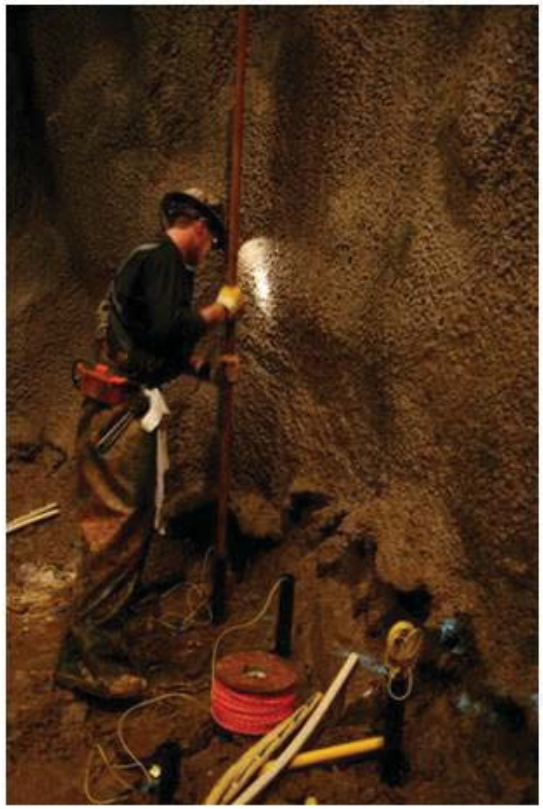


# EMULSION LOADER



Resolution Copper Mining

# LOADING IN #10 SHAFT





Resolution Copper Mining

# LOADING IN #10 SHAFT






# SAFE HANDLING AND USE OF EXPLOSIVES

## ➢ MSHA REGULATIONS

- **Before firing a blast:**
  - Ample warning shall be given to allow all persons to be evacuated
  - Clear exit routes shall be provided for persons firing the round
  - All access routes to the blast area shall be guarded or barricaded to prevent the passage of persons or vehicles
- **Work shall not be resumed in the blast area until a post-blast examination addressing potential blast-related hazards has been conducted by a person with the ability and experience to perform the examination**
- **When a misfire is suspected, persons shall not enter the blast area:**
  - For 30 minutes if safety fuse and blasting caps are used
  - For 15 minutes if any other type detonators are used




# SAFE HANDLING AND USE OF EXPLOSIVES

## ➢ MSHA REGULATIONS

- **During the approach and progress of an electrical storm:**
  - Underground electrical blasting operations that are capable of being initiated by lightning shall be suspended and all persons withdrawn from the blast area or to a safe location
  - Cementation uses an electronic blasting system (IKON), with safeguards that prevent initiation by lightning. However, explosives are not transported on the surface or in the shaft during an electrical storm
- **Damaged or deteriorated explosive material shall be disposed of in a safe manner in accordance with the instructions of the manufacturer**
  - At RCM damaged, deteriorated or waste explosives are stored at the magazines until they are blasted with a subsequent shaft blast




# SAFE HANDLING AND USE OF EXPLOSIVES

## ➢ MSHA REGULATIONS

- **When blasting sulfide ores where hot holes occur that my react with explosive material in blast holes, operators shall:**
  - Measure an appropriate number of blast hole temperatures in order to assess the specific mine conditions prior to the introduction of explosive material
  - Limit the time between the completion of loading and the initiation of the blast to no more than 12 hours
  - Take other special precautions to address the specific conditions at the mine to prevent premature detonation
- **Explosive material shall be protected from temperatures in excess of 150 degrees F**




# SAFE HANDLING AND USE OF EXPLOSIVES

## ➢ MSHA REGULATIONS

**– In preparation for high rock temperatures, Cementation has developed procedures for hot hole blasting:**

- Drill hole temperatures will be checked with a thermal heat tester or test probe
- Drill holes with a temperature of 150 deg F or less require no special action
- Drill holes with a temperature of 150 – 175 deg F will be blasted within 3 hours
- The total time from start of loading to firing the blast must not exceed 3 hours
- Drill holes with a temperature of 175 degrees will not be loaded

# APPENDIX C

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| Chief, Federal Explosives Licensing Center (FELC): Christopher R. Reeves | Expiration Date: **May 1, 2016** |

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ATF Form 5400.14/5400.15 Part 1
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Bureau of Alcohol, Tobacco, Firearms and Explosives
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# APPENDIX D

## GLOSSARY

**GLOSSARY**

Ammonium Nitrate – The ammonium salt of nitric acid represented by the formula $NH_4NO_3$

ANFO – An explosive material consisting of ammonium nitrate and fuel oil

ATF – Prior to January 24, 2003. The Bureau of Alcohol, Tobacco and Firearms, Department of the Treasury, Washington DC On or after January 24, 2003, Bureau of Alcohol, Tobacco, Firearms and Explosives, Department of the Treasury, Washington DC

BATF – Same as above

Black Powder – A low-explosive compound of an intimate mixture of sulfur, charcoal and an alkali, usually potassium or sodium nitrate

Blasting Agent – An explosive material or mixture consisting of fuel oil and an oxidizer, intended for blasting that cannot be detonated by means of a No. 8 blasting cap when unconfined

BO – "Bad Order" un-usable

Combustible - A substance that ignites and burns readily

Detonating Cord – A flexible cord containing a center core of high explosive and used to initiate other explosives

Detonator – A device containing any initiating or primary explosive that is used for initiating detonation

Dynamite – A high explosive consisting essentially of a mixture of nitroglycerin and carbonaceous materials

Emulsion – An explosive material containing substantial amounts of oxidizers dissolved in water droplets, surrounded by an immiscible fuel

Ignition – The act or process of initiating combustion

Magazine – Any building or structure, other than an explosives manufacturing building, used for storage of explosive materials.

Powder – A common synonym for explosive materials

# APPENDIX Q

Prediction of Solute Chemistry for Tailings

Project Report

January 8, 2016

**Resolution Copper Mining Co.**

**Resolution Project Geochemistry**

DISTRIBUTION
H. Gluski (RCM)

# FINAL REPORT: Prediction of Solute Chemistry for Tailings



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## Abbreviations

| | |
|---|---|
| ALT | Apache Leap Tuff |
| atm | atmospheres (pressure) |
| CAP | Central Arizona Project |
| DRA | Decision and Reliability Analysis |
| EPS | East Plant Site |
| g | gram |
| gpm | gallons per minute |
| kg | kilogram |
| L/s | Liters per second |
| $m^2/g$ | square meters per gram |
| mg/L | milligram per liter |
| mol | mole |
| POC | Point of Compliance |
| RCM | Resolution Copper Mining |
| TDS | Total Dissolved Solids |
| TSF | Tailings Storage Facility |
| tonne | Metric ton (1000 kg) |


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# 1. SUMMARY

This report presents the results from a simulation model designed to predict water chemistry in the tailings and process circuits for the Resolution Project. The predictions of water chemistry presented in this report are a result of reactive processes expected to occur as a result of mixing of solutions with different chemistries and evaporation. They are meant to provide a representation of the chemical composition of water circulating through the tailings water circuits during operation and also entrained in the pore space of buried tailings, thereby providing a starting source solution chemistry for seepage chemistry modeling. The effects of sulfide mineral oxidation in the tailings dams, beaches, and slimes are not included in the model. Sulfide oxidation processes will be examined in a future study using the water chemistry predictions developed in this report as a starting point.

The primary findings presented in this report specific to tailings water chemistry are summarized as follows:

- The tailings water is predicted to have pH in the range of 8.2 to 8.5 and SO4 concentrations in the range of 2200 to 2350 mg/L.
- Metal concentrations are predicted to be highest for Ni and Zn at concentrations about 1.5 and 0.4 mg/L, respectively. Concentrations of Co, Cd, Cu, and Pb are predicted to be much lower due to solubility control by their various hydroxide and carbonate secondary mineral phases under the slightly alkaline pH conditions.
- Concentrations of As and Sb are predicted to be in the range of 0.002 to 0.008 mg/L and 0.02 to 0.03 mg/L, respectively. Selenium concentrations are predicted to be higher in the range of 0.4 to 1.0 mg/L. Water pumped from the underground mine is the source of most of the selenium (Hatch, 2015).
- While model simulations also indicate that most metal concentrations will generally be low due to the neutral to alkaline pH conditions, solutes most likely to present potentially mobile constituents tailings water are sulfate, sodium, potassium, selenium, nickel, and zinc.
- Expected lime addition rates of 0.28 to 0.56 kg/tonne ore at the West Plant are sufficient to maintain slightly alkaline and stable pH values in tailings water. Without lime addition, pH values are predicted to remain circumneutral, but slightly more variable than with lime addition. Lime addition to maintain slightly alkaline pH has a beneficial effect for limiting the concentrations of most cationic metals due to solubility controls.
- Chemical release rates for two ore processing systems, referred to as the Selective Flowsheet and Bulk Flowsheet, are now included in the simulation model. These release rates are based on results from pilot plant testing. Water chemistries in the tailings and process water circuits resulting from either ore processing system are not significantly different.


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# 2. General

Mining operations at the Resolution Project managed by Resolution Copper Mining LLC (RCM) will include a tailings storage facility (TSF) containing thickened tailings. Two types of tailings will be produced; a low sulfur scavenger tailings making up about 85% of total tailings and high sulfur cleaner tailings making up the remaining 15% of total tailings production.

Water for ore processing will be obtained from available freshwater sources, precipitation, excess water from the underground mine, reclaim water recycled from the TSF, and return water from the copper concentrate filter plant. Water from the underground mine is a potential source of metals and sulfate to the tailings water. Ore processing will also release some metals and sulfate to tailings water while also adding alkalinity to the water. All the different water chemistries will be mixed in proportion to their flow rates in the tailings water circuit with excess water accumulated in the TSF surface pond. The chemistry of water in the TSF pond and wet beach areas will also be affected by evaporation.

Prediction of the chemical composition of water in the tailings circuit during the mine's operational period is the focus of this report. This predicted chemistry is meant to be representative of the water in the TSF pond and also the water initially entrained in the pore space of deposited tailings. Consolidation of deposited tailings over time will cause a portion of the entrained water to flow to the TSF dams as toe seepage. Sulfide oxidation and leaching will occur in unsaturated zones of the dams, affecting the chemistry of seepage water. However, the predictions of water chemistry for the TSF presented in this report do not include the added effects of sulfide mineral oxidation on water chemistry. Instead, the predictions presented here are meant to represent the starting conditions for modeling the effects of sulfide oxidation and leaching processes that will eventually occur over time. The additional effects of sulfide mineral oxidation will be developed and presented in a subsequent report that is focused on sulfide mineral oxidation and consequent effects on seepage chemistry.

## 2.1 Decision and Reliability Analysis Objectives

The work described in this report was carried out within the framework of the Decision and Reliability Analysis process followed for the different data collection and modeling efforts underway for the Resolution Project. The model described in this report was developed to address the following objectives:

*During mine operations, the chemistry of tailings water has the potential to affect ore processing due to input of acidity from the block cave. Also, any tailings water potentially escaping from the TSF and seepage collection systems has the potential to affect downgradient water chemistry at POCs. After closure, water seeping from tailings has the potential to impact design of water treatment facilities and affect downgradient water quality at POCs following seepage collection.*

The predictions of solute chemistry for tailings water described in this report provide the starting point for modeling the additional effects of sulfide oxidation and leaching on TSF pond and seepage water chemistry. The effects of sulfide oxidation on tailings water chemistry will be addressed in subsequent report.


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The results presented in this report are based on information for water flows and operational practices that are currently available. As that information is refined and improved in the future in parallel studies, there may be a future need to revise the data and assumptions used in this study to develop improved predictions of water chemistry for the tailings circuit.

## 2.2 Goals

The work presented in this report has goals that are relevant to both the operational mine life and closure planning. The goals specific to the operational life are:

- Predict the chemical composition of water in the process and tailings circuits over the mine's operational period
- Assess the lime requirement needed to neutralize the acidity of the block cave water for use at the mill
- Provide an initial infiltration chemistry for integration with future sulfide oxidation and fate and transport models

The goals specific to mine closure planning overlap with those for the operation are period. They are:

- Provide an initial infiltration chemistry for integration with the future sulfide oxidation modeling of tailings
- Provide an initial seepage chemistry for the fate and transport model
- Provide information for assisting in the assessment of the need and duration for collection and treating of TS seepage water


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# 3. Conceptual Model

The conceptual model includes two main parts:

- Water balance
- Chemical mass balance

The conceptual model of the water mass balance for the process and tailings circuit is based on the schematic shown in Figure 3-1. Estimated flow rates as functions of time for each of the flow paths shown between major facilities were provided by RCM as annual average flows. The water balance data are similar to generalized flow rates presented in the mine plan of operations.

## 3.1 Water and Chemical Balance Components

The chemical mass balances were defined by assigning chemical compositions to each of the water sources entering the circuit, identifying points of solution mixing, and then applying the effects of reactive processes. The primary point of solution mixing is at the TSF pond. The primary water sources to the TSF circuit are:

- Renewable Freshwater Makeup from Central Arizona Project (CAP) canal water and banked Recovery Wells: This is alkaline water with constant chemical compositions over time. The proportions for freshwater makeup are assumed for this model to be 25% CAP canal water and 75% Recovery well water.
- Underground Mine: The rates and chemistries of water pumped from the mine are the subjects of the block cave geochemistry report (Hatch, 2015). The box around this area of Figure 3-1 is meant to indicate that data for these flows and chemistries are obtained from Hatch (2015). There are two main components of the Underground Mine water:
    - Water Pumped from the Underground Mine: This water is a mixture from a number of sources that will be collected in underground sumps, including excess mine service water, blowdown from refrigeration systems, and groundwater entering the workings. This water is slightly acidic from interaction with sulfide oxidation and leaching processes with partial neutralization by mixing with alkaline mine service water in sumps.
    - Ore Moisture: A second source of water from the underground mine is ore moisture. Ore moisture is modeled as 4% by weight of ore (Hatch, 2015). This water is also slightly acidic from interaction with sulfide oxidation and leaching processes (Hatch, 2015).
- Precipitation and Runoff: The TSF and seepage collection ponds will collect precipitation that will be mixed into the tailings water. This water has a dilute chemical composition typical of Arizona rain water.

The primary water losses include:


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- Evaporation: Evaporation of water from the TSF wet beaches and ponds comprise a significant water loss. Evaporation removes water but not chemicals; hence results in concentrating solutes.
- Entrainment: Water entrained in deposited tailings comprises another major water loss. Water lost to entrainment takes its chemical components with it becoming the chemical composition of water within the pore space of deposited tailings.
- West Plant: There are two small water losses expected to occur during ore processing:
  - Evaporation: A small evaporation loss is expected to occur at the West Plant.
  - Moly Plant: A small flow of water from the West Plant to the Moly Plant is included in the water balance
- Filter Plant: A small amount of water is lost to copper concentrate after filtration with the excess water returned to the tailings circuit.

Reclaimed or re-used water is also included in the conceptual model. The main reclaim water types are:

- Reclaim from the TSF Pond: This water is returned to the West Plant for ore processing. The chemistry of this water is based on the mixture of water sources to the TSF and evaporation.
- Filter Plant Return: A small amount of water will be returned from the Filter Plant after filtration of copper concentrate underflow slurry from the West Plant.

## 3.2 Additional Chemical Inputs

### *3.2.1 Lime*

It is anticipated that lime (CaO) will be added at the West Plant to control pH to a range of about 7.5 to 8.5 needed for ore processing. In the simulation model, lime is added as a reagent at expected rates per mass of ore processed.

### *3.2.2 Ore Processing*

Ore Processing will result in the release of chemical constituents. These releases are modeled as rates of chemical inputs to tailings solution as a function of the rate of ore processed. Data for release rates were obtained from pilot plant testing of potential ore processing methods (ALS, 2014).


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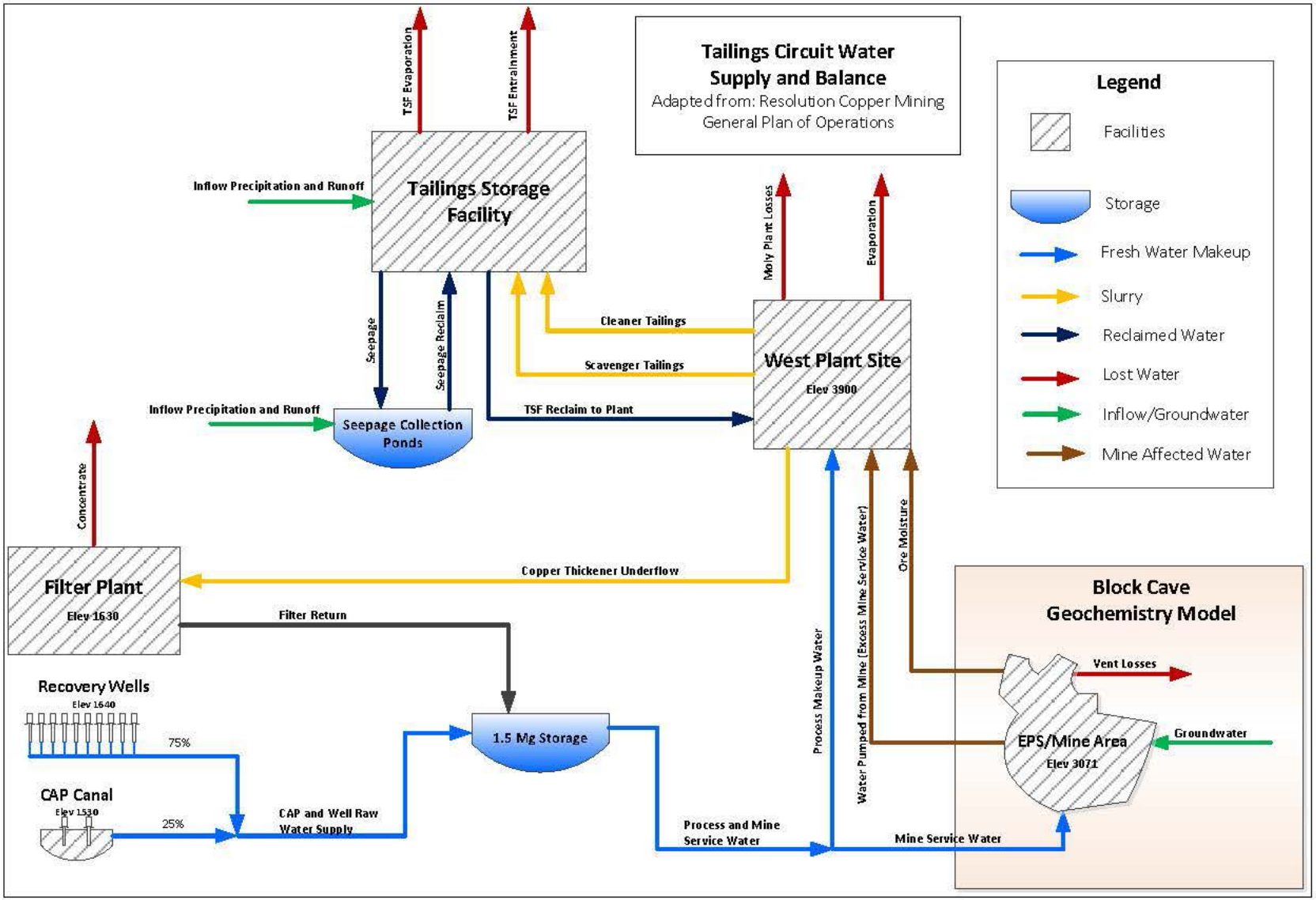


**Figure 3-1. Water circuit for tailings and ore processing**


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# 4. Modeling Framework

## 4.1 Software

The model was developed with a combination of GoldSim (version 11.1.3) and PHREEQC (Parkhurst and Appelo, 2013). GoldSim was used for the water and chemical mass balance components of the model. PHREEQC was used for the reactive processes that affect water chemistry, including aqueous speciation, solubility, redox, and adsorption. The WATEQ4F.DAT thermodynamic database was used for the PHREEQC calculations. This database was modified by the addition of basis species and thermodynamic data for Sb, Be, Co, Cr, Hg, Mo, Tl, and V. Thermodynamic data for these elements were obtained from the MINTEQ.V4.DAT database. The chemical balance portions of the model include calculations for:

- Ca, Mg, Na, K, Cl, $HCO_3$, $SO_4$, $SiO_2$, F, $NO_3$-N, Al, Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Fe, Pb, Mn, Hg, Mo, Ni, Se, Ag, Tl, Zn, and pH.

The PHREEQC geochemical model was integrated directly into the GoldSim water balance model, so that changes to water chemistry resulting from reactive processes are made at each time step in the simulations and incorporated directly into the simulation results (Eary, 2007).

## 4.2 Simulation Period

The simulation run-time settings for the model were:

- Time: The time setting is Elapsed time, that is, time is not associated with a calendar date but starts at time zero and ends after the specified simulation duration is reached. Elapsed time is useful when a precise date for the start and end of operations are not yet defined.
- Duration: The simulation duration is 45 years. This duration covers the currently anticipated period of mining and ore processing.
- Time step: 0.0833 years (one month) for water balance simulations for a total of 540 equal time steps over the 45-year duration
- Simulation Type: The simulation type is Deterministic. The results discussed in the following sections were produced from single simulation model runs using the best estimates for all input parameters. Sensitivity runs were also made to determine responses to variations in single and sets of key input parameters.


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# 5. Model Development and Parameters

## 5.1 Calculation Sequence

The model was developed according to the conceptual model shown in Figure 3-1. The conceptual model includes both water balance and chemical balance components. The calculation sequence for combining these components into a single model is shown in Figure 5-1. The modeling approach involved mixing solutions with different chemical compositions in proportion to their flow rates and equilibrating the bulk, mixed solution compositions with the PHREEQC geochemical model (Parkhurst and Appelo, 2013) according to specified reactive processes. The primary point of mixing and equilibration in the model is the TSF pond (Figure 5-1). Selected mineral phases determined to be oversaturated through the PHREEQC calculations were allowed to precipitate from solution to give an equilibrated solution composition. Only minerals expected to form rapidly from solution under the conditions expected for ore processing, slurry transport, and storage in the TSF were allowed to precipitate in the equilibrium calculations. The mixing and equilibration processes produces a new solution composition according to the chemical balance and specified reactive processes.


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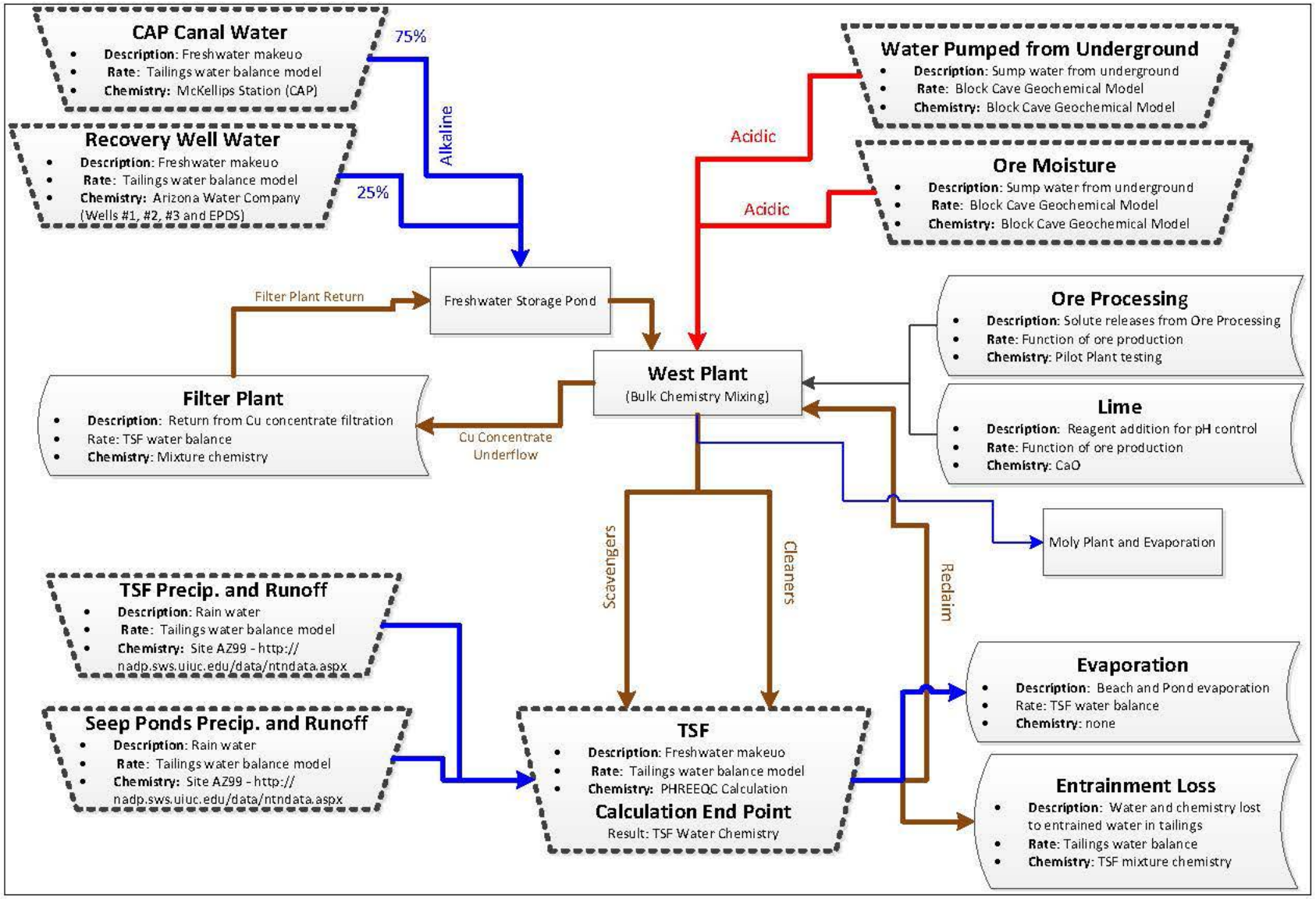


**Figure 5-1. Calculation sequence for the numerical model of TSF water chemistry**


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## 5.2 Water Chemistry

Water entering the process and tailings circuits from outside sources are:

- Renewable, static chemistries not expected to change over time:
  - CAP canal water (25% of total)
  - Recovery Well water (75% of total)
  - Precipitation and runoff
- Dynamic chemistries predicted to change over the mine life:
  - Water pumped from underground mine areas
  - Ore moisture
- Chemical releases directly added to tailings water at the process plant:
  - Solute release rates resulting from ore processing
  - Lime addition to process water for maintenance of pH

Chemical compositions were assigned to each of these water sources as described in the following section.

### *5.2.1 Static Chemistries*

#### *5.2.1.1 CAP Canal Water*

The primary sources of renewable makeup water are the Central Arizona Project (CAP) canal and banked Recovery Wells. Based on guidance from RCM, 25% of renewable water will be obtained from the CAP canal and 75% from the Recovery Wells.

The chemistry of the CAP canal water was defined from the average of 12 monthly samples from 2010 reported for the CAP McKellips Station[1]. The average composition was calculated using PHREEQC's solution mixing function with equal mixing fractions for all 12 samples. The McKellips Station data did not include results for most metals; hence, concentrations of 0 mg/L were used for these metals in model inputs. Table 5-1 gives the chemical composition for the CAP canal water.

#### *5.2.1.2 Recovery Well Water*

The chemical composition for the Recovery Wells was estimated from the 2012 water quality report for Superior, Arizona obtained from the Arizona Water Company (Wells #1, #2, #3 and EPDS) (Table 5-1). The average composition was calculated using PHREEQC's solution mixing function with equal mixing fractions for all four samples. The Report contained concentrations for As, Ba, Cr, Cu, Pb, F, $NO_3$, Cl, and Na. Concentrations for all other parameters were assumed to be the same as CAP canal water or 0 mg/L for analytes not reported.

[1] [1] http://www.cap-az.com/Operations/WaterQuality/H2OQuality/WaterQualityData.aspx?location=mckellips


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#### 5.2.1.3 *Precipitation Chemistry*

The chemistry of precipitation was obtained from the National Atmospheric Deposition Program for Site AZ99 (Oliver Knoll) (http://nadp.sws.uiuc.edu/data/ntndata.aspx) as the average of 5 years of mean annual concentrations (Table 5-1).

### 5.2.2 *Dynamic Chemistries*

#### 5.2.2.1 *Water Pumped Underground Mine Areas*

The chemical compositions of water pumped from the underground mine areas as a function of time were obtained from the predictive simulation results reported in Hatch (2015). Figure 5-2 shows annual average flow rates from the underground mine (Hatch, 2015). This water is a mixture of acidic water generated from the passage of groundwater through ore zones where sulfide minerals will be exposed to air and alkaline water from excess mine service water, blowdown water from refrigeration systems, and deep groundwater. The resulting mixture chemistry is slightly acidic (pH ~ 5.0 to 5.1) with elevated concentrations of $SO_4$ and some metals (Table 5-2).

#### 5.2.2.2 *Ore Moisture Chemistry*

The chemical composition for ore moisture as a function of time was also obtained directly from the predictive simulations reported in Hatch (2015). Ore moisture is assumed to make up 4% by weight of ore transported out of the underground mine. It is assumed to be comprised of a mixture of groundwater expected to flow through the block cave and mine service water used for dust control, drilling, and other uses (Hatch, 2015). The water making up ore moisture is assumed to come in contact with fragmented sulfidic ore that is exposed to ventilation air and therefore undergo some amount of oxidation. The chemical composition is slightly acidic (pH ~ 4.5 to 4.6) with elevated $SO_4$ and some metals (Table 5-3).

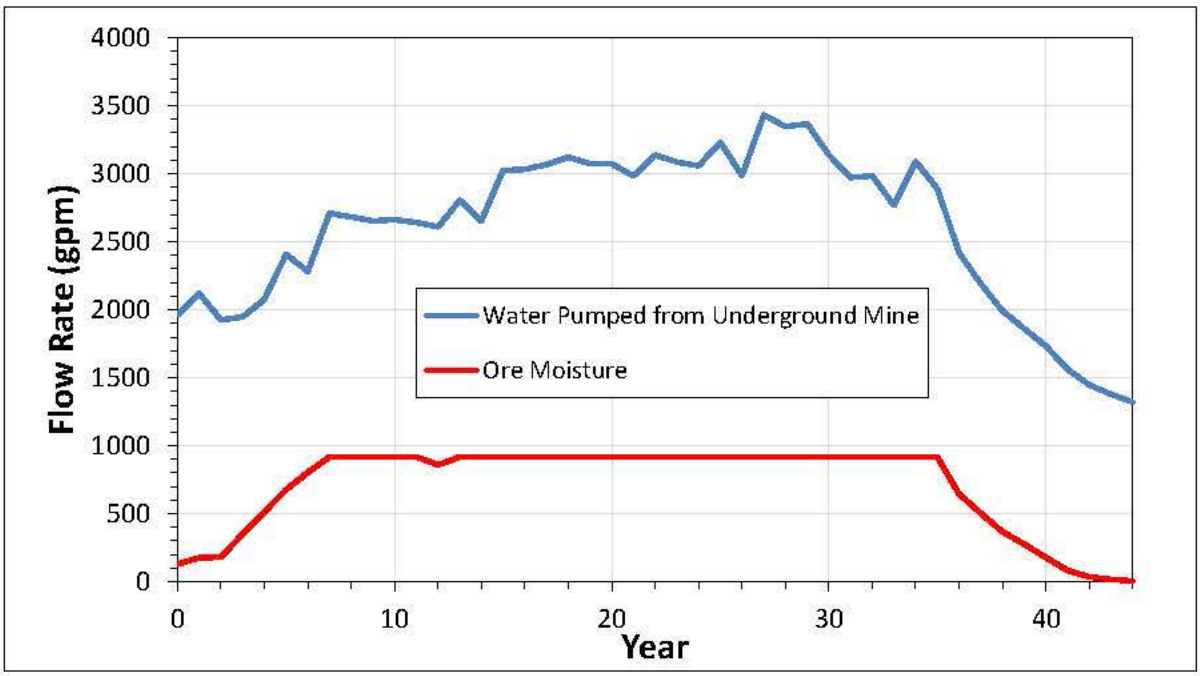


**Figure 5-2. Annual average flows from the underground mine**


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**Table 5-1: Chemical compositions for CAP Canal and Recovery Well renewable sources**

| Parameter | Concentrations (mg/L) | | | |
|---|---|---|---|---|
| | CAP Canal | Recovery Wells | Mixture (25% CAP + 75% Recovery Well) | Precipitation |
| Ca | 72.3 | 30 | 41 | 1.53 |
| Mg | 27.4 | 7 | 12 | 0.022 |
| Na | 92.1 | 69.5 | 75 | 0.071 |
| K | 4.8 | 4.8 | 5 | 0.023 |
| Cl | 87.3 | 1.1 | 23 | 0.121 |
| $HCO_3$ | 122 | 180 | 159 | NA |
| $SO_4$ | 258.5 | 32.5 | 140 | 0.684 |
| SiO2 | 7.0 | 7.0 | 7.0 | NA |
| F | NA | 0.4 | 0.3 | NA |
| $NO_3$-N | 0.3 | 2.0 | 1.6 | 0.963 |
| Al | NA | NA | 0 | NA |
| Sb | NA | NA | 0 | NA |
| As | NA | 0.006 | 0 | NA |
| Ba | 0.13 | 0.01 | 0.039 | NA |
| Be | NA | NA | 0 | NA |
| B | NA | NA | 0 | NA |
| Cd | NA | NA | 0 | NA |
| Cr | NA | 0.004 | 0 | NA |
| Co | NA | NA | 0 | NA |
| Cu | 0.02 | 0.20 | 0.024 | NA |
| Fe | 0.08 | 0.08 | 0.08 | NA |
| Pb | NA | 0.002 | 0 | NA |
| Mn | 0.0048 | 0.0048 | 0.005 | NA |
| Hg | NA | NA | 0 | NA |
| Mo | NA | NA | 0 | NA |
| Ni | NA | NA | 0 | NA |
| Se | NA | NA | 0 | NA |
| Ag | NA | NA | 0 | NA |
| Tl | NA | NA | 0 | NA |
| Zn | NA | NA | 0 | NA |
| pH (s.u.) | 8.3 | 8.3 | 8.29 | 5.34 |

NA – not analyzed


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**Table 5-2. Chemistry of water pumped from underground mine areas (referred to as Upper Level Sump chemistry in Hatch, 2015)**

| Parameter | pH | Ca | Mg | Na | K | Cl | $HCO_3$ | $SO_4$ | $SiO_2$ | F | $NO_3$-N | Al | Sb | As | Ba | Be | B | Cd | Cr | Co | Cu | Fe | Pb | Mn | Hg | Mo | Ni | Se | Ag | Tl | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | s.u. | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **1** | 6.87 | 309 | 78 | 149 | 37 | 26 | 5 | 1364 | 1.4 | 2.7 | 0.6 | 0.004 | 0.001 | 0.006 | 0.019 | 0.000 | 0.00 | 0.002 | 0.002 | 0.02 | 0.1 | 0.00 | 0.001 | 3.5 | 0.000 | 0.00202 | 0.02 | 0.01 | 0.008 | 0.001 | 0.02 |
| **2** | 6.90 | 342 | 85 | 163 | 40 | 28 | 4 | 1504 | 1.9 | 2.9 | 0.6 | 0.004 | 0.002 | 0.006 | 0.021 | 0.000 | 0.01 | 0.004 | 0.006 | 0.05 | 0.2 | 0.00 | 0.002 | 4.0 | 0.001 | 0.000016 | 0.1 | 0.02 | 0.016 | 0.001 | 0.02 |
| **3** | 6.90 | 345 | 88 | 174 | 41 | 32 | 4 | 1540 | 3.5 | 2.9 | 0.8 | 0.004 | 0.002 | 0.006 | 0.021 | 0.001 | 0.01 | 0.006 | 0.010 | 0.08 | 0.4 | 0.00 | 0.004 | 4.2 | 0.001 | 0.000005 | 0.1 | 0.04 | 0.023 | 0.001 | 0.01 |
| **4** | 7.07 | 354 | 92 | 190 | 43 | 36 | 7 | 1604 | 4.0 | 2.9 | 1.1 | 0.006 | 0.002 | 0.006 | 0.021 | 0.001 | 0.01 | 0.004 | 0.006 | 0.05 | 0.3 | 0.00 | 0.003 | 4.2 | 0.001 | 0.000001 | 0.1 | 0.02 | 0.017 | 0.001 | 0.01 |
| **5** | 7.05 | 369 | 96 | 198 | 45 | 37 | 6 | 1676 | 3.9 | 2.9 | 1.1 | 0.004 | 0.002 | 0.007 | 0.021 | 0.001 | 0.01 | 0.005 | 0.008 | 0.07 | 0.3 | 0.00 | 0.004 | 4.4 | 0.001 | 0.000001 | 0.1 | 0.03 | 0.018 | 0.001 | 0.006 |
| **6** | 5.84 | 393 | 103 | 203 | 48 | 41 | 1 | 1807 | 6.4 | 4.3 | 1.1 | 0.8 | 0.005 | 0.011 | 0.020 | 0.005 | 0.05 | 0.020 | 0.031 | 0.29 | 18 | 0.02 | 0.012 | 5.8 | 0.003 | 0.000003 | 0.3 | 0.12 | 0.049 | 0.002 | 1.5 |
| **7** | 7.03 | 390 | 103 | 217 | 48 | 42 | 10 | 1793 | 4.9 | 3.2 | 1.3 | 0.2 | 0.002 | 0.009 | 0.020 | 0.001 | 0.01 | 0.005 | 0.007 | 0.06 | 4 | 0.01 | 0.003 | 4.6 | 0.001 | 0.000001 | 0.1 | 0.03 | 0.014 | 0.001 | 0.3 |
| **8** | 5.74 | 408 | 110 | 215 | 51 | 46 | 2 | 1922 | 7.3 | 5.9 | 1.2 | 1.7 | 0.007 | 0.012 | 0.020 | 0.007 | 0.07 | 0.029 | 0.045 | 0.42 | 34 | 0.04 | 0.017 | 6.6 | 0.004 | 0.000003 | 0.4 | 0.18 | 0.051 | 0.002 | 2.5 |
| **9** | 5.38 | 413 | 112 | 216 | 52 | 48 | 0 | 1969 | 8.0 | 7.3 | 1.2 | 2.4 | 0.009 | 0.013 | 0.020 | 0.010 | 0.09 | 0.038 | 0.059 | 0.56 | 48 | 0.05 | 0.022 | 7.4 | 0.005 | 0.000003 | 0.5 | 0.23 | 0.060 | 0.003 | 3.4 |
| **10** | 5.35 | 415 | 114 | 218 | 52 | 49 | 0 | 1995 | 8.3 | 8.1 | 1.3 | 2.9 | 0.010 | 0.013 | 0.020 | 0.012 | 0.11 | 0.043 | 0.070 | 0.64 | 55 | 0.05 | 0.025 | 7.9 | 0.005 | 0.000003 | 0.6 | 0.27 | 0.063 | 0.003 | 3.9 |
| **11** | 5.30 | 417 | 117 | 218 | 52 | 51 | 0 | 2024 | 8.6 | 9.3 | 1.3 | 3.5 | 0.012 | 0.014 | 0.020 | 0.015 | 0.13 | 0.051 | 0.087 | 0.76 | 63 | 0.06 | 0.030 | 8.5 | 0.006 | 0.000004 | 0.7 | 0.32 | 0.068 | 0.003 | 4.4 |
| **12** | 5.28 | 417 | 118 | 219 | 51 | 52 | 0 | 2038 | 8.7 | 9.9 | 1.3 | 3.8 | 0.013 | 0.015 | 0.020 | 0.017 | 0.14 | 0.055 | 0.099 | 0.83 | 67 | 0.06 | 0.033 | 8.9 | 0.007 | 0.000004 | 0.8 | 0.35 | 0.068 | 0.004 | 4.6 |
| **13** | 5.23 | 419 | 121 | 220 | 50 | 55 | 0 | 2072 | 9.4 | 12.1 | 1.3 | 5.0 | 0.016 | 0.016 | 0.020 | 0.022 | 0.17 | 0.066 | 0.125 | 1.00 | 80 | 0.07 | 0.040 | 9.8 | 0.008 | 0.000004 | 1.0 | 0.43 | 0.076 | 0.004 | 5.3 |
| **14** | 5.13 | 427 | 128 | 220 | 50 | 59 | 0 | 2164 | 10.5 | 16.7 | 1.3 | 7.6 | 0.022 | 0.017 | 0.020 | 0.031 | 0.24 | 0.087 | 0.175 | 1.34 | 108 | 0.08 | 0.054 | 11.7 | 0.011 | 0.000005 | 1.3 | 0.58 | 0.094 | 0.006 | 6.9 |
| **15** | 5.17 | 424 | 126 | 222 | 49 | 59 | 0 | 2132 | 9.9 | 14.5 | 1.3 | 6.3 | 0.021 | 0.018 | 0.020 | 0.030 | 0.22 | 0.079 | 0.166 | 1.23 | 95 | 0.08 | 0.050 | 11.1 | 0.010 | 0.000005 | 1.2 | 0.54 | 0.082 | 0.005 | 6.2 |
| **16** | 5.04 | 439 | 139 | 221 | 50 | 68 | 0 | 2299 | 12.3 | 24.0 | 1.3 | 11.6 | 0.032 | 0.022 | 0.020 | 0.048 | 0.35 | 0.120 | 0.267 | 1.91 | 147 | 0.11 | 0.077 | 14.7 | 0.016 | 0.000007 | 1.8 | 0.84 | 0.120 | 0.008 | 9.1 |
| **17** | 5.02 | 445 | 143 | 222 | 53 | 72 | 0 | 2339 | 13.1 | 24.5 | 1.3 | 11.9 | 0.035 | 0.023 | 0.020 | 0.051 | 0.39 | 0.125 | 0.288 | 2.04 | 153 | 0.11 | 0.083 | 15.2 | 0.018 | 0.000008 | 2.0 | 0.89 | 0.131 | 0.009 | 9.4 |
| **18** | 5.02 | 448 | 145 | 222 | 56 | 74 | 0 | 2355 | 13.5 | 23.7 | 1.2 | 11.4 | 0.037 | 0.022 | 0.020 | 0.050 | 0.41 | 0.125 | 0.291 | 2.06 | 152 | 0.11 | 0.084 | 15.2 | 0.018 | 0.000008 | 2.0 | 0.90 | 0.136 | 0.009 | 9.3 |
| **19** | 5.02 | 452 | 147 | 222 | 59 | 76 | 0 | 2377 | 14.0 | 23.3 | 1.2 | 11.2 | 0.038 | 0.021 | 0.020 | 0.049 | 0.42 | 0.125 | 0.293 | 2.10 | 154 | 0.11 | 0.085 | 15.2 | 0.019 | 0.000009 | 2.0 | 0.91 | 0.143 | 0.010 | 9.3 |
| **20** | 5.04 | 453 | 146 | 222 | 62 | 75 | 0 | 2364 | 13.9 | 21.4 | 1.2 | 10.2 | 0.037 | 0.019 | 0.020 | 0.044 | 0.41 | 0.117 | 0.273 | 2.00 | 146 | 0.10 | 0.080 | 14.6 | 0.019 | 0.000009 | 1.9 | 0.85 | 0.142 | 0.009 | 8.7 |
| **21** | 5.05 | 454 | 145 | 222 | 65 | 75 | 0 | 2359 | 14.0 | 20.2 | 1.2 | 9.5 | 0.036 | 0.018 | 0.020 | 0.040 | 0.41 | 0.112 | 0.256 | 1.93 | 141 | 0.10 | 0.076 | 14.1 | 0.018 | 0.000009 | 1.9 | 0.81 | 0.143 | 0.009 | 8.4 |
| **22** | 5.08 | 452 | 143 | 222 | 67 | 73 | 0 | 2329 | 13.6 | 18.1 | 1.2 | 8.4 | 0.033 | 0.016 | 0.020 | 0.035 | 0.38 | 0.103 | 0.229 | 1.78 | 130 | 0.10 | 0.069 | 13.2 | 0.017 | 0.000009 | 1.7 | 0.74 | 0.136 | 0.008 | 7.8 |
| **23** | 5.05 | 458 | 146 | 220 | 71 | 76 | 0 | 2371 | 14.4 | 19.3 | 1.2 | 9.0 | 0.036 | 0.016 | 0.020 | 0.035 | 0.41 | 0.110 | 0.237 | 1.91 | 140 | 0.10 | 0.073 | 13.7 | 0.018 | 0.000010 | 1.8 | 0.77 | 0.149 | 0.009 | 8.2 |
| **24** | 5.06 | 458 | 145 | 219 | 74 | 75 | 0 | 2363 | 14.4 | 18.5 | 1.2 | 8.6 | 0.034 | 0.015 | 0.020 | 0.032 | 0.40 | 0.109 | 0.222 | 1.87 | 137 | 0.10 | 0.070 | 13.3 | 0.017 | 0.000010 | 1.8 | 0.72 | 0.149 | 0.009 | 8.0 |
| **25** | 5.07 | 458 | 144 | 218 | 75 | 75 | 0 | 2350 | 14.3 | 17.6 | 1.2 | 8.1 | 0.033 | 0.014 | 0.020 | 0.030 | 0.39 | 0.107 | 0.207 | 1.82 | 132 | 0.10 | 0.067 | 12.9 | 0.017 | 0.000010 | 1.7 | 0.68 | 0.147 | 0.008 | 7.7 |
| **26** | 5.05 | 465 | 147 | 215 | 79 | 77 | 0 | 2391 | 15.3 | 18.8 | 1.2 | 8.8 | 0.035 | 0.014 | 0.020 | 0.031 | 0.42 | 0.119 | 0.220 | 1.99 | 142 | 0.10 | 0.073 | 13.4 | 0.018 | 0.000011 | 1.9 | 0.71 | 0.161 | 0.009 | 8.2 |
| **27** | 5.10 | 459 | 142 | 216 | 75 | 73 | 0 | 2319 | 14.2 | 15.6 | 1.2 | 7.0 | 0.031 | 0.014 | 0.020 | 0.027 | 0.37 | 0.107 | 0.191 | 1.77 | 120 | 0.09 | 0.064 | 12.2 | 0.016 | 0.000010 | 1.7 | 0.60 | 0.144 | 0.008 | 6.9 |
| **28** | 5.04 | 472 | 149 | 209 | 81 | 79 | 0 | 2409 | 16.2 | 18.6 | 1.1 | 8.7 | 0.037 | 0.014 | 0.020 | 0.032 | 0.44 | 0.133 | 0.229 | 2.16 | 144 | 0.10 | 0.077 | 13.8 | 0.019 | 0.000013 | 2.1 | 0.70 | 0.166 | 0.009 | 8.0 |
| **29** | 5.06 | 474 | 147 | 207 | 80 | 78 | 0 | 2392 | 16.4 | 17.7 | 1.1 | 8.2 | 0.036 | 0.014 | 0.020 | 0.031 | 0.44 | 0.135 | 0.225 | 2.17 | 139 | 0.10 | 0.076 | 13.6 | 0.018 | 0.000013 | 2.1 | 0.67 | 0.171 | 0.009 | 7.6 |
| **30** | 5.07 | 475 | 146 | 204 | 80 | 77 | 0 | 2375 | 16.5 | 16.9 | 1.1 | 7.7 | 0.035 | 0.013 | 0.020 | 0.030 | 0.43 | 0.137 | 0.220 | 2.17 | 133 | 0.10 | 0.075 | 13.4 | 0.018 | 0.000014 | 2.0 | 0.64 | 0.172 | 0.009 | 7.2 |
| **31** | 5.11 | 470 | 141 | 204 | 76 | 74 | 0 | 2313 | 15.5 | 14.5 | 1.1 | 6.4 | 0.031 | 0.013 | 0.020 | 0.027 | 0.39 | 0.126 | 0.196 | 1.97 | 116 | 0.09 | 0.068 | 12.4 | 0.016 | 0.000013 | 1.9 | 0.55 | 0.162 | 0.008 | 6.2 |
| **32** | 5.16 | 464 | 137 | 205 | 73 | 71 | 0 | 2258 | 14.4 | 12.5 | 1.1 | 5.3 | 0.027 | 0.013 | 0.020 | 0.024 | 0.34 | 0.115 | 0.173 | 1.77 | 100 | 0.08 | 0.060 | 11.5 | 0.014 | 0.000012 | 1.7 | 0.47 | 0.147 | 0.007 | 5.5 |
| **33** | 5.16 | 464 | 137 | 204 | 73 | 70 | 0 | 2251 | 14.3 | 12.3 | 1.1 | 5.2 | 0.027 | 0.013 | 0.020 | 0.024 | 0.34 | 0.117 | 0.171 | 1.78 | 98 | 0.08 | 0.060 | 11.4 | 0.014 | 0.000011 | 1.7 | 0.45 | 0.146 | 0.007 | 5.4 |
| **34** | 5.22 | 456 | 133 | 207 | 70 | 67 | 0 | 2195 | 13.1 | 10.3 | 1.2 | 4.1 | 0.023 | 0.013 | 0.020 | 0.020 | 0.29 | 0.103 | 0.147 | 1.55 | 82 | 0.07 | 0.052 | 10.5 | 0.012 | 0.000010 | 1.4 | 0.38 | 0.126 | 0.006 | 4.7 |
| **35** | 5.15 | 467 | 139 | 199 | 75 | 72 | 0 | 2266 | 14.7 | 12.8 | 1.1 | 5.5 | 0.028 | 0.013 | 0.020 | 0.025 | 0.36 | 0.128 | 0.179 | 1.91 | 103 | 0.08 | 0.064 | 11.8 | 0.014 | 0.000012 | 1.8 | 0.45 | 0.152 | 0.007 | 5.6 |
| **36** | 5.18 | 463 | 136 | 201 | 73 | 70 | 0 | 2232 | 14.1 | 11.6 | 1.1 | 4.8 | 0.026 | 0.013 | 0.020 | 0.023 | 0.33 | 0.120 | 0.166 | 1.79 | 93 | 0.07 | 0.059 | 11.3 | 0.013 | 0.000011 | 1.7 | 0.41 | 0.141 | 0.007 | 5.2 |
| **37** | 5.18 | 454 | 134 | 194 | 72 | 68 | 0 | 2187 | 13.7 | 11.9 | 1.1 | 5.0 | 0.025 | 0.013 | 0.020 | 0.023 | 0.33 | 0.122 | 0.165 | 1.80 | 93 | 0.07 | 0.059 | 11.2 | 0.013 | 0.000011 | 1.7 | 0.39 | 0.139 | 0.006 | 5.1 |
| **38** | 5.17 | 446 | 133 | 191 | 72 | 69 | 0 | 2160 | 14.0 | 12.5 | 1.1 | 5.3 | 0.026 | 0.012 | 0.020 | 0.024 | 0.34 | 0.126 | 0.168 | 1.85 | 95 | 0.08 | 0.061 | 11.3 | 0.013 | 0.000011 | 1.7 | 0.39 | 0.140 | 0.007 | 5.3 |
| **39** | 5.14 | 442 | 134 | 181 | 74 | 70 | 0 | 2151 | 14.1 | 14.1 | 1.0 | 6.2 | 0.027 | 0.012 | 0.020 | 0.026 | 0.37 | 0.138 | 0.182 | 2.02 | 105 | 0.08 | 0.065 | 11.8 | 0.014 | 0.000011 | 1.9 | 0.42 | 0.148 | 0.007 | 5.8 |
| **40** | 5.12 | 436 | 134 | 177 | 75 | 72 | 0 | 2143 | 14.6 | 15.2 | 1.0 | 6.8 | 0.029 | 0.012 | 0.020 | 0.027 | 0.39 | 0.147 | 0.191 | 2.13 | 111 | 0.09 | 0.069 | 12.1 | 0.015 | 0.000012 | 2.0 | 0.43 | 0.152 | 0.007 | 6.1 |



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**Table 5-3. Ore moisture chemistry**

| Parameter | pH | Ca | Mg | Na | K | Cl | $HCO_3$ | $SO_4$ | $SiO_2$ | F | $NO_3$-N | Al | Sb | As | Ba | Be | B | Cd | Cr | Co | Cu | Fe | Pb | Mn | Hg | Mo | Ni | Se | Ag | Tl | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | s.u. | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| **1** | 6.67 | 512 | 86 | 144 | 41 | 27 | 11 | 1881 | 4.2 | 3.2 | 0.3 | 0.1 | 0.005 | 0.001 | 0.028 | 0.001 | 0.05 | 0.020 | 0.027 | 0.30 | 5 | 0.01 | 0.005 | 5.3 | 0.002 | 0.02584 | 0.3 | 0.1 | 0.071 | 0.002 | 0.3 |
| **2** | 5.17 | 614 | 99 | 149 | 44 | 36 | 0 | 2284 | 15.4 | 7.5 | 0.3 | 2.5 | 0.015 | 0.007 | 0.028 | 0.008 | 0.16 | 0.064 | 0.098 | 0.94 | 58 | 0.07 | 0.031 | 8.9 | 0.007 | 0.00018 | 0.9 | 0.4 | 0.215 | 0.004 | 2.7 |
| **3** | 4.91 | 606 | 111 | 154 | 50 | 45 | 0 | 2456 | 26.6 | 16.4 | 0.4 | 7.4 | 0.024 | 0.009 | 0.028 | 0.020 | 0.26 | 0.107 | 0.168 | 1.58 | 137 | 0.13 | 0.056 | 12.4 | 0.012 | 0.00008 | 1.5 | 0.7 | 0.358 | 0.006 | 5.1 |
| **4** | 4.77 | 598 | 124 | 159 | 57 | 54 | 0 | 2634 | 34.1 | 27.2 | 0.4 | 13.2 | 0.033 | 0.011 | 0.027 | 0.032 | 0.37 | 0.149 | 0.235 | 2.22 | 218 | 0.18 | 0.079 | 16.0 | 0.017 | 0.00005 | 2.1 | 0.9 | 0.497 | 0.008 | 7.6 |
| **5** | 4.69 | 592 | 137 | 163 | 63 | 63 | 0 | 2813 | 34.4 | 38.5 | 0.4 | 19.4 | 0.042 | 0.012 | 0.027 | 0.043 | 0.47 | 0.191 | 0.299 | 2.84 | 298 | 0.23 | 0.102 | 19.5 | 0.021 | 0.00004 | 2.7 | 1.2 | 0.528 | 0.011 | 11.5 |
| **6** | 4.63 | 586 | 148 | 168 | 70 | 72 | 0 | 2980 | 34.3 | 49.6 | 0.5 | 25.4 | 0.050 | 0.013 | 0.027 | 0.055 | 0.57 | 0.230 | 0.358 | 3.42 | 373 | 0.27 | 0.124 | 22.7 | 0.025 | 0.00004 | 3.2 | 1.4 | 0.510 | 0.013 | 15.5 |
| **7** | 4.58 | 581 | 159 | 172 | 76 | 80 | 0 | 3144 | 34.3 | 60.6 | 0.5 | 31.4 | 0.058 | 0.013 | 0.027 | 0.066 | 0.66 | 0.267 | 0.416 | 3.98 | 445 | 0.30 | 0.145 | 25.8 | 0.029 | 0.00003 | 3.8 | 1.7 | 0.496 | 0.015 | 19.8 |
| **8** | 4.54 | 576 | 170 | 176 | 81 | 87 | 0 | 3298 | 34.3 | 71.2 | 0.6 | 37.2 | 0.066 | 0.014 | 0.027 | 0.076 | 0.75 | 0.302 | 0.469 | 4.50 | 512 | 0.34 | 0.164 | 28.7 | 0.033 | 0.00003 | 4.3 | 1.9 | 0.486 | 0.016 | 24.0 |
| **9** | 4.52 | 573 | 179 | 179 | 86 | 94 | 0 | 3425 | 34.3 | 80.0 | 0.6 | 41.9 | 0.072 | 0.014 | 0.026 | 0.085 | 0.82 | 0.331 | 0.514 | 4.93 | 567 | 0.37 | 0.180 | 31.1 | 0.036 | 0.00003 | 4.7 | 2.1 | 0.480 | 0.018 | 27.6 |
| **10** | 4.50 | 571 | 187 | 182 | 82 | 100 | 0 | 3504 | 34.2 | 86.6 | 0.6 | 45.5 | 0.079 | 0.017 | 0.026 | 0.098 | 0.90 | 0.358 | 0.579 | 5.35 | 597 | 0.38 | 0.198 | 33.4 | 0.040 | 0.00003 | 5.1 | 2.2 | 0.474 | 0.020 | 29.6 |
| **11** | 4.49 | 570 | 196 | 185 | 76 | 107 | 0 | 3562 | 34.2 | 92.4 | 0.7 | 48.7 | 0.086 | 0.020 | 0.026 | 0.112 | 0.98 | 0.384 | 0.657 | 5.77 | 614 | 0.39 | 0.216 | 35.7 | 0.043 | 0.00003 | 5.5 | 2.4 | 0.468 | 0.021 | 30.8 |
| **12** | 4.49 | 569 | 205 | 189 | 70 | 114 | 0 | 3619 | 34.2 | 98.2 | 0.7 | 51.8 | 0.093 | 0.025 | 0.026 | 0.129 | 1.06 | 0.408 | 0.740 | 6.19 | 631 | 0.40 | 0.236 | 38.0 | 0.047 | 0.00003 | 5.9 | 2.6 | 0.464 | 0.023 | 32.0 |
| **13** | 4.48 | 569 | 213 | 193 | 65 | 122 | 0 | 3676 | 34.2 | 104.0 | 0.7 | 54.9 | 0.101 | 0.030 | 0.026 | 0.146 | 1.15 | 0.431 | 0.827 | 6.60 | 647 | 0.41 | 0.255 | 40.2 | 0.051 | 0.00003 | 6.3 | 2.8 | 0.460 | 0.025 | 33.1 |
| **14** | 4.48 | 568 | 221 | 196 | 61 | 129 | 0 | 3727 | 34.2 | 108.8 | 0.8 | 57.5 | 0.109 | 0.036 | 0.026 | 0.162 | 1.24 | 0.450 | 0.911 | 6.97 | 660 | 0.41 | 0.273 | 42.1 | 0.055 | 0.00003 | 6.7 | 3.0 | 0.458 | 0.027 | 34.0 |
| **15** | 4.47 | 568 | 229 | 200 | 58 | 137 | 0 | 3774 | 34.2 | 113.3 | 0.8 | 59.9 | 0.118 | 0.043 | 0.026 | 0.179 | 1.33 | 0.467 | 0.997 | 7.33 | 672 | 0.42 | 0.291 | 43.9 | 0.059 | 0.00003 | 7.0 | 3.2 | 0.456 | 0.029 | 34.9 |
| **16** | 4.48 | 568 | 235 | 203 | 59 | 143 | 0 | 3791 | 34.2 | 111.6 | 0.8 | 59.0 | 0.123 | 0.048 | 0.026 | 0.188 | 1.40 | 0.468 | 1.049 | 7.48 | 668 | 0.41 | 0.300 | 44.5 | 0.062 | 0.00003 | 7.2 | 3.3 | 0.454 | 0.030 | 34.6 |
| **17** | 4.49 | 569 | 237 | 204 | 67 | 146 | 0 | 3756 | 34.2 | 101.0 | 0.8 | 53.2 | 0.124 | 0.047 | 0.026 | 0.180 | 1.40 | 0.446 | 1.030 | 7.28 | 639 | 0.40 | 0.292 | 42.8 | 0.063 | 0.00003 | 7.0 | 3.2 | 0.454 | 0.030 | 32.5 |
| **18** | 4.50 | 570 | 237 | 205 | 76 | 148 | 0 | 3721 | 34.2 | 91.9 | 0.8 | 48.2 | 0.123 | 0.043 | 0.026 | 0.170 | 1.40 | 0.424 | 0.995 | 7.05 | 613 | 0.39 | 0.282 | 41.1 | 0.062 | 0.00003 | 6.8 | 3.1 | 0.453 | 0.030 | 30.7 |
| **19** | 4.51 | 571 | 236 | 204 | 86 | 148 | 0 | 3684 | 34.2 | 84.0 | 0.8 | 43.9 | 0.121 | 0.037 | 0.026 | 0.157 | 1.38 | 0.402 | 0.944 | 6.80 | 589 | 0.37 | 0.270 | 39.3 | 0.061 | 0.00003 | 6.5 | 2.9 | 0.453 | 0.030 | 29.1 |
| **20** | 4.52 | 572 | 234 | 203 | 95 | 148 | 0 | 3648 | 34.2 | 77.5 | 0.7 | 40.4 | 0.118 | 0.031 | 0.026 | 0.142 | 1.36 | 0.381 | 0.886 | 6.53 | 568 | 0.36 | 0.257 | 37.4 | 0.060 | 0.00003 | 6.3 | 2.8 | 0.453 | 0.029 | 27.7 |
| **21** | 4.53 | 572 | 232 | 201 | 104 | 146 | 0 | 3614 | 34.2 | 72.4 | 0.7 | 37.6 | 0.115 | 0.027 | 0.026 | 0.128 | 1.33 | 0.363 | 0.828 | 6.28 | 551 | 0.36 | 0.244 | 35.7 | 0.058 | 0.00003 | 6.1 | 2.6 | 0.453 | 0.028 | 26.6 |
| **22** | 4.53 | 573 | 230 | 198 | 112 | 145 | 0 | 3587 | 34.2 | 68.4 | 0.7 | 35.4 | 0.111 | 0.023 | 0.026 | 0.118 | 1.30 | 0.351 | 0.778 | 6.09 | 537 | 0.35 | 0.233 | 34.2 | 0.056 | 0.00003 | 5.9 | 2.5 | 0.453 | 0.027 | 25.6 |
| **23** | 4.54 | 574 | 228 | 195 | 120 | 144 | 0 | 3563 | 34.2 | 65.2 | 0.7 | 33.7 | 0.108 | 0.020 | 0.026 | 0.108 | 1.28 | 0.343 | 0.732 | 5.96 | 525 | 0.34 | 0.224 | 33.0 | 0.055 | 0.00003 | 5.7 | 2.4 | 0.453 | 0.027 | 24.9 |
| **24** | 4.55 | 574 | 225 | 191 | 127 | 142 | 0 | 3537 | 34.2 | 62.5 | 0.6 | 32.2 | 0.105 | 0.017 | 0.027 | 0.099 | 1.25 | 0.339 | 0.687 | 5.85 | 516 | 0.34 | 0.216 | 31.8 | 0.053 | 0.00003 | 5.6 | 2.3 | 0.453 | 0.026 | 24.3 |
| **25** | 4.55 | 575 | 223 | 187 | 132 | 140 | 0 | 3515 | 34.2 | 60.4 | 0.6 | 31.1 | 0.102 | 0.015 | 0.027 | 0.092 | 1.22 | 0.339 | 0.651 | 5.78 | 508 | 0.33 | 0.210 | 30.9 | 0.052 | 0.00003 | 5.5 | 2.1 | 0.453 | 0.025 | 23.7 |
| **26** | 4.56 | 576 | 220 | 182 | 133 | 138 | 0 | 3469 | 34.2 | 57.4 | 0.6 | 29.5 | 0.099 | 0.014 | 0.027 | 0.088 | 1.20 | 0.341 | 0.629 | 5.73 | 489 | 0.32 | 0.205 | 30.1 | 0.051 | 0.00003 | 5.5 | 2.0 | 0.453 | 0.025 | 22.6 |
| **27** | 4.57 | 578 | 218 | 176 | 133 | 137 | 0 | 3422 | 34.2 | 54.7 | 0.5 | 28.0 | 0.097 | 0.014 | 0.027 | 0.086 | 1.18 | 0.345 | 0.614 | 5.71 | 471 | 0.32 | 0.202 | 29.4 | 0.049 | 0.00003 | 5.4 | 1.9 | 0.453 | 0.024 | 21.4 |
| **28** | 4.58 | 580 | 215 | 170 | 132 | 135 | 0 | 3372 | 34.3 | 52.1 | 0.5 | 26.6 | 0.094 | 0.014 | 0.027 | 0.083 | 1.16 | 0.349 | 0.600 | 5.70 | 453 | 0.31 | 0.199 | 28.8 | 0.048 | 0.00003 | 5.4 | 1.8 | 0.453 | 0.023 | 20.2 |
| **29** | 4.59 | 582 | 210 | 162 | 129 | 132 | 0 | 3305 | 34.3 | 49.1 | 0.5 | 25.0 | 0.091 | 0.013 | 0.027 | 0.080 | 1.13 | 0.352 | 0.581 | 5.65 | 431 | 0.30 | 0.195 | 28.0 | 0.046 | 0.00004 | 5.3 | 1.7 | 0.454 | 0.022 | 18.9 |
| **30** | 4.60 | 585 | 206 | 155 | 127 | 129 | 0 | 3246 | 34.3 | 46.7 | 0.4 | 23.7 | 0.088 | 0.013 | 0.027 | 0.077 | 1.11 | 0.355 | 0.566 | 5.61 | 412 | 0.29 | 0.191 | 27.3 | 0.045 | 0.00004 | 5.3 | 1.6 | 0.454 | 0.022 | 17.8 |
| **31** | 4.61 | 587 | 202 | 147 | 125 | 127 | 0 | 3201 | 34.3 | 44.8 | 0.4 | 22.7 | 0.085 | 0.012 | 0.027 | 0.075 | 1.10 | 0.360 | 0.554 | 5.60 | 399 | 0.28 | 0.189 | 26.8 | 0.044 | 0.00004 | 5.3 | 1.5 | 0.454 | 0.021 | 17.0 |
| **32** | 4.62 | 588 | 201 | 142 | 125 | 126 | 0 | 3177 | 34.3 | 43.9 | 0.4 | 22.2 | 0.084 | 0.012 | 0.027 | 0.075 | 1.09 | 0.366 | 0.548 | 5.64 | 392 | 0.28 | 0.188 | 26.7 | 0.043 | 0.00004 | 5.3 | 1.5 | 0.454 | 0.021 | 16.6 |
| **33** | 4.62 | 589 | 201 | 136 | 126 | 126 | 0 | 3162 | 34.3 | 43.3 | 0.3 | 21.9 | 0.083 | 0.012 | 0.027 | 0.074 | 1.09 | 0.374 | 0.546 | 5.70 | 389 | 0.27 | 0.189 | 26.7 | 0.043 | 0.00004 | 5.3 | 1.4 | 0.454 | 0.021 | 16.4 |
| **34** | 4.62 | 590 | 201 | 132 | 127 | 127 | 0 | 3158 | 34.3 | 43.2 | 0.3 | 21.8 | 0.083 | 0.012 | 0.027 | 0.075 | 1.10 | 0.383 | 0.547 | 5.78 | 389 | 0.27 | 0.190 | 26.8 | 0.043 | 0.00004 | 5.4 | 1.4 | 0.454 | 0.021 | 16.4 |
| **35** | 4.62 | 590 | 202 | 127 | 128 | 127 | 0 | 3152 | 34.3 | 43.0 | 0.3 | 21.7 | 0.082 | 0.011 | 0.027 | 0.075 | 1.10 | 0.392 | 0.548 | 5.87 | 389 | 0.27 | 0.192 | 26.9 | 0.042 | 0.00004 | 5.5 | 1.4 | 0.454 | 0.020 | 16.4 |
| **36** | 4.62 | 591 | 201 | 122 | 128 | 127 | 0 | 3139 | 34.3 | 42.7 | 0.3 | 21.6 | 0.082 | 0.011 | 0.027 | 0.075 | 1.11 | 0.400 | 0.548 | 5.94 | 387 | 0.27 | 0.193 | 27.0 | 0.042 | 0.00004 | 5.5 | 1.3 | 0.454 | 0.020 | 16.3 |
| **37** | 4.62 | 591 | 203 | 118 | 129 | 128 | 0 | 3145 | 34.3 | 43.1 | 0.3 | 21.7 | 0.082 | 0.011 | 0.027 | 0.076 | 1.12 | 0.410 | 0.552 | 6.05 | 391 | 0.28 | 0.195 | 27.3 | 0.042 | 0.00004 | 5.6 | 1.3 | 0.453 | 0.020 | 16.5 |
| **38** | 4.61 | 591 | 206 | 116 | 132 | 130 | 0 | 3166 | 34.3 | 43.8 | 0.2 | 22.2 | 0.083 | 0.011 | 0.027 | 0.078 | 1.13 | 0.422 | 0.560 | 6.19 | 399 | 0.28 | 0.199 | 27.7 | 0.043 | 0.00004 | 5.7 | 1.3 | 0.453 | 0.021 | 16.9 |
| **39** | 4.60 | 590 | 210 | 114 | 136 | 133 | 0 | 3195 | 34.3 | 44.9 | 0.2 | 22.7 | 0.084 | 0.011 | 0.027 | 0.080 | 1.16 | 0.435 | 0.570 | 6.35 | 409 | 0.28 | 0.203 | 28.3 | 0.043 | 0.00004 | 5.9 | 1.3 | 0.452 | 0.021 | 17.5 |
| **40** | 4.60 | 590 | 214 | 112 | 140 | 136 | 0 | 3229 | 34.3 | 46.1 | 0.2 | 23.4 | 0.085 | 0.011 | 0.027 | 0.082 | 1.18 | 0.449 | 0.582 | 6.53 | 420 | 0.29 | 0.208 | 28.9 | 0.044 | 0.00004 | 6.0 | 1.3 | 0.452 | 0.021 | 18.2 |



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### 5.2.3 *Chemical Releases*

#### 5.2.3.1 *Ore Processing*

A metallurgical testing program with composite ores was carried out in 2014 with a pilot plant system (ALS, 2014). Samples of water were collected during testing and analyzed for chemical composition. These were locked cycle tests carried out over 8 to 9 hours with re-circulation of the process water. Two process flow sheets were tested:

- Bulk flowsheet
- Selective flowsheet

The final water chemistry for the series of tests KM4420-P1 to KM4420-P5 (bulk flowsheet) and for KM4420-P6 to KM4420-P8 (selective flowsheet) were used to calculate release rates. In these calculations, concentrations identified as less than detection were set equal to 50% of the detection level. Release rates $R_i$ in units of mg/kg for chemical parameters ($i$) (Table 5-4) were then calculated according to:

$$R_i = \frac{(C_{final} - C_{tap}) \cdot V}{M} \qquad \text{Eq. 1}$$

In Equation 1, $C_{final}$ is the final concentration in the test series, $C_{tap}$ is the concentration in the tap water used to start the test, $M$ is the average weight of ore processing during the test series, and $V$ is the average volume of water used in the tests. The pilot plant testing followed a locked cycle procedure with continuous re-circulation of fluid; hence the volume of water in Equation 1 was estimated from average weight of ore processed during each step of the test series and average density of the slurry. Multiplication of the chemical release rates (Table 5-4) by the future ore throughput rate for the West Plant gives the rates of chemical masses for each dissolved solute entering the tailings circuit from process water chemistry. Figure 5-3 shows the ore production rate over time from the mine.


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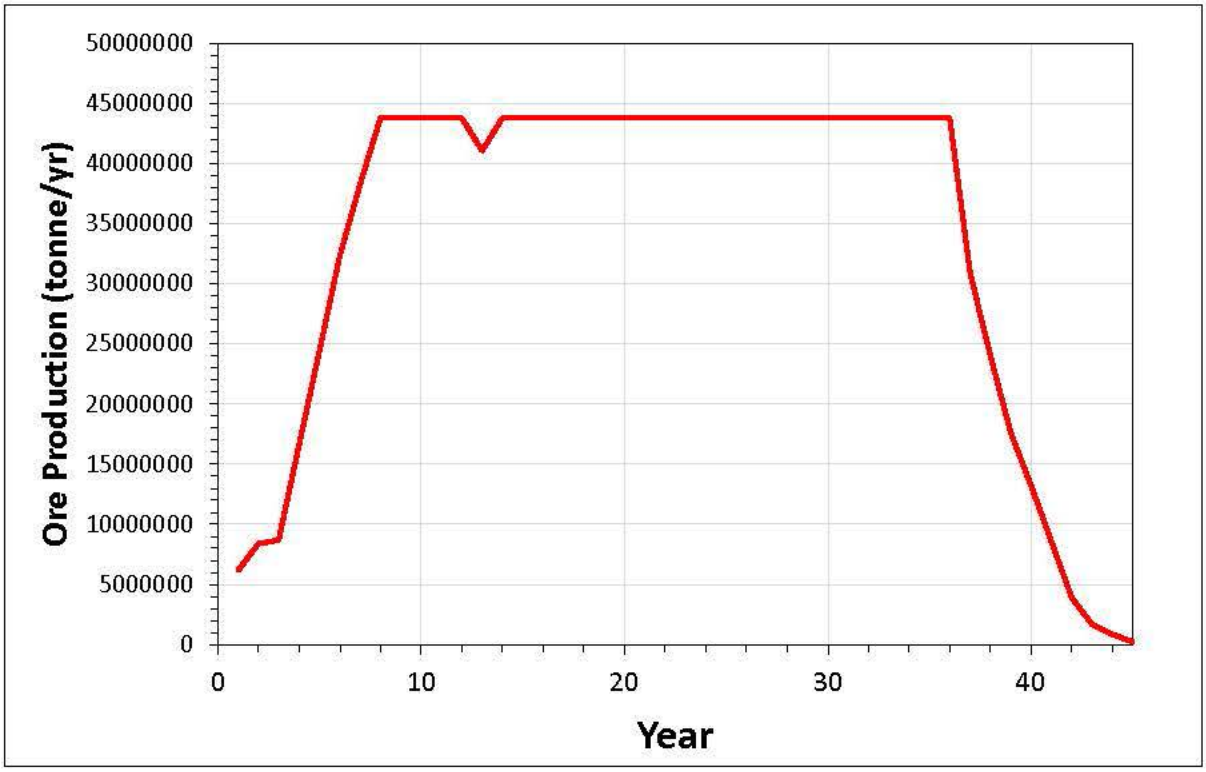


**Figure 5-3. Ore production**

### 5.2.3.2 *Lime Addition to Process Water*

Lime will be added to the process water to maintain the pH between 7.5 and 8.5. Four rates of lime addition were assessed to determine the effect on the pH of process water:

- 0 kg/tonne ore
- 0.28 kg/tonne ore
- 0.56 kg/tonne ore
- 0.84 kg/tonne ore

In the model simulation of solution chemistry, the lime added was assumed to be equivalent to pure CaO.


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**Table 5-4. Release rates from ore processing**

| Parameter | Bulk Flowsheet | Selective Flowsheet |
|---|---|---|
| | mg/kg | mg/kg |
| Ca | 2.183E+02 | 2.819E+02 |
| Mg | 8.733E+00 | 7.644E+00 |
| Na | 2.700E+01 | 4.251E+01 |
| K | 8.820E+01 | 0.000E+00 |
| Cl | 7.383E+00 | 1.112E+01 |
| $HCO_3$ | 0.000E+00 | 0.000E+00 |
| $SO_4$ | 7.127E+02 | 8.943E+02 |
| $SiO_2$ | 0.000E+00 | 0.000E+00 |
| F | 4.872E+00 | 6.890E+00 |
| $NO_3$ | 0.000E+00 | 0.000E+00 |
| Al | 1.270E-01 | 2.158E-01 |
| Sb | 8.618E-04 | 0.000E+00 |
| As | 3.246E-03 | 0.000E+00 |
| Ba | 0.000E+00 | 0.000E+00 |
| Be | 0.000E+00 | 0.000E+00 |
| B | 0.000E+00 | 0.000E+00 |
| Cd | 5.401E-04 | 0.000E+00 |
| Cr | 0.000E+00 | 0.000E+00 |
| Co | 4.884E-04 | 0.000E+00 |
| Cu | 3.447E-03 | 2.155E-02 |
| Fe | 0.000E+00 | 0.000E+00 |
| Pb | 0.000E+00 | 0.000E+00 |
| Mn | 4.625E-01 | 2.320E-01 |
| Hg | 0.000E+00 | 0.000E+00 |
| Mo | 1.583E-01 | 0.000E+00 |
| Ni | 4.309E-03 | 0.000E+00 |
| Se | 2.244E-02 | 2.193E-02 |
| Ag | 1.063E-04 | 0.000E+00 |
| Tl | 0.000E+00 | 0.000E+00 |
| Zn | 5.602E-02 | 0.000E+00 |
| Weight (kg) | 458.8 | 537.3 |
| Water Volume (L) | 1318.0 | 1564.7 |
| Slurry Density (%) | 34.8% | 34.3% |


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## 5.3 Geochemical Processes

Chemical processes will occur due to the mixing of chemical inflows from the different sources used to define the chemical mass balance within the tailings circuit. Chemical processes are represented in model simulations by equilibrium chemical reactions using the PHREEQC geochemical model (Parkhurst and Appelo, 2013).

The specifications of equilibrium geochemical parameters for input to PHREEQC are given in Table 5-5. These parameters are used to define the equilibrium chemical conditions for the following reactive processes:

- **Temperature**: The temperature of water in the tailings and process water circuits was assumed to be 30ºC.
- **Redox**: Redox conditions were assumed to be oxidizing with an $O_2(g)$ partial pressure equal to atmospheric levels due to the assumption of complete mixing and exposure to air. Slurries may not be in exact equilibrium with the atmosphere but are expected to contain at least some amount of dissolved $O_2$, and in the absence of any significant amounts of chemical reductants, such as organic matter, it was assumed that metals and sulfur will exist predominantly in their oxidized forms.
- **$CO_2(g)$**: The partial pressure of $CO_2(g)$ was fixed at $10^{-3.2}$ atm based on the assumption that it would be slightly elevated (two times) over atmospheric $CO_2(g)$.
- **Solubility**: Mixing of solutions in the tailings circuit will result in solute concentrations that exceed the solubilities of certain secondary minerals. It is assumed that some of these minerals will precipitate from solution and will serve as solubility controls for the solutes contained in their structures. Secondary minerals expected to serve as solubility controls are given in Table 5-5. These secondary minerals are selected based on compilations in Eary (1999), Eary and Castendyk (2013), and Nordstrom and Alpers (1999) for the expected pH conditions and low temperatures expected to exist in the tailings circuit.
- **Adsorption**: Adsorption reactions were included in the geochemical parameters assuming that ferrihydrite [$Fe(OH)_{3(a)}$] is the primary sorbent surface. The mass of ferrihydrite available for adsorption was calculated from the amount determined in simulations to precipitate from solution as a result of solution mixing. Surface complexation modeling was based on the diffuse layer model database of Dzombak and Morel (1990) as incorporated into PHREEQC.


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**Table 5-5: PHREEQC Parameters used for equilibrium chemical processes for solution mixing in the tailings and process water circuits**

| Parameter | Value |
|---|---|
| Temperature | 30°C |
| Partial pressure $CO_2(g)$ | $10^{-3.2}$ atm |
| Partial pressure $O_2(g)$ | $10^{-0.7}$ atm |
| Secondary minerals specified as solubility controls (Only allowed to precipitate if oversaturation conditions exist) | Anglesite, $PbSO_4$<br>Antlerite, $Cu_3(OH)_4SO_4$<br>Amorphous Al hydroxide, $Al(OH)_{3(a)}$<br>Barite, $BaSO_4$<br>$Be(OH)_2(am)$<br>Chalcedony, $SiO_2$<br>Cerargyrite, AgCl<br>Co hydroxide, $Co(OH)_3$<br>$Cu(OH)_2$<br>Ferrihydrite, $Fe(OH)_{3(a)}$<br>Fluorite, $CaF_2$<br>Gypsum, $CaSO_4{\cdot}2H_2O$<br>Hydrozincite, $Zn_5(OH)_6(CO_3)_2$<br>Manganite, MnOOH<br>Otavite, $CdCO_3$ |
| Adsorption/Desorption | Surface Adsorption (mass determined from simulated amount of ferrihydrite, $Fe(OH)_3$, precipitated.<br>Surface area equal to 600 $m^2/g$<br>Molecular weight of 89 g/mol)<br><br>Hfo_wOH (week binding sites)<br>0.2 binding sites (mol/mol Fe)<br><br>Hfo_sOH (strong binding sites)<br>0.005 binding sites (mol/mol Fe) |


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# 6. Simulation Results

## 6.1 Time Trends

A series of time-trend charts of mean annual concentrations of selected parameters are shown in this section for the 45-year simulation period. The selected parameters in the charts are illustrative of other parameters included in the model but not shown in charts. The time trends results discussed in this report section are specific to the following conditions that are assumed to be indicative of a Base Case scenario:

- Rate of lime addition equal to 0.28 kg/tonne ore for a slurry density of 30% for ore processing.
- Ore processing according to the Selective Flow Sheet (ALS, 2014).
- Flows rates and water chemistries for water pumped from the underground mine and ore moisture from the base case scenario for the block cave geochemical model (Hatch, 2015).

Numerical simulation results for mean annual concentrations for all parameters for tailing water for the Base Case are given in Table 6-1.

The following conclusions are made from the simulation results for the Base Case:

- Figure 6-1 (pH): The predicted pH is in the range of 8.2 to 8.5 and relatively constant for the entire simulation period. The addition of lime at the expected rate of 0.28 kg/tonne is sufficient to maintain the pH in the slightly alkaline pH range needed for ore processing.
- Figure 6-2 (Sulfate): The concentration of $SO_4$ is predicted to increase rapidly during the first few years of operation and then stay within a range of about 2200 to 2350 mg/L for the majority of the simulation period. The $SO_4$ concentrations are generally at saturation with gypsum solubility given the Ca concentrations of 520 to 580 mg/L. Sulfate concentrations are predicted to increase to 3400 mg/L toward the end of the simulation period. This change occurs after mine production has decreased, which reduces the rate of required freshwater makeup to the extent that evapoconcentration causes concentrations in the TSF to increase. The primary sources of $SO_4$ are the water pumped from the mine and releases during ore processing.
- Figure 6-3 (Al, Fe, and Mn): The concentrations of these metals are all predicted to be relatively low due to solubility limits of Al and Fe hydroxides and $MnCO_{3(d)}$ in the case of Mn under the slightly alkaline pH conditions.
- Figure 6-4 (Co, Cd, Cu, Ni, Pb, and Zn): Predicted time trends for these divalent metals show gradual increases over about the first 10 years and then level out at relatively steady concentrations. Nickel and Zn are predicted to have the highest concentrations at about 1.5 and 0.4 mg/L, respectively, through most of the simulation period. Nickel and Pb are predicted to increase during the last few years of the simulation period due to the evapoconcentration effects mentioned above. Concentrations of Co, Cd, Cu, and Pb are predicted to be relatively low due to


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solubility control by their various hydroxide and carbonate secondary mineral phases under the slightly alkaline pH conditions (Table 5-5).

- Figure 6-5 (As, Sb, and Se): Concentrations of As and Sb are predicted to be in the range of 0.002 to 0.008 mg/L and 0.02 to 0.03 mg/L, respectively. Selenium concentrations are predicted to be higher in the range of 0.4 to 1.0 mg/L. Water from the underground mine as pumped water and ore moisture are the sources of most of the selenium (Hatch, 2015).

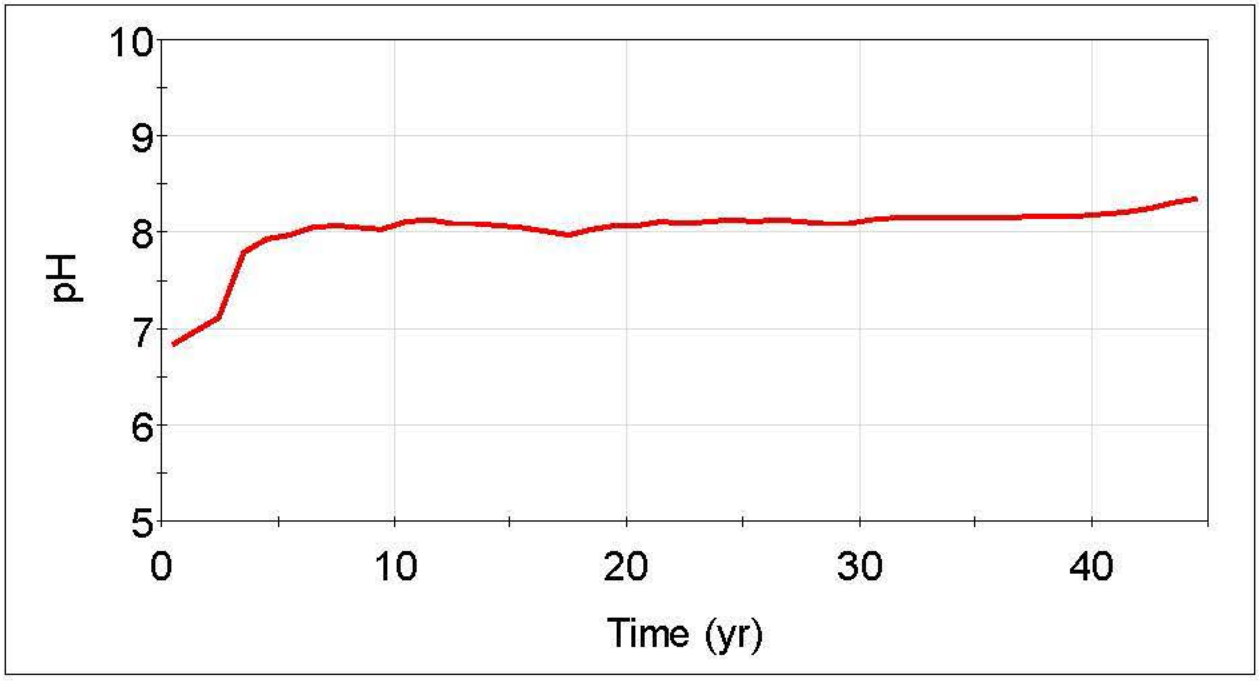


**Figure 6-1. Predicted annual average pH for tailings water**


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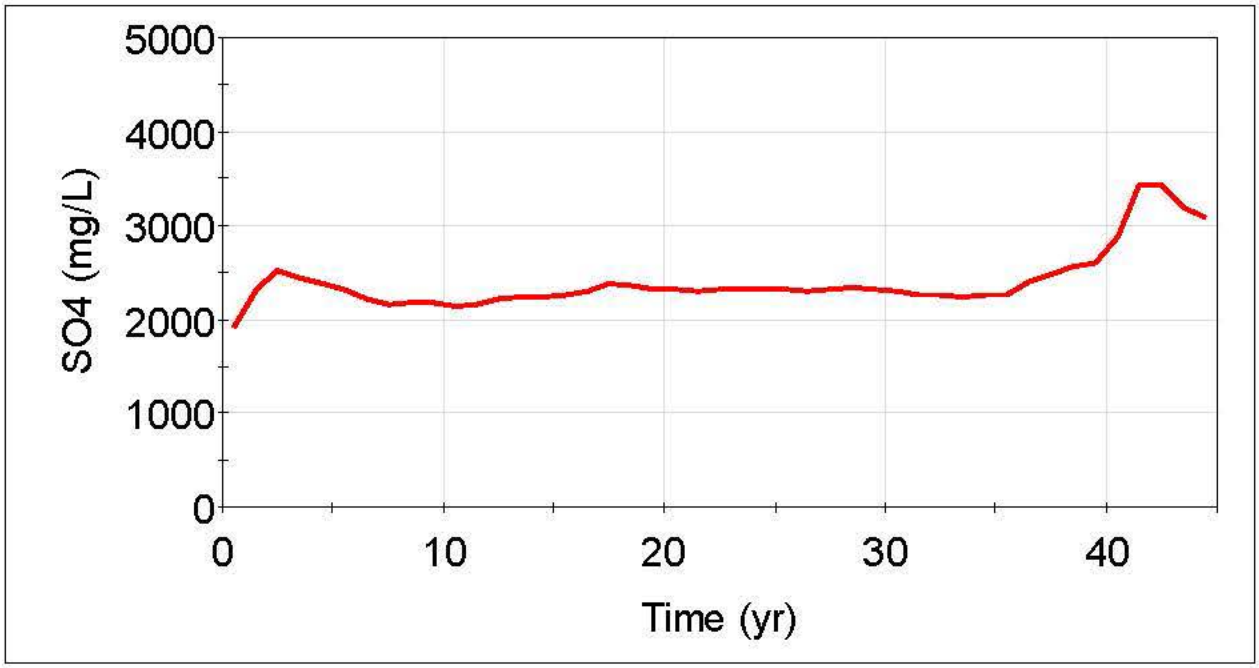


**Figure 6-2. Predicted annual average $SO_4$ concentrations for tailings water**

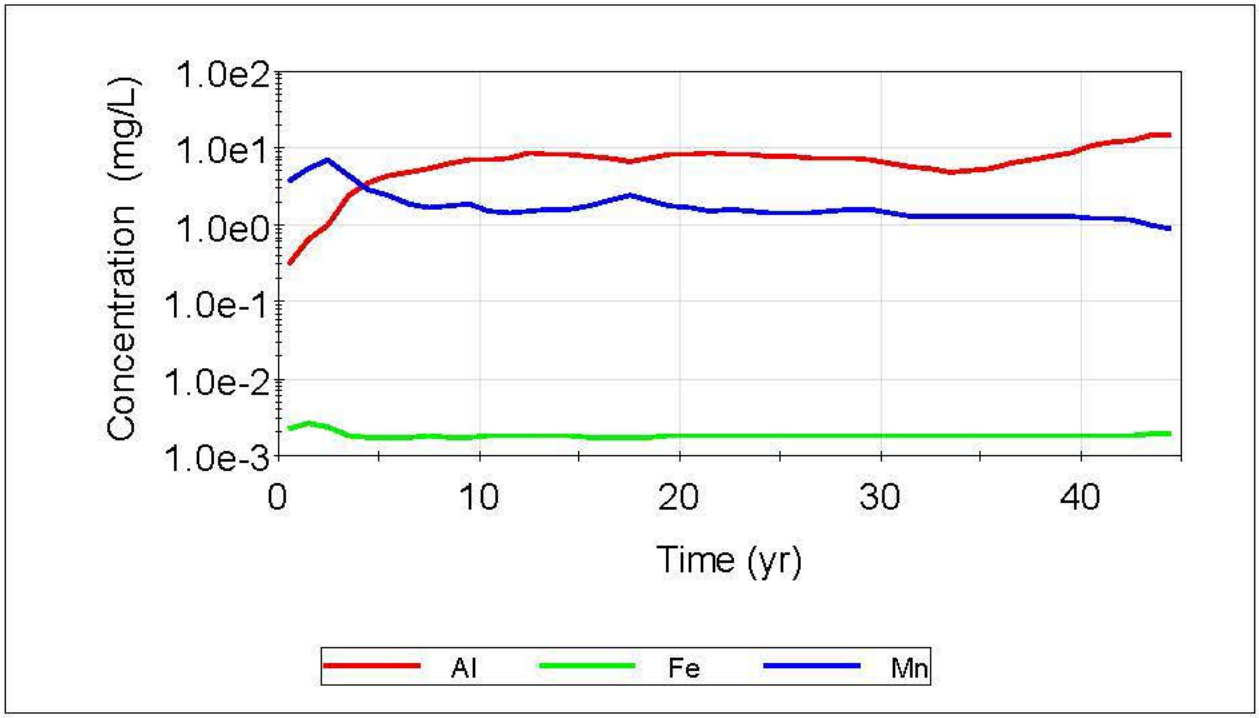


**Figure 6-3. Predicted annual average Al, Fe, and Mn concentrations for tailings water**


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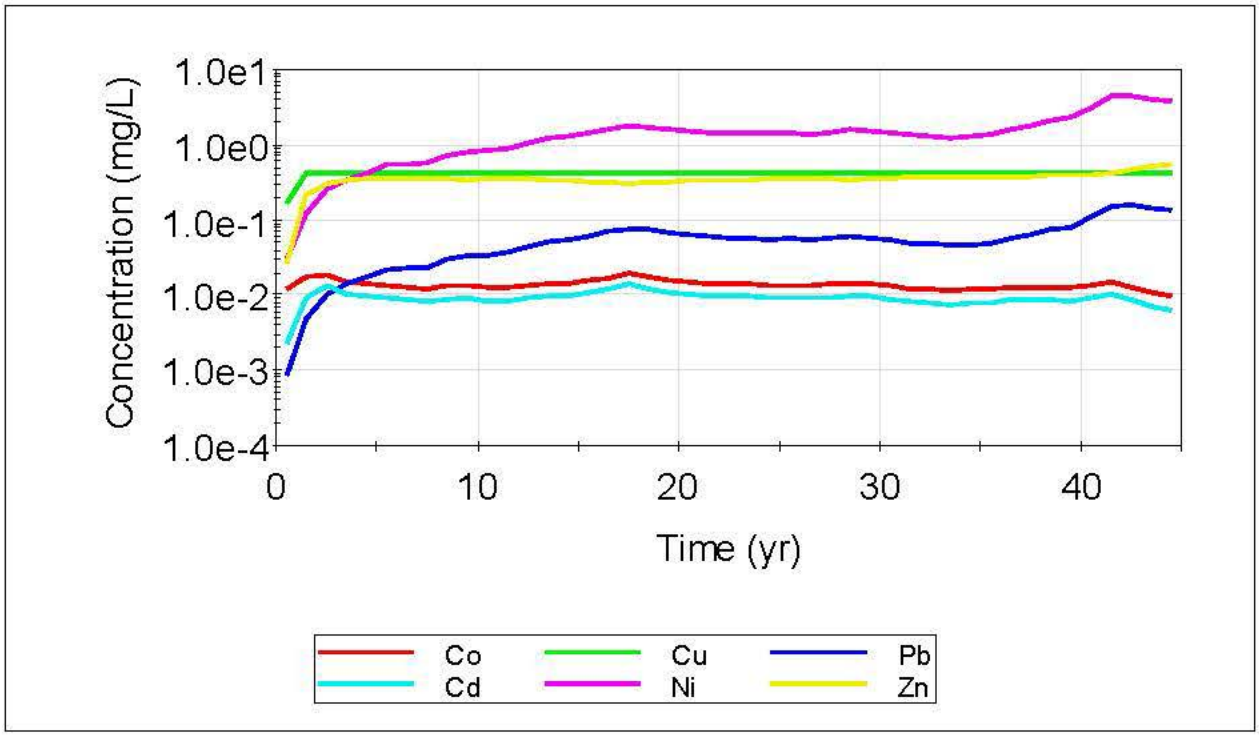


**Figure 6-4. Predicted annual average Co, Cd, Cu, Ni, Pb, and Zn concentrations for tailings water**

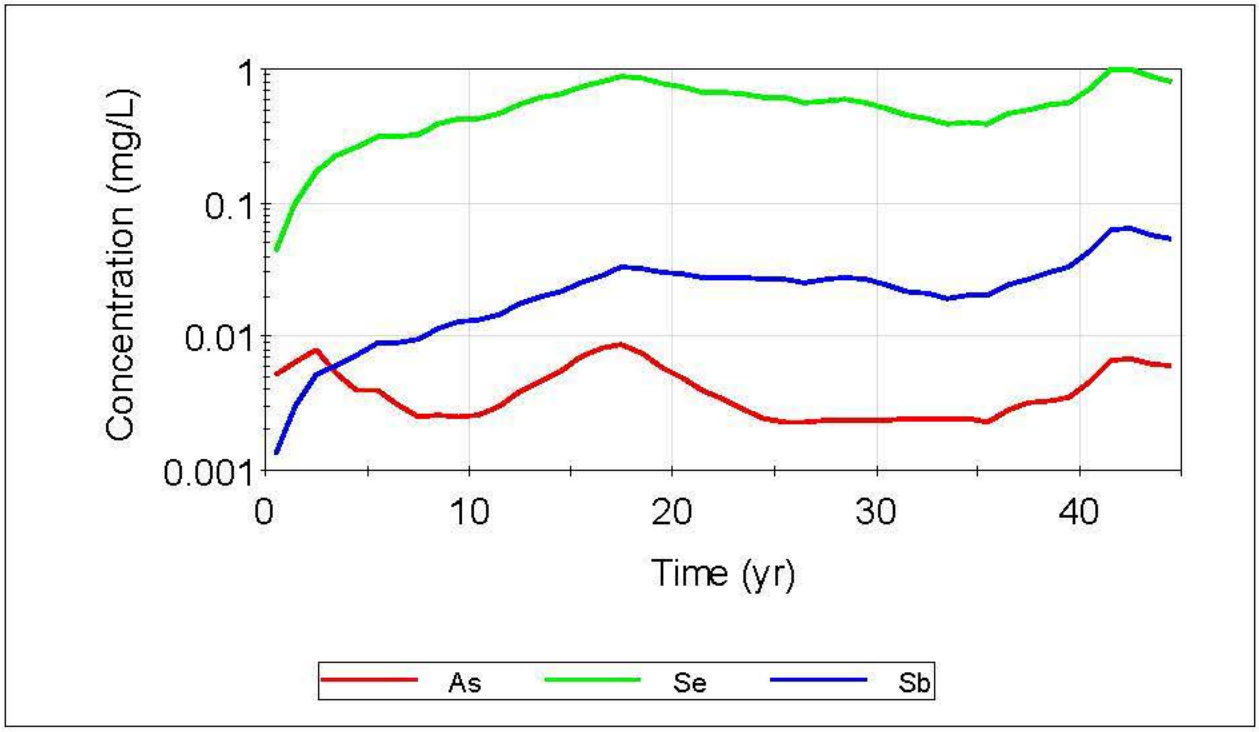


**Figure 6-5. Predicted annual average As, Sb, and Se concentrations for tailings water**


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**Table 6-1. Predicted mean annual concentrations for tailings water (base case scenario-Selective Flow Sheet) (mg/L)**

| Year | pH | Ca | Mg | Na | K | Cl | $HCO_3$ | $SO_4$ | $SiO_2$ | F | $NO_3$ | Al | Sb | As | Ba | Be | B | Cd | Cr | Co | Cu | Fe | Pb | Mn | Hg | Mo | Ni | Se | Ag | Tl | Zn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 8.47 | 545 | 84 | 198 | 35 | 40 | 194 | 1830 | 1.5 | 2.0 | 0.8 | 0.3 | 0.001 | 0.005 | 0.013 | 0.00008 | 0.005 | 0.002 | 0.003 | 0.012 | 0.165 | 0.002 | 0.0009 | 0.689 | 0.0005 | 0.003747 | 0.030 | 0.043 | 0.011 | 0.0005 | 0.027 |
| 2 | 8.45 | 596 | 114 | 271 | 46 | 56 | 188 | 2217 | 3.2 | 2.2 | 0.9 | 0.6 | 0.003 | 0.006 | 0.015 | 0.0009 | 0.021 | 0.009 | 0.014 | 0.017 | 0.424 | 0.002 | 0.005 | 0.794 | 0.001 | 0.000041 | 0.123 | 0.099 | 0.034 | 0.001 | 0.223 |
| 3 | 8.44 | 579 | 138 | 339 | 55 | 73 | 184 | 2406 | 6.8 | 2.4 | 1.4 | 1.3 | 0.005 | 0.008 | 0.015 | 0.003 | 0.044 | 0.013 | 0.029 | 0.019 | 0.424 | 0.002 | 0.010 | 0.807 | 0.002 | 0.000015 | 0.255 | 0.172 | 0.065 | 0.002 | 0.307 |
| 4 | 8.49 | 590 | 124 | 348 | 45 | 82 | 208 | 2336 | 10.3 | 2.3 | 1.7 | 2.5 | 0.006 | 0.006 | 0.015 | 0.004 | 0.059 | 0.010 | 0.038 | 0.015 | 0.425 | 0.002 | 0.014 | 0.799 | 0.003 | 0.000010 | 0.340 | 0.225 | 0.083 | 0.002 | 0.337 |
| 5 | 8.51 | 597 | 115 | 341 | 41 | 84 | 217 | 2284 | 10.9 | 2.3 | 1.7 | 3.4 | 0.007 | 0.004 | 0.015 | 0.005 | 0.073 | 0.009 | 0.047 | 0.014 | 0.425 | 0.002 | 0.017 | 0.799 | 0.004 | 0.000007 | 0.419 | 0.264 | 0.084 | 0.002 | 0.349 |
| 6 | 8.52 | 604 | 107 | 319 | 37 | 82 | 218 | 2219 | 11.5 | 2.2 | 1.7 | 4.3 | 0.009 | 0.004 | 0.015 | 0.006 | 0.094 | 0.009 | 0.060 | 0.014 | 0.426 | 0.002 | 0.022 | 0.797 | 0.004 | 0.000007 | 0.536 | 0.312 | 0.085 | 0.002 | 0.348 |
| 7 | 8.53 | 615 | 96 | 294 | 33 | 78 | 225 | 2135 | 11.6 | 2.2 | 1.7 | 4.8 | 0.009 | 0.003 | 0.015 | 0.006 | 0.097 | 0.008 | 0.062 | 0.013 | 0.426 | 0.002 | 0.023 | 0.797 | 0.005 | 0.000005 | 0.556 | 0.316 | 0.078 | 0.002 | 0.358 |
| 8 | 8.53 | 622 | 88 | 273 | 31 | 74 | 227 | 2078 | 11.1 | 2.2 | 1.7 | 5.2 | 0.009 | 0.003 | 0.015 | 0.006 | 0.101 | 0.008 | 0.064 | 0.012 | 0.426 | 0.002 | 0.023 | 0.796 | 0.005 | 0.000004 | 0.576 | 0.317 | 0.070 | 0.002 | 0.360 |
| 9 | 8.52 | 619 | 92 | 275 | 32 | 76 | 219 | 2093 | 11.9 | 2.2 | 1.7 | 6.3 | 0.012 | 0.003 | 0.015 | 0.006 | 0.127 | 0.009 | 0.080 | 0.013 | 0.426 | 0.002 | 0.029 | 0.792 | 0.006 | 0.000005 | 0.725 | 0.383 | 0.079 | 0.003 | 0.347 |
| 10 | 8.51 | 616 | 94 | 279 | 32 | 78 | 215 | 2109 | 12.2 | 2.2 | 1.8 | 7.0 | 0.013 | 0.003 | 0.015 | 0.006 | 0.142 | 0.009 | 0.091 | 0.014 | 0.426 | 0.002 | 0.033 | 0.791 | 0.006 | 0.000005 | 0.811 | 0.422 | 0.080 | 0.003 | 0.341 |
| 11 | 8.53 | 624 | 90 | 269 | 30 | 77 | 225 | 2072 | 12.4 | 2.1 | 1.9 | 7.0 | 0.013 | 0.003 | 0.015 | 0.006 | 0.145 | 0.008 | 0.096 | 0.012 | 0.426 | 0.002 | 0.034 | 0.795 | 0.007 | 0.000004 | 0.820 | 0.422 | 0.074 | 0.003 | 0.357 |
| 12 | 8.53 | 622 | 93 | 276 | 29 | 80 | 226 | 2090 | 12.9 | 2.2 | 2.1 | 7.6 | 0.015 | 0.004 | 0.015 | 0.006 | 0.162 | 0.008 | 0.111 | 0.012 | 0.426 | 0.002 | 0.037 | 0.796 | 0.007 | 0.000004 | 0.904 | 0.464 | 0.076 | 0.004 | 0.359 |
| 13 | 8.52 | 615 | 102 | 296 | 31 | 87 | 219 | 2149 | 13.7 | 2.2 | 2.2 | 8.8 | 0.017 | 0.004 | 0.015 | 0.006 | 0.192 | 0.009 | 0.136 | 0.013 | 0.426 | 0.002 | 0.044 | 0.794 | 0.009 | 0.000005 | 1.060 | 0.541 | 0.082 | 0.004 | 0.348 |
| 14 | 8.50 | 612 | 106 | 299 | 31 | 90 | 212 | 2166 | 14.2 | 2.2 | 2.2 | 9.8 | 0.020 | 0.005 | 0.015 | 0.006 | 0.221 | 0.010 | 0.161 | 0.014 | 0.425 | 0.002 | 0.050 | 0.792 | 0.010 | 0.000005 | 1.199 | 0.608 | 0.084 | 0.005 | 0.339 |
| 15 | 8.50 | 613 | 106 | 295 | 30 | 90 | 210 | 2160 | 14.2 | 2.2 | 2.2 | 10.3 | 0.021 | 0.006 | 0.015 | 0.006 | 0.239 | 0.010 | 0.177 | 0.014 | 0.425 | 0.002 | 0.054 | 0.791 | 0.011 | 0.000005 | 1.272 | 0.645 | 0.084 | 0.005 | 0.336 |
| 16 | 8.48 | 609 | 112 | 301 | 30 | 94 | 202 | 2189 | 14.6 | 2.2 | 2.2 | 11.2 | 0.024 | 0.008 | 0.015 | 0.006 | 0.273 | 0.011 | 0.205 | 0.015 | 0.425 | 0.002 | 0.061 | 0.792 | 0.012 | 0.000005 | 1.422 | 0.719 | 0.083 | 0.006 | 0.325 |
| 17 | 8.46 | 604 | 119 | 306 | 33 | 99 | 191 | 2223 | 15.5 | 2.2 | 2.2 | 12.2 | 0.029 | 0.009 | 0.015 | 0.006 | 0.320 | 0.012 | 0.238 | 0.017 | 0.424 | 0.002 | 0.069 | 0.794 | 0.014 | 0.000006 | 1.623 | 0.810 | 0.083 | 0.007 | 0.312 |
| 18 | 8.43 | 594 | 132 | 331 | 38 | 108 | 180 | 2310 | 16.7 | 2.3 | 2.3 | 12.7 | 0.033 | 0.009 | 0.015 | 0.007 | 0.366 | 0.014 | 0.265 | 0.019 | 0.424 | 0.002 | 0.076 | 0.806 | 0.016 | 0.000007 | 1.803 | 0.892 | 0.083 | 0.008 | 0.303 |
| 19 | 8.46 | 599 | 129 | 324 | 40 | 107 | 191 | 2288 | 16.8 | 2.3 | 2.3 | 11.5 | 0.032 | 0.008 | 0.015 | 0.006 | 0.362 | 0.012 | 0.253 | 0.017 | 0.424 | 0.002 | 0.073 | 0.799 | 0.016 | 0.000008 | 1.733 | 0.849 | 0.083 | 0.008 | 0.314 |
| 20 | 8.49 | 605 | 123 | 311 | 41 | 103 | 203 | 2245 | 16.4 | 2.3 | 2.3 | 10.1 | 0.030 | 0.007 | 0.015 | 0.006 | 0.341 | 0.011 | 0.228 | 0.015 | 0.425 | 0.002 | 0.067 | 0.794 | 0.015 | 0.000007 | 1.595 | 0.775 | 0.083 | 0.007 | 0.328 |
| 21 | 8.50 | 607 | 121 | 309 | 43 | 102 | 209 | 2238 | 16.4 | 2.3 | 2.3 | 9.3 | 0.029 | 0.006 | 0.015 | 0.006 | 0.331 | 0.010 | 0.211 | 0.015 | 0.425 | 0.002 | 0.063 | 0.794 | 0.015 | 0.000008 | 1.518 | 0.731 | 0.083 | 0.007 | 0.336 |
| 22 | 8.51 | 609 | 120 | 309 | 45 | 102 | 215 | 2231 | 16.3 | 2.2 | 2.3 | 8.6 | 0.028 | 0.005 | 0.015 | 0.006 | 0.318 | 0.010 | 0.194 | 0.014 | 0.425 | 0.002 | 0.059 | 0.796 | 0.014 | 0.000008 | 1.440 | 0.686 | 0.083 | 0.007 | 0.345 |
| 23 | 8.51 | 608 | 121 | 309 | 47 | 102 | 215 | 2238 | 16.5 | 2.3 | 2.3 | 8.4 | 0.028 | 0.004 | 0.015 | 0.006 | 0.319 | 0.010 | 0.187 | 0.014 | 0.425 | 0.002 | 0.058 | 0.796 | 0.014 | 0.000008 | 1.435 | 0.668 | 0.083 | 0.007 | 0.345 |
| 24 | 8.51 | 607 | 122 | 311 | 50 | 103 | 215 | 2246 | 16.8 | 2.3 | 2.3 | 8.3 | 0.028 | 0.004 | 0.015 | 0.006 | 0.322 | 0.010 | 0.181 | 0.014 | 0.425 | 0.002 | 0.058 | 0.797 | 0.014 | 0.000008 | 1.451 | 0.657 | 0.083 | 0.007 | 0.346 |
| 25 | 8.52 | 609 | 121 | 311 | 51 | 103 | 221 | 2241 | 16.9 | 2.3 | 2.3 | 7.9 | 0.027 | 0.003 | 0.015 | 0.006 | 0.312 | 0.009 | 0.169 | 0.013 | 0.426 | 0.002 | 0.055 | 0.799 | 0.013 | 0.000008 | 1.408 | 0.619 | 0.083 | 0.007 | 0.354 |
| 26 | 8.52 | 608 | 123 | 310 | 54 | 103 | 219 | 2249 | 17.1 | 2.3 | 2.3 | 7.9 | 0.027 | 0.003 | 0.015 | 0.006 | 0.318 | 0.009 | 0.168 | 0.014 | 0.425 | 0.002 | 0.056 | 0.798 | 0.014 | 0.000009 | 1.447 | 0.611 | 0.083 | 0.007 | 0.350 |
| 27 | 8.52 | 610 | 120 | 305 | 52 | 101 | 222 | 2229 | 16.8 | 2.2 | 2.3 | 7.3 | 0.026 | 0.003 | 0.015 | 0.006 | 0.305 | 0.009 | 0.160 | 0.013 | 0.426 | 0.002 | 0.054 | 0.799 | 0.013 | 0.000009 | 1.401 | 0.573 | 0.083 | 0.006 | 0.356 |
| 28 | 8.51 | 608 | 123 | 306 | 55 | 103 | 218 | 2247 | 17.2 | 2.3 | 2.2 | 7.4 | 0.026 | 0.003 | 0.015 | 0.006 | 0.319 | 0.009 | 0.166 | 0.014 | 0.425 | 0.002 | 0.056 | 0.798 | 0.013 | 0.000009 | 1.478 | 0.577 | 0.083 | 0.007 | 0.349 |
| 29 | 8.51 | 607 | 126 | 305 | 56 | 104 | 214 | 2255 | 17.8 | 2.3 | 2.2 | 7.6 | 0.028 | 0.003 | 0.015 | 0.006 | 0.338 | 0.010 | 0.174 | 0.014 | 0.425 | 0.002 | 0.059 | 0.797 | 0.014 | 0.000010 | 1.584 | 0.589 | 0.083 | 0.007 | 0.344 |
| 30 | 8.51 | 608 | 124 | 302 | 56 | 103 | 217 | 2244 | 17.7 | 2.3 | 2.2 | 7.1 | 0.027 | 0.003 | 0.015 | 0.006 | 0.330 | 0.009 | 0.169 | 0.014 | 0.425 | 0.002 | 0.058 | 0.797 | 0.013 | 0.000010 | 1.561 | 0.556 | 0.083 | 0.007 | 0.348 |
| 31 | 8.53 | 612 | 119 | 297 | 53 | 101 | 224 | 2217 | 17.3 | 2.2 | 2.2 | 6.4 | 0.024 | 0.003 | 0.015 | 0.006 | 0.308 | 0.009 | 0.156 | 0.013 | 0.426 | 0.002 | 0.054 | 0.800 | 0.012 | 0.000010 | 1.472 | 0.507 | 0.083 | 0.006 | 0.359 |
| 32 | 8.55 | 617 | 114 | 294 | 50 | 98 | 233 | 2188 | 16.7 | 2.2 | 2.2 | 5.7 | 0.022 | 0.003 | 0.015 | 0.006 | 0.278 | 0.008 | 0.140 | 0.012 | 0.426 | 0.002 | 0.049 | 0.804 | 0.011 | 0.000009 | 1.342 | 0.450 | 0.083 | 0.006 | 0.374 |
| 33 | 8.55 | 619 | 112 | 292 | 49 | 97 | 237 | 2178 | 16.4 | 2.2 | 2.2 | 5.4 | 0.021 | 0.003 | 0.015 | 0.006 | 0.267 | 0.008 | 0.134 | 0.012 | 0.427 | 0.002 | 0.048 | 0.807 | 0.011 | 0.000009 | 1.298 | 0.422 | 0.083 | 0.005 | 0.379 |
| 34 | 8.56 | 621 | 109 | 288 | 47 | 95 | 240 | 2159 | 16.0 | 2.2 | 2.2 | 5.0 | 0.019 | 0.003 | 0.015 | 0.006 | 0.252 | 0.008 | 0.126 | 0.012 | 0.427 | 0.002 | 0.045 | 0.809 | 0.010 | 0.000008 | 1.235 | 0.391 | 0.083 | 0.005 | 0.385 |
| 35 | 8.55 | 619 | 112 | 289 | 49 | 96 | 236 | 2173 | 16.1 | 2.2 | 2.2 | 5.2 | 0.020 | 0.003 | 0.015 | 0.006 | 0.262 | 0.008 | 0.131 | 0.012 | 0.427 | 0.002 | 0.047 | 0.806 | 0.010 | 0.000009 | 1.297 | 0.395 | 0.083 | 0.005 | 0.379 |
| 36 | 8.55 | 620 | 112 | 287 | 49 | 97 | 236 | 2170 | 16.4 | 2.2 | 2.2 | 5.3 | 0.020 | 0.003 | 0.015 | 0.006 | 0.271 | 0.008 | 0.135 | 0.012 | 0.427 | 0.002 | 0.049 | 0.806 | 0.010 | 0.000009 | 1.349 | 0.396 | 0.083 | 0.005 | 0.378 |
| 37 | 8.54 | 604 | 135 | 337 | 60 | 114 | 230 | 2326 | 18.8 | 2.3 | 2.5 | 6.3 | 0.024 | 0.004 | 0.015 | 0.006 | 0.325 | 0.009 | 0.161 | 0.013 | 0.426 | 0.002 | 0.058 | 0.808 | 0.013 | 0.000011 | 1.630 | 0.464 | 0.083 | 0.006 | 0.371 |
| 38 | 8.54 | 599 | 148 | 361 | 67 | 123 | 234 | 2402 | 20.4 | 2.4 | 2.9 | 7.0 | 0.027 | 0.004 | 0.015 | 0.006 | 0.361 | 0.009 | 0.179 | 0.013 | 0.426 | 0.002 | 0.065 | 0.813 | 0.014 | 0.000012 | 1.823 | 0.497 | 0.083 | 0.007 | 0.380 |
| 39 | 8.55 | 596 | 162 | 379 | 76 | 132 | 239 | 2478 | 20.4 | 2.4 | 3.3 | 7.9 | 0.030 | 0.004 | 0.015 | 0.006 | 0.409 | 0.008 | 0.202 | 0.013 | 0.426 | 0.002 | 0.074 | 0.818 | 0.016 | 0.000013 | 2.076 | 0.538 | 0.083 | 0.008 | 0.390 |
| 40 | 8.56 | 595 | 172 | 385 | 83 | 137 | 242 | 2517 | 20.4 | 2.4 | 3.7 | 8.7 | 0.033 | 0.005 | 0.015 | 0.006 | 0.446 | 0.008 | 0.221 | 0.012 | 0.426 | 0.002 | 0.081 | 0.822 | 0.017 | 0.000013 | 2.279 | 0.565 | 0.083 | 0.008 | 0.398 |
| 41 | 8.55 | 577 | 217 | 459 | 109 | 169 | 240 | 2794 | 20.4 | 2.6 | 4.8 | 11.6 | 0.043 | 0.006 | 0.015 | 0.006 | 0.587 | 0.009 | 0.290 | 0.013 | 0.426 | 0.002 | 0.106 | 0.829 | 0.022 | 0.000017 | 3.010 | 0.713 | 0.085 | 0.011 | 0.400 |
| 42 | 8.55 | 553 | 303 | 598 | 159 | 228 | 244 | 3320 | 20.3 | 2.8 | 7.2 | 16.8 | 0.062 | 0.008 | 0.014 | 0.006 | 0.853 | 0.010 | 0.421 | 0.015 | 0.425 | 0.002 | 0.154 | 0.846 | 0.032 | 0.000024 | 4.390 | 0.990 | 0.091 | 0.016 | 0.417 |
| 43 | 8.59 | 560 | 306 | 589 | 165 | 230 | 268 | 3297 | 20.5 | 2.8 | 8.0 | 17.4 | 0.064 | 0.009 | 0.014 | 0.006 | 0.883 | 0.009 | 0.435 | 0.012 | 0.426 | 0.002 | 0.160 | 0.866 | 0.033 | 0.000024 | 4.552 | 0.991 | 0.091 | 0.016 | 0.467 |
| 44 | 8.63 | 576 | 275 | 527 | 150 | 207 | 288 | 3068 | 20.6 | 2.7 | 7.7 | 15.5 | 0.058 | 0.008 | 0.015 | 0.006 | 0.793 | 0.007 | 0.391 | 0.011 | 0.428 | 0.002 | 0.144 | 0.883 | 0.030 | 0.000021 | 4.097 | 0.871 | 0.089 | 0.015 | 0.511 |
| 45 | 8.64 | 585 | 260 | 500 | 142 | 197 | 300 | 2963 | 20.7 | 2.7 | 7.6 | 14.6 | 0.054 | 0.008 | 0.015 | 0.006 | 0.746 | 0.006 | 0.368 | 0.010 | 0.429 | 0.002 | 0.137 | 0.895 | 0.028 | 0.000019 | 3.862 | 0.809 | 0.088 | 0.014 | 0.537 |



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## 6.2 Sensitivities

A series of simulations were made to assess the sensitivity of selected water chemistry parameters to key model parameters. The sensitivities examined include the following:

- Rate of lime addition
- Ore processing flow sheet (selective and bulk flowsheets)
- Carbonate equilibria
- Maximum oxidation parameters for the water pumped from the underground mine

The sensitivity results are shown in the following sections. The results are focused on pH, $SO_4$, Cu, and Se because these are primary indicators of the chemistry of tailings water.

### *6.2.1 Effects of Lime Addition on pH*

A primary consideration at the West Plant is the solution pH, which needs to be maintained at slightly alkaline values for mineral processing. The expectation is that lime will be added to counteract any potential effects of the inflow of water pumped from the underground mine and ore moisture that are predicted to be slightly acidic (Hatch, 2015). The anticipated rate of lime addition is from 0.28 to 0.84 kg/ton ore.

Figure 6-6 shows a comparison of the predicted pH of tailings water for a range of potential rates of lime addition. These results are for the Selective Flowsheet option examined in pilot plant testing of ore processing (ALS, 2014). Figure 6-7 shows a comparison for $SO_4$ concentrations. The effects of lime addition are summarized as follows:

- With no lime addition, the pH is predicted to be variable, ranging from 6.8 to 8.1. Sulfate concentrations are highest for this scenario, ranging up 3500 mg/L. These higher $SO_4$ concentrations are due to the shift in the solubility equilibrium of gypsum, resulting from lower Ca concentrations when no lime is added.
- At increasing lime addition rates, the pH is predicted to shift upward to a range from 8.5 to 8.9. Sulfate concentrations are predicted to decrease by a small amount with each incremental increase in lime addition. The decrease in $SO_4$ concentrations are due to the shift in the solubility of gypsum resulting from increased Ca concentrations from the lime.


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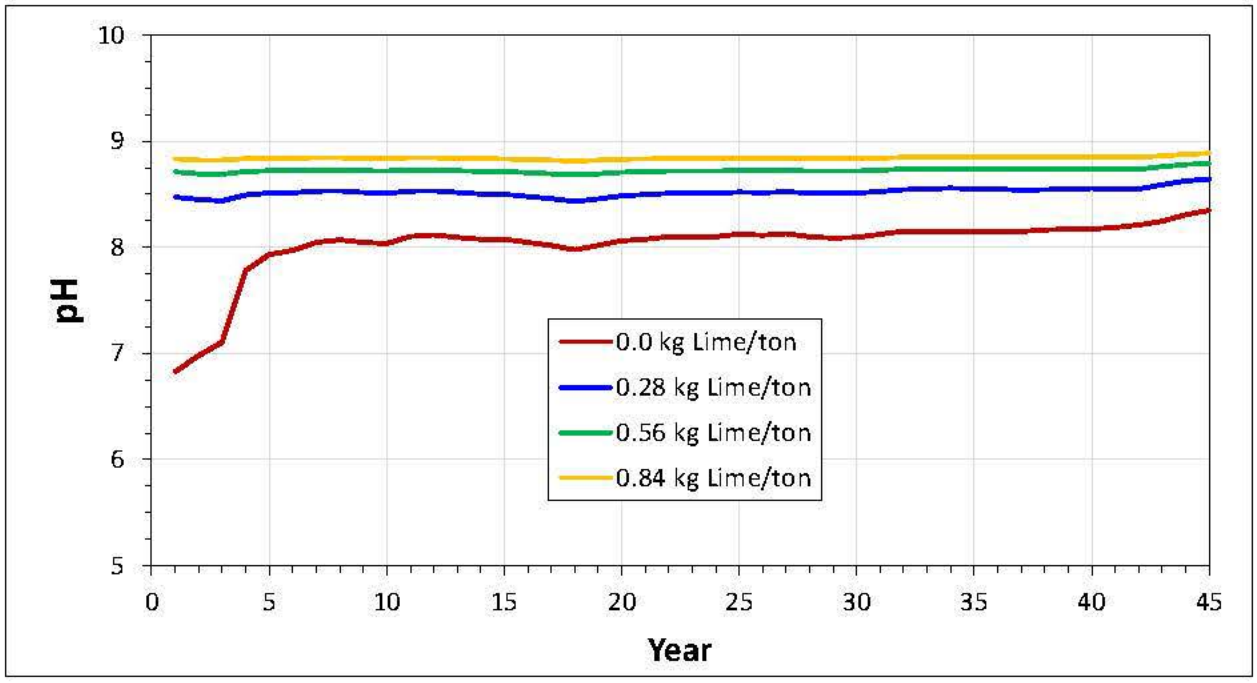


**Figure 6-6. Effects of lime addition rate on the predicted pH (Selective Flowsheet)**

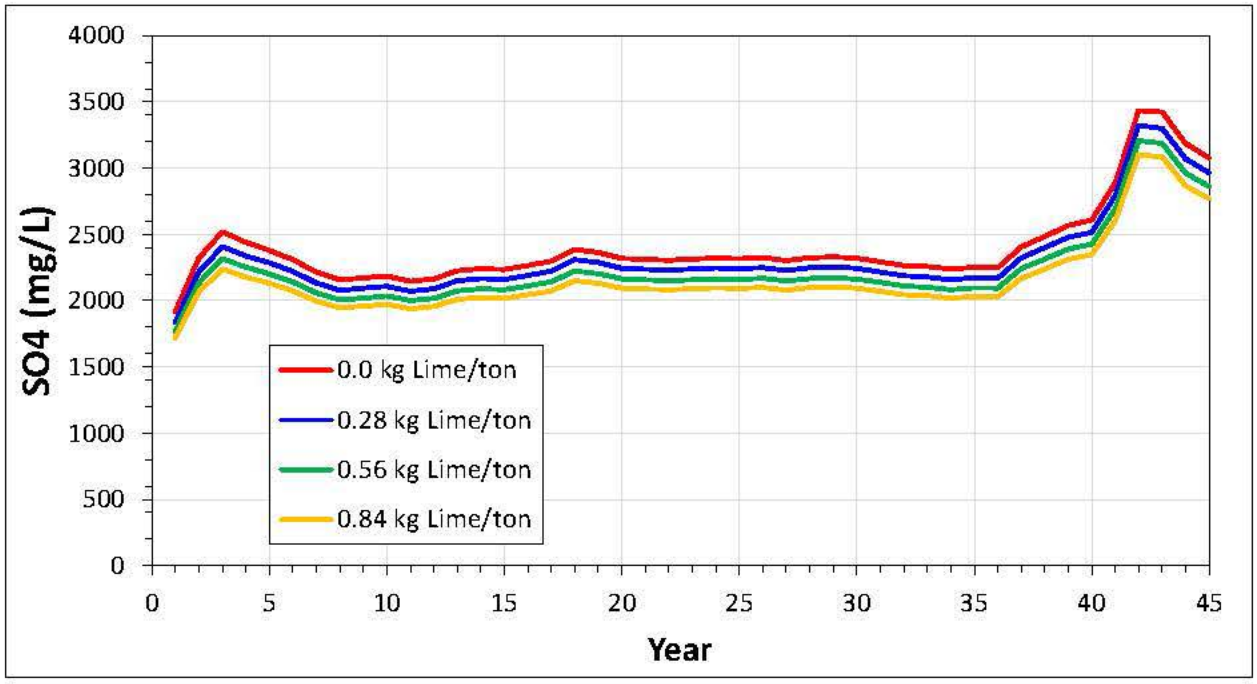


**Figure 6-7. Effects of lime addition rate on the predicted $SO_4$ concentration (Selective Flowsheet)**


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### 6.2.2 *Effects of Ore Processing Flowsheet*

Two difference ore processing systems were assessed in pilot plant testing (ALS, 2014). These systems are referred to as the Selective and Bulk flowsheets. Rates of chemical release during ore processing are different for the two different systems (Table 5-4). The resulting differences in predicted pH and $SO_4$ concentrations in the tailings circuit for the two flowsheets are shown in Figure 6-8 and Figure 6-9. The rate of lime addition for both of these simulations for the two flowsheets was 0.28 kg/ton ore.

The predictions for the Bulk Flowsheet show almost exactly the same pH trend as for the Selective Flowsheet (Figure 6-3). The pH is controlled by the equilibrium established between the lime addition rate and solubility equilibrium with $CO_2(g)$ and secondary mineral solubilities, which are the same for the simulations for both flowsheets.

The results for the Bulk Flowsheet have higher $SO_4$ compared to the Selective flowsheet (Figure 6-9). This result is due to the lower rate of Ca release for the Bulk Flowsheet compared to the Selective flowsheet, which results in higher $SO_4$ concentrations due to solubility control by gypsum.

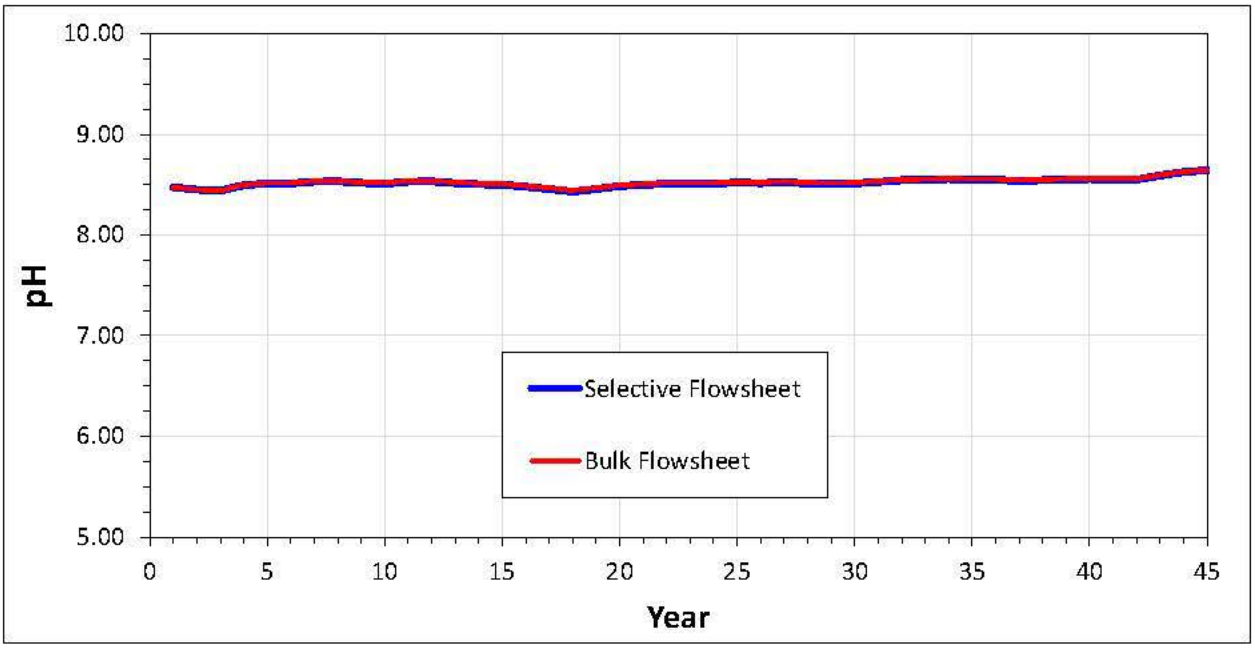


**Figure 6-8. Comparison of the effects of the ore processing system on the pH**


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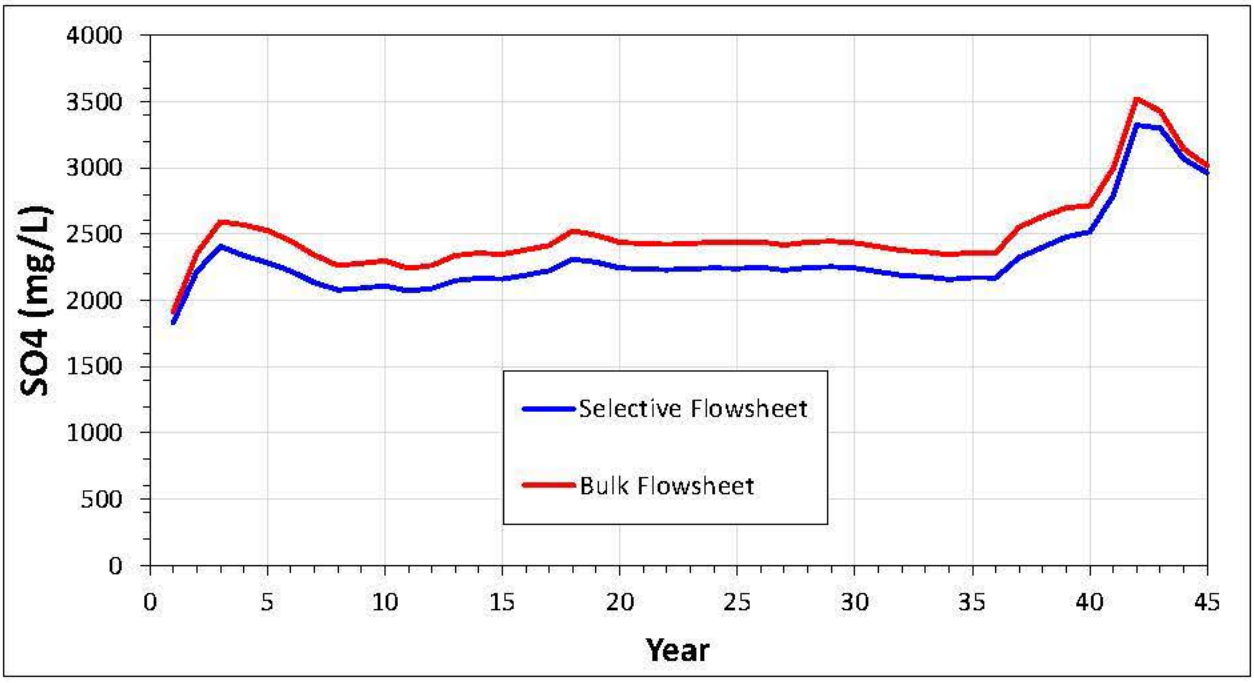


**Figure 6-9. Comparison of the effects of ore processing system on the $SO_4$ concentration**

### 6.2.3 *Carbonate Equilibria*

In the base case model simulations, equilibrium with calcite solubility was not specified based on the assumption that the time needed to reach equilibrium may be longer than the residence time of water in the TSF pond and water distribution circuit. However, it is worth including calcite equilibria in the sensitivity analysis due to its potential impact on pH and $SO_4$. Figure 6-10 and Figure 6-11 show the effects on pH and $SO_4$, respectively, under conditions of with and without equilibrium with calcite solubility. These simulations were made with a $CO_2(g)$ pressure of $10^{-3.2}$ atm and a lime addition rate of 0.28 kg/tonne ore.

The results indicate that the precipitation of calcite would result in decrease in the pH from 8.5 to about 7.6 (Figure 6-10). The effect on $SO_4$ concentration is a small increase due to the shift in gypsum solubility under conditions of lower Ca concentrations imposed by calcite solubility (Figure 6-11).


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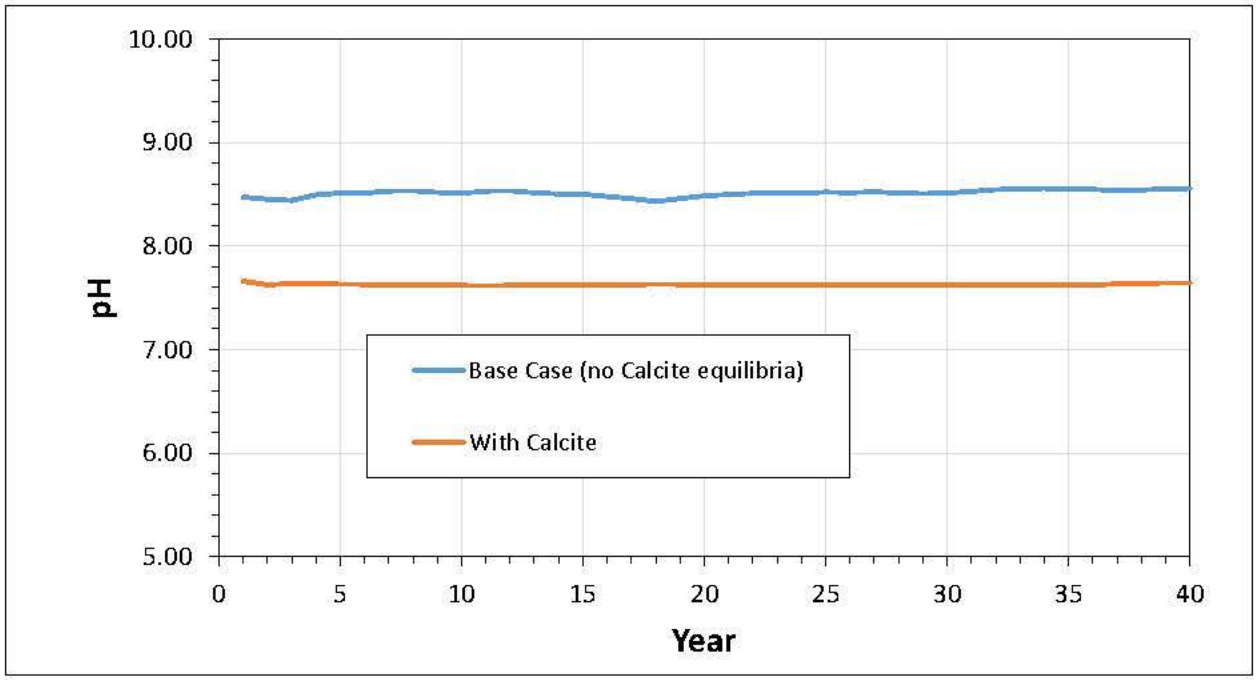


**Figure 6-10. Comparison of the effects of calcite equilibria on the predicted pH**

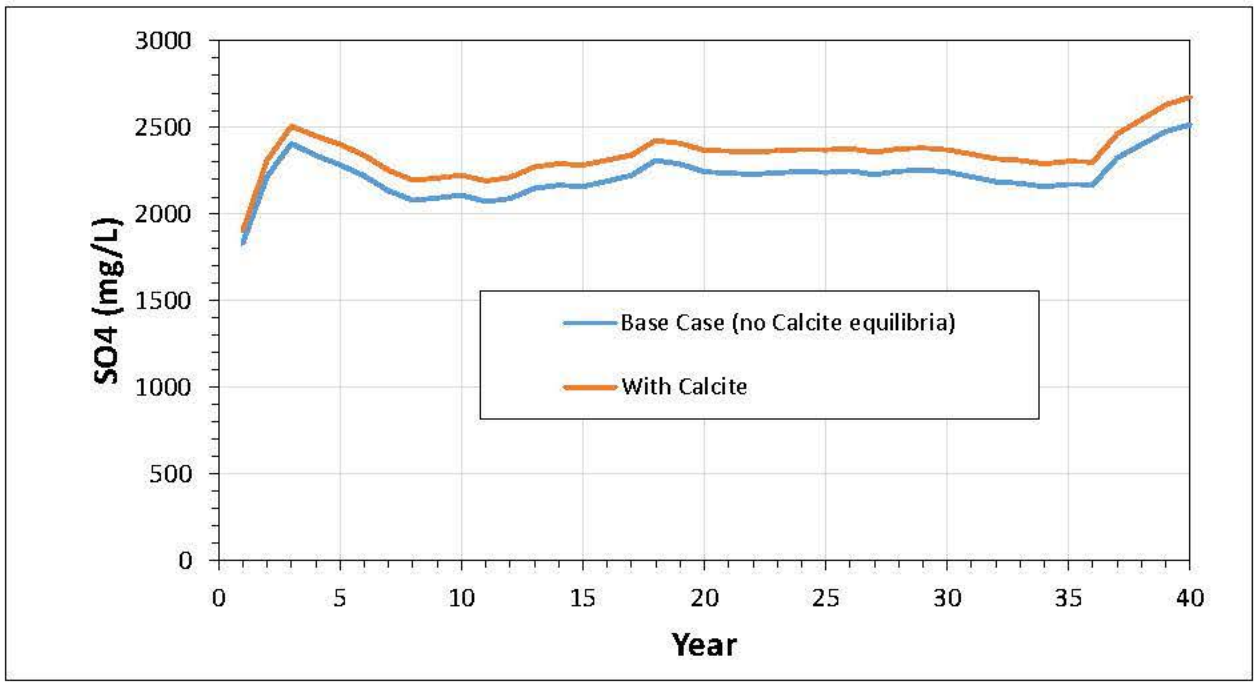


**Figure 6-11. Comparison of the effects of calcite equilibria on the predicted $SO_4$ concentration**


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### 6.2.4 *Maximum Underground Mine Oxidation Parameters*

One of the scenarios in the sensitivity analyses examined for the underground mine water chemistry predictions was a Worst Case that involved setting key model parameters for sulfide oxidation and solution mixing to values expected to produce the poorest water chemistry (Hatch, 2015). Those parameters were:

- Oxidized thickness = 4 m
- Temperature effect factor = 200%
- Deep Groundwater inflow equal to 50% of expected rate
- Apache Leap Tuff (ALT) inflow equal to 200% of the expected rate

For the tailings system, the additional parameters were added to the above list to create two potential Worst Case scenarios for tailings water.

- Lime addition rate = 0 kg/tonne
- Lime addition rate = 0.28 kg/tonne (Base Case)

The results for pH for this Worst Case indicate an overall decrease in pH from about 8.5 for the Base Case to a range of 6.3 to 7.4 for the Worst Case (Figure 6-12). The addition of lime at the expected rate of 0.28 kg/tonne limits the decrease in pH, resulting in a range of 7.5 to 8.4. This increase in pH is important because many metal concentrations are affected by the solubilities of oxide and hydroxide solids that are functions of pH. As a result, the addition of lime mitigates much the potential effects resulting from the underground mine water Worst Case scenario.

Sulfate concentrations for the Worst Case range from 250 to 1500 mg/L higher than the Base Case (Figure 6-13). The addition of lime has a small effect on the predicted $SO_4$ concentrations.

The effects on metal concentrations are exemplified by Cu and Se in Figure 6-14 and Figure 6-15, respectively. Copper concentrations are predicted to be higher for the Worst Case but are substantially reduced under conditions of lime addition due to the higher pH (Figure 6-14). Copper concentrations are controlled by the solubilities of Cu hydroxide, sulfates, and carbonates, whose solubilities are a function of pH, $SO_4$, and $CO_2(g)$. This result indicates that the addition of lime for ore processing has a potential beneficial effect for limiting metal concentrations in tailings water.

Predictions for Se show a different behavior in that Se concentrations are the same with and without lime addition (Figure 6-15). Selenium is not affected by solubility or adsorption under the oxidizing conditions expected for the tailings water; hence, concentrations predicted for lime or no lime are the same. Selenium concentrations for the Worst Case scenario range up 3.6 mg/L compared to a maximum of 1.0 mg/L for the Base Case (Figure 6-15).


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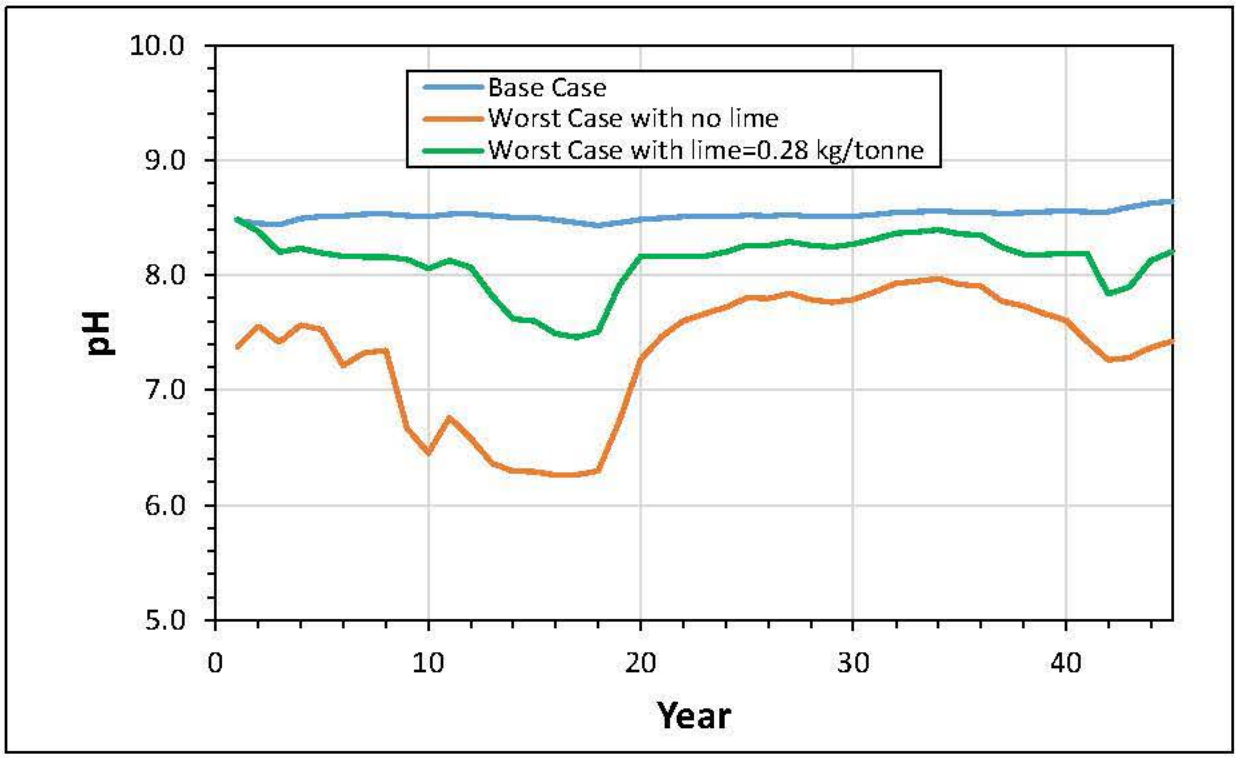


**Figure 6-12. Comparison of Base Case and Worst Case conditions tailings water pH**

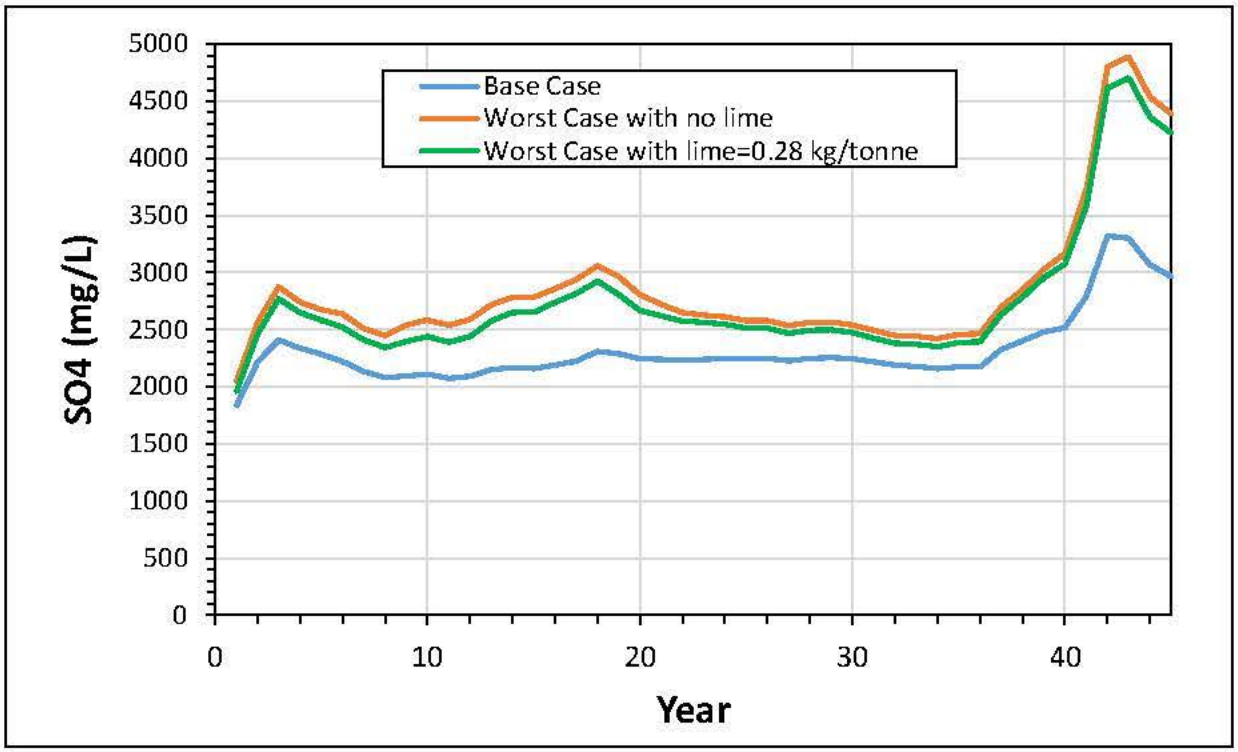


**Figure 6-13. Comparison of Base Case and Worst Case conditions $SO_4$ in tailings water**


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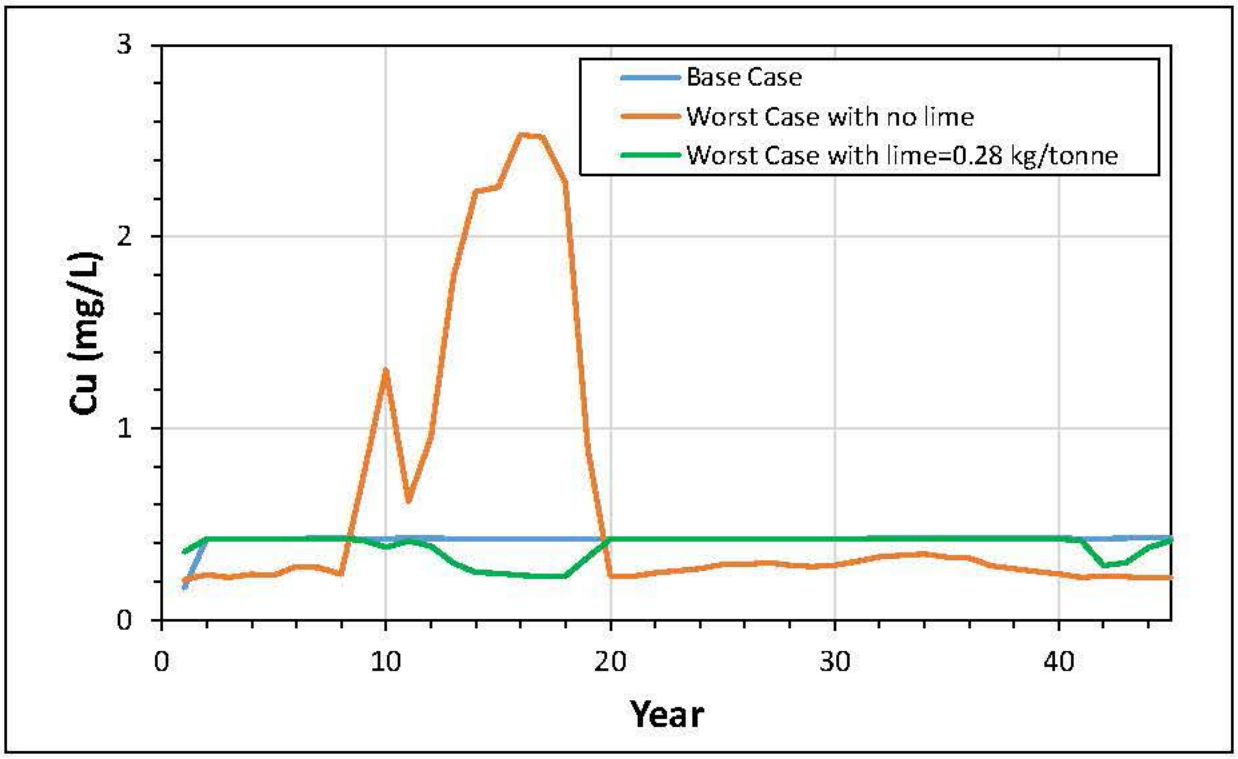


**Figure 6-14. Comparison of Base Case and Worst Case conditions Cu in tailings water**

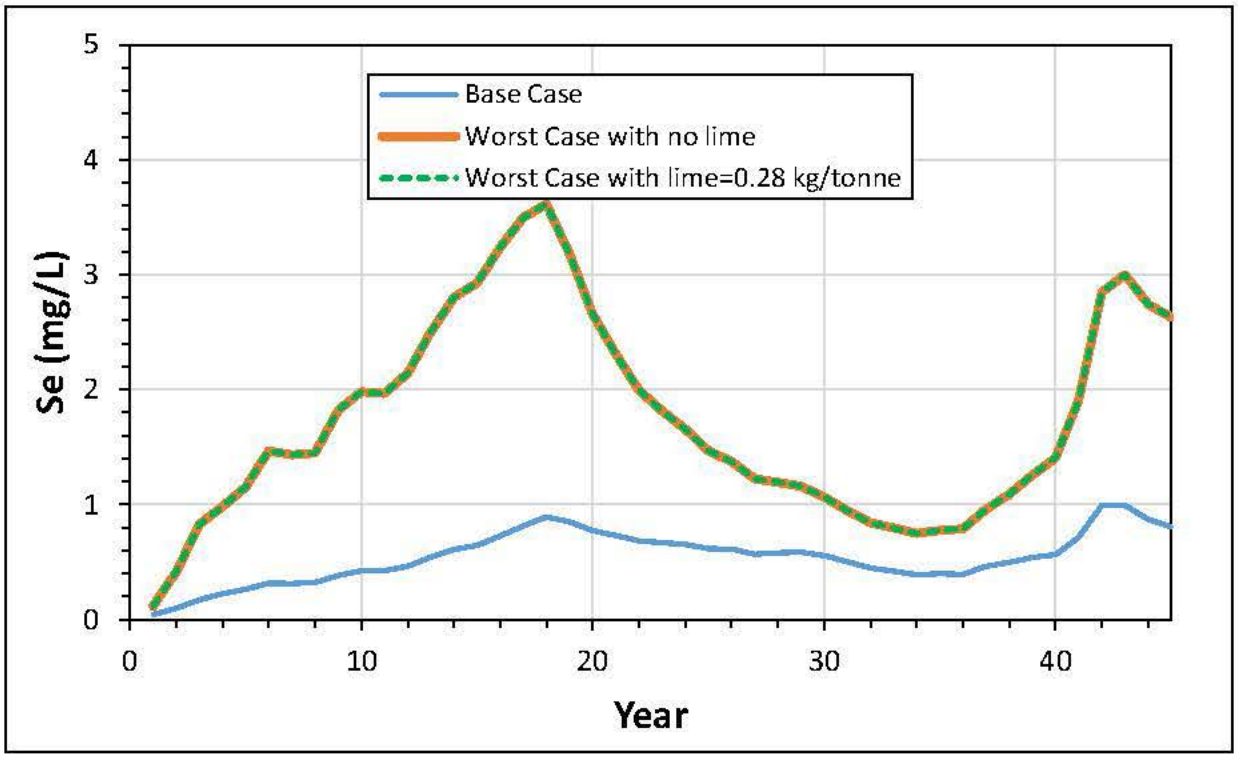


**Figure 6-15. Comparison of Base Case and Worst Case conditions Se in tailings water**


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# 7. Limitations of Water Quality Predictions

The predictions of water chemistry provided in this report are based on information available at the time of development of the input data and modeling approach. While this information is thought to provide a reasonable depiction of geochemical processes and effects on water chemistry, ongoing and future studies will likely result in refinements of many aspects of the project. The key types of data used here that have potential to be changed in the future are:

- Water Balance: Hydrologic modeling studies are ongoing and future models may result in changes to flow rates from the ALT and Deep Groundwater systems to the block cave, which would result in changes to the input chemical balances for the tailings circuit model described in this report.
- Mining Schedule: The schedule and position of the cave panels will likely be changed as information from exploration and development work as well as project economics progress. This may result in changes to the ore production schedule, which would change the rate of input of ore moisture and chemistry of ore moisture, which are inputs the tailings circuit model described in this report.
- Geochemistry: The modeling effort for the Resolution project includes a continuous review process. These reviews may result in improvements in approaches used to represent geochemical processes affecting water chemistry, such that the model described in this report may be refined in the future.
- Closure: The water chemistry predictions made in this report are specific to the period of mining operations and not to post-closure groundwater or TSF seepage chemistry. The results in this report are meant to provide a starting point for making predictions for post-closure water chemistry, but that subject is will be addressed in subsequent studies.


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# APPENDIX R

Overview of Acid Rock Drainage Operational and Post-Closure Water Management Strategies at Resolution Copper Mining for the Protection of Groundwater and Surface Water

Rio Tinto
4700 Daybreak Parkway
South Jordan Utah 84095
USA

Internal memo

| | |
|---|---|
| From | Rich Borden, GM Environment |
| Department | Copper HSE |
| To | Vicky Peacey |
| CC | |
| Date | 5 September, 2014 |

**Overview of Acid Rock Drainage Operational and Post-Closure Water Management Strategies at Resolution Copper Mining for the Protection of Groundwater and Surface Water**

Resolution will implement best practice, proactive acid rock drainage (ARD) management strategies. The goal of these strategies will be to minimize ARD risks during operation and ensure that ARD is avoided after closure. All potentially impacted water will be contained on site during operation and will be put to beneficial use, thereby reducing the need to import makeup water. The ultimate goal of the management strategies is to avoid the creation of any post-closure ARD-related water management liabilities. No potentially acid generating (PAG) development rock, ore and concentrate will be present on site at closure. All PAG rock within the block cave will be deeply buried and ultimately flooded, permanently isolating it from oxygen and controlling ARD in perpetuity. Similarly the PAG portion of the tailings will be encapsulated within a much larger mass of benign tailings, effectively controlling oxygen ingress and ARD generation in perpetuity.

**Development Rock ARD Management**

The block cave mining method will avoid the production of large volumes of waste rock, and less than 20 million tons of development rock will be created during excavation of the underground workings. To the extent practicable non-acid generating, geochemically benign development rock will be segregated from PAG rock and will be used as clean fill, cover material or put to some other beneficial use. During operation PAG development rock will be stored on the intermediate and development rock stockpiles, permitted facilities under ADEQ's Aquifer Protection Permitting (APP) program. Any water which contacts the PAG development rock will be captured and used within the process water circuit. Before closure all PAG development rock will be processed through the concentrator to recover the contained copper and eliminate the need for post-closure management.

**Ore and Concentrate ARD Management**

Ore brought from underground will be delivered directly to a roofed and fully contained ore stockpile before being processed within the concentrator. The stockpile will be isolated from precipitation and so will not pose any ARD risk. All ore will be processed before closure.

Concentrate will be piped from the concentrator to the loadout facility where it will be transported offsite. Concentrate containment tanks with secondary containment will be constructed at the loadout area and along the MARRCO Corridor. These basins will be able to safely accommodate the entire pipeline volume should it ever need to be drained during an upset condition. All concentrate will be shipped offsite before closure.

Stormwater which falls on the East Plant site (mine surface infrastructure), the West Plant site (concentrator) and the loadout facility will be captured and contained on site in lined contact water basins. Any water which could inadvertently contact ore or concentrate will thus be captured and put to beneficial use.

**Block Cave ARD and Post-Closure Water Management**

The overarching strategy for management of potential block cave ARD during the operational period will be the capture and reuse of all water which contacts the caved, mineralized rock mass. At closure the strategy will focus on the exclusion of oxygen from the residual caved mineralized rock mass, controlling the risk of ARD in perpetuity.

**Operation** - During operation the underground workings beneath the block cave will be continuously dewatered and their zone of groundwater capture will include the entire caved rock, fractured rock and continuous subsidence zones. All water contacting the block cave will thus be captured and put to beneficial use within the process water circuit.

Most of the ore and other mineralized host rock is potentially acid generating. Oxidation of ore and other mineralized rock is likely to occur as it moves towards the draw points more than 5000 feet below surface. The oxidation front is only anticipated to extend tens to hundreds of feet into the caved rock overlying the production level. At any given time, less than five percent of the rock within the caved zone is anticipated to be both net acid generating and to be in contact with oxygen. Approximately 1000 gpm of water is predicted to report to the production level workings, most of which must travel through the overlying caved ore. On average, this water is anticipated to be weakly to moderately acidic with elevated sulfate and some elevated metals concentrations. Excess mine water will be pumped to the surface where it will be mixed with the much greater flow of alkaline scavenger tailings slurry exiting the concentrator (at a water:water ratio of >10:1). The excess mine water will be neutralized during the mixing process, raising the pH and causing the precipitation of sulfate and dissolved metals. Neutralization solids (predominately gypsum) will be co-disposed within the much larger mass of

scavenger tailings (at a solids:solids ratio of >1000:1). Additional lime will be added at the mill if needed to ensure the tailings slurry maintains a neutral to alkaline pH.

**Closure** - At closure both the underground ventilation and pumping systems will be turned off. Oxidation and potential ARD generation from the mineralized caved rock above the draw points will end almost immediately. The dewatered rock mass within and surrounding the block cave will also begin to slowly resaturate. Reflooding to near pre-mining groundwater levels is anticipated to take approximately 1000 years and radial flow towards the underground workings and the caved rock zone will persist for centuries, maintaining a hydraulic sink.

ARD risks posed by the residual mineralized rock at the bottom of the block cave will be controlled in perpetuity by its burial beneath 2000 to 5000 feet of geochemically benign rock and by its eventual saturation by reflooding waters. The quality of water which reports to the production level will be closely monitored as closure approaches as it will be indicative of early reflood water quality. Water quality accumulating in the workings may be monitored after closure by sample collection at the bottom of the shafts.
Reflood waters in the upper 2000 to 5000 feet of the caved zone (within the geochemically benign Apache Leap Tuff and Whitetail Conglomerate) are predicted to be of good quality and will not require any special monitoring.

Figure 1 is a conceptual model of the post closure hydrogeologic and geochemical behavior of the block cave which highlights these ARD predictions and controls in more detail.

Figure 1 – Schematic Diagram of Block Cave Behavior at Closure

1 – At closure the caved rock zone will be approximately two kilometers in diameter and a depression approximately 600 to 1000 feet deep will be present at the surface. Approximately 6000 vertical feet of highly fractured and rubblized rock will be present within the caved rock zone. This caved rock will be several orders of magnitude more permeable than the surrounding undisturbed bedrock. Three significant rock types will be present in the caved zone and the immediately adjacent fractured rock zone:

**Mineralized rock** which hosts the ore body but which has copper concentrations below cutoff grades will be present at the bottom of the caved rock zone immediately above the inactive draw points at the production level. This mineralized rock may vary from roughly 600 to 3000 feet thick. Rock in this zone is pyrite-bearing and has elevated metals concentrations due to naturally occurring copper mineralization. It is typically potentially acid generating and could produce ARD if exposed to oxygen. However, only the lowermost tens to a few hundred feet are anticipated to be exposed to oxygen during operation. Undisturbed bedrock beneath the Whitetail Conglomerate is an aquitard with low permeability and is also constrained by numerous faults which act as groundwater flow barriers.

**Whitetail Conglomerate** which overlies the mineralized rock will vary in thickness from about 1000 to 4000 feet within the caved rock zone. The conglomerate was deposited after the formation of the ore body and is geochemically benign. It contains minimal sulfide minerals and abundant neutralization potential (typically >10% calcium carbonate). Undisturbed Whitetail bedrock is an aquitard with very low permeability and effectively isolates the upper Apache Leap aquifer from the underlying deep bedrock. Within the caved rock zone the conglomerate will have higher secondary permeability but will likely still inhibit vertical flow compared to the units above and below it.
**Apache Leap Tuff** which overlies the Whitetail Conglomerate will vary from roughly 1000 to almost 2000 feet within the caved rock zone. It is also geochemically benign with minimal sulfide minerals and minor neutralization potential.

2 – The mineralized rock mass is isolated from direct oxygen migration from the surface by between 2000 and 6000 feet of overlying benign rock. Its primary oxygen exposure pathway during operation is via the underlying draw points and forced air ventilation system at the production level. At closure all ventilation will be discontinued to the underground workings. The production level and the overlying mineralized rock will rapidly become anoxic. Oxidation reactions and ARD generation (if any) within the caved, mineralized rock mass will become negligible. Once access to the shafts is no longer needed, all shaft collars and subcollars will be permanently sealed preventing any subsequent oxygen ingress.

3 – Water will enter the immediate area of the caved rock zone via direct precipitation (3a), lateral inflow from the Apache Leap aquifer (3b) and lateral, yet limited, inflow from the deep bedrock (3c) [arrows sized based on relative flow contributions]. The immediate area of the block cave will become a groundwater recharge zone compared to the surrounding undisturbed landscape because there will be no runoff from the surface depression and because the Apache Leap Tuff will be highly fractured and very permeable. Surface water diversion strategies to minimize runoff into the depression are being explored and will be refined through NEPA. The impermeable Whitetail Conglomerate will not contribute significant seepage to the block cave as it refloods. However, water which enters the caved rock zone via precipitation or lateral inflow from the Apache Leap will need to flow downward through thousands of feet of conglomerate before reaching the base of the caved zone (3d). Based on short and long term laboratory leaching tests, the conglomerate will release significant alkalinity to the infiltrating water and deliver it to the mineralized rock zone and the recovering water table.

4a – Within several years of closure, the underground workings and the mineralized rock immediately above the inactive draw points will be reflooded. Any residual oxidation that may persist after the ventilation system is turned off will effectively end as the flooding front advances upward. The mineralized rock near the draw points which is most likely to have been oxidized and potentially acidified during operation will be the first material in the caved rock zone to be reflooded. Early reflood water quality will largely be controlled by the interaction of good quality, alkaline water from above with the partially oxidized mineralized rock. The first flush of water which accumulates in the underground workings will release any

residual sulfide oxidation products into solution. The first water which accumulates at the production level is thus likely to have the poorest quality within the caved zone. Subsequent reflood waters which accumulate above this in the mineralized rock zone will have progressively better water quality as saturation progresses upward.

4b – As flooding continues over decades to centuries the saturated zone will eventually reach the bottom of the caved Whitetail Conglomerate. Radial groundwater flow towards the block cave will likely still persist at this time. Water quality within the conglomerate is predicted to be good because 1) the cave will largely fill from the top down, so water within the conglomerate will not contact the underlying mineralized rock, 2) more saline waters that may be in contact with the mineralized rock will be more dense and so stratified conditions are likely to be established within the caved zone 3) the high calcium carbonate content of the conglomerate will create a geochemical barrier to the vertical migration of any lower pH water from depth and 4) the undisturbed Whitetail Conglomerate around the margins of the block cave will act as a low permeability aquitard limiting upward migration around the cave.

4c – After roughly 1000 years water levels will recover to near their pre-mining levels. A shallow pit lake may or may not form in the block cave depression depending on the depth of subsidence experienced at the surface. Flow-through conditions are likely to be established in the shallow Apache Leap aquifer system. This upper active groundwater flow system will remain isolated from the pore water in the deep caved mineralized rock by the Whitetail conglomerate.

**Tailings ARD and Post-Closure Water Management**

The overarching management strategy to proactively control acid rock drainage risks at the tailings impoundment will be the segregation and special handling of PAG cleaner and non-acid forming scavenger tailings. Runoff and seepage water which contacts the tailings during the operational period will also be captured and returned to beneficial use in the process circuit. Active water management will continue after closure until rehabilitation and drain down of the impoundment is largely completed, infiltration is minimized such that evaporation exceeds toe seepage, and it can be demonstrated that runoff water and residual seepage does not pose any environmental risks.

Pyrite and other gangue sulfide minerals will preferentially report to the cleaner tailings during the concentrating process. Scavenger tailings, which will make up about 85% of the tailings mass, will pose a very low geochemical risk because they will contain almost no pyrite (generally less than 0.1% sulfide sulfur) and very low residual metals concentrations. This benign material will be used to construct the tailings embankment and to encapsulate the much smaller mass of chemically reactive cleaner tailings.

More than 90% of the sulfides and the great majority of metals contained within the tailings will thus be concentrated in about 15% of the tailings mass. This

relatively small volume of cleaner tailings will be preferentially placed within the interior of the tailings impoundment where it can be kept saturated and isolated from oxygen during operation. At closure the majority of cleaner tailings will be permanently protected from contact with oxygen by the surrounding scavenger tailings. Approximately ten percent of the impoundment footprint will have cleaner tailings present near the final tailings surface. This relatively small surface will be buried beneath a layer of scavenger tailings either mechanically or hydraulically placed and a robust cover that is designed to limit water and oxygen ingress.

Process water co-disposed with the tailings and stored within the tailings pore spaces will be maintained at a circum-neutral to alkaline pH. The proactive prevention of ARD within the tailings will ensure that tailings seepage and runoff waters will maintain a neutral pH and low dissolved metals concentrations in compliance with aquifer water quality standards at points of compliance throughout operations and closure..

**Operation**

Figure 2 is a conceptual model which illustrates the ARD management strategy during operation in more detail.

1 – A reclaim pond will be maintained in the central interior of the tailings impoundment throughout its operational life. The pond will be maintained at the design depth and surface area by the balancing of precipitation, evaporation and returned seepage water, with the ongoing discharge of tailings slurry into the impoundment and the pumping of reclaim water to the concentrator for reuse. In the first few years of operation the cleaner tailings will be stored behind a separate starter dam (1a) in the center of the ultimate full impoundment footprint. However by year 10 the much larger scavenger tailings impoundment will merge with and cover the cleaner starter dam facility. Cleaner tailings will then be discharged directly into the reclaim pond. This will ensure they are saturated from the moment of placement and effectively isolated from contact with oxygen throughout the operational period. If any short term beaches of cleaner tailings are unintentionally exposed on the margins of the pond, the risks of ARD formation are still very low because the cleaner tailings have been demonstrated by humidity cell testing to have a three month lag period before the onset of acidic conditions. Given that the tailings impoundment is being continuously filled, any cleaner tailings beaches will be continuously covered by new tailings with low permeability, within the lag period.

2 – Ongoing deposition of cleaner tailings within the central interior of the impoundment will encapsulate the geochemically reactive tailings within a much larger mass of scavenger tailings. The scavenger tailings will be discharged from the margins of the impoundment and very fine-grained, low permeability and inert slimes will preferentially flow to the decant pond area. These fine grained scavenger tailings will intermix with, cover and surround the cleaner tailings. The entire cleaner interior tailings mass will remain saturated through operation with the decant pond over the top.

3 – On the margins of the impoundment the embankment (above small starter dams composed of local borrow material) will be constructed with more coarse scavenger tailings sands. These sands will have a higher permeability and will remain unsaturated throughout operation and closure. However, they will pose minimal ARD or other geochemical risks because the scavenger tailings by design will have very low sulfide and metals contents.

4 – As the tailings consolidate seepage water will preferentially flow laterally towards the impoundment margins via the higher permeability scavenger tailings sands, underlying drainage blankets (if needed beneath embankments to maintain unsaturated conditions) and in the thin, shallow alluvial deposits located in the drainage lines at the bedrock/tailings contact (arrows sized based on relative flow contribution).

5 - Eleven seepage and runoff collection ponds will be constructed in drainages surrounding the tailings storage facility. These ponds will capture runoff from the tailings embankment and seepage from the impoundment interior (#4 on diagram). The seepage collection dams will be cored with low permeability materials and will be excavated through shallow alluvial deposits and weathered bedrock so that they can be keyed into competent and lower permeability bedrock. All six seepage collection dams between the tailings impoundment, Queen Creek and Potts Canyon are underlain by the low permeability Gila Conglomerate or Pinal Schist aquitards. The five collection dams above Roblas Canyon are underlain by both the Pinal Schist aquitard and some younger Precambrian rocks. If needed grout curtains will also be installed below the collection dams to minimize potential underflow via the bedrock flow pathway. Up to approximately 800 gpm of seepage and runoff may ultimately report to these collection systems on average during operations. This water will be returned to the process water circuit for beneficial reuse.

6 – A much smaller volume of seepage water will enter the bedrock beneath the tailings impoundment footprint. Deep seepage rates are anticipated to be very low because roughly 80% of the impoundment footprint is underlain by the very low permeability Gila Conglomerate and Pinal Schist aquitards. Because of the proactive ARD and seepage collection and management strategies employed at the tailings impoundment, any seepage to bedrock is predicted to have a neutral pH and low metals concentrations.

**Closure**

At closure tailings will no longer be discharged into the impoundment and it is anticipated that the tailings mass will begin to drain down and dry out immediately. This drain down will be accelerated by the dry climate of the area, the maintenance of upstream diversion channels and the discharge of good quality surface water runoff from the facility. After revegetation has been completed, any impoundment surfaces with exposed scavenger tailings are anticipated to produce runoff with acceptable quality for direct discharge to the environment. Similarly, once the cleaner tailings exposures are capped and vegetated, runoff should also be suitable for direct discharge. Seepage will continue to be collected at the toe of

the embankment and actively managed through the initial drain down period. However it is anticipated that toe seepage will dry up at many of the collection ponds as the phreatic surface within the tailings mass declines. Seepage is predicted to maintain a circum-neutral pH throughout the post-closure period because of the pro-active ARD management controls implemented during operation and because of the capping of the small area of exposed cleaner tailings at closure. Seepage water of suitable quality may be discharged directly to the surrounding environment. If seepage water quality will not allow direct discharge, then the water may either be returned to the interior of the tailings impoundment, polished for discharge or put to some beneficial use. The final method for management of post-closure seepage water will be refined as operational data is collected and as additional studies are completed through NEPA.

Figure 3 is a conceptual model which illustrates the post-closure ARD and water management strategy in more detail.

1 – The entire tailings surface will be revegetated at closure. This will enhance evapotranspiration rates and reduce net infiltration. The tailings embankment will be progressively reclaimed during operation; while the interior surface will be reclaimed as final surfaces are created towards the end of mine life. Scavenger tailings may be directly planted or may be revegetated after addition of soil amendments and/or placement of a thin cover layer to control wind and water erosion and to support revegetation. Approximately ten percent of the tailings surface will have exposed cleaner tailings and will be capped with a much thicker cover system before being revegetated. This cover may be constructed of scavenger tailings and/or imported growth media. The primary purposes of the cleaner tailings cover will be a) to preserve runoff water quality; b) to support a self-sustaining diverse vegetation community; c) to control wind and water erosion and d) to significantly reduce infiltration and/or oxygen ingress into the underlying cleaner tailings. Annual evaporation in the area is approximately three times annual precipitation so a store and release cover system will be used to restrict infiltration over the cleaner tailings. Final cover designs will be studied and optimized during NEPA and the operational period.

2 – Internal runoff water which flows towards the old decant pond area may be removed from the impoundment interior to further reduce infiltration. After capping and revegetation, this water is anticipated to be suitable for direct discharge to the environment. Final surface water runoff management designs will be studied and optimized during NEPA and the operational period.

3 – Runoff water from the exterior surface of the tailings embankment is anticipated to be suitable for direct discharge to the environment after closure. This water will be directed into the surrounding ephemeral drainages. Seepage water flows reporting to the eleven collection ponds are expected to decline rapidly after closure and many of the ponds are anticipated to dry up completely. Ponds which continue to receive toe seepage will be actively managed after closure. Seepage water of suitable quality may be discharged directly to the surrounding environment. If seepage water quality will not allow direct discharge, then the water may either be returned to the interior of the tailings impoundment, polished

for discharge or put to some beneficial use. The final method for management of post-closure seepage water will be refined as operational data is collected and as additional impact assessment studies are completed through NEPA.

4 – As draindown progresses the water table within the tailings interior will decline. Some mixed cleaner/scavenger tailings will be present in the vadose zone above the water table. However, much of this vadose zone tailings mass is anticipated to maintain pore water saturation above 85%, effectively controlling oxygen ingress in perpetuity. More shallow, unsaturated cleaner tailings will be protected from water and/or oxygen ingress by the overlying cover.

5 – Even after draindown is completed and a steady state condition has been reached the water table will remain mounded in the fine-grained cleaner tailings and scavenger tailings slimes in the center of the impoundment interior. Cleaner tailings below the water table will be isolated from oxygen in perpetuity. However, neutralizing potential within the saturated tailings mass below the water table will be available should any acidic seepage be generated in the overlying vadose zone.

6 – As draindown progresses and the height of the water table declines in the tailings mass, the small flux of water into the underlying bedrock will also decline. Deep seepage rates are anticipated to be very low because roughly 80% of the impoundment footprint is underlain by the very low permeability Gila Conglomerate and Pinal Schist aquitards. Because of the proactive ARD management strategies employed at the tailings impoundment, any seepage to bedrock is predicted to have a neutral pH and low metals concentrations. However, even if ARD were to form in the overlying cleaner tailings, any acid water entering the bedrock would be effectively neutralized by the abundant calcium carbonate in the Gila Conglomerate, which underlies the cleaner tailings footprint.

Figure 1

Schematic Diagram of Block Cave Behavior at Closure

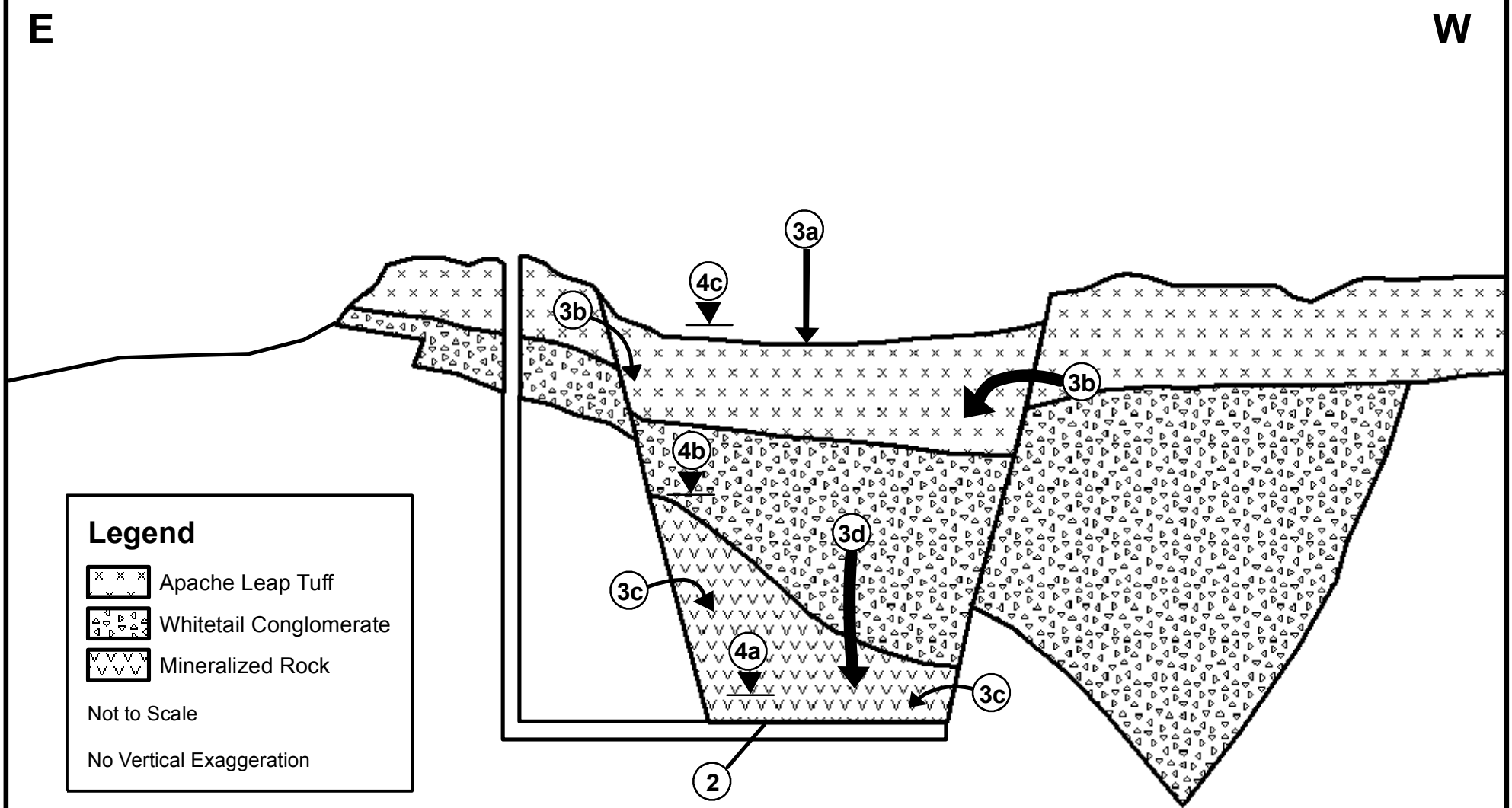


Figure 2 Schematic Diagram of Tailings Impoundment ARD and Water Management During Operations

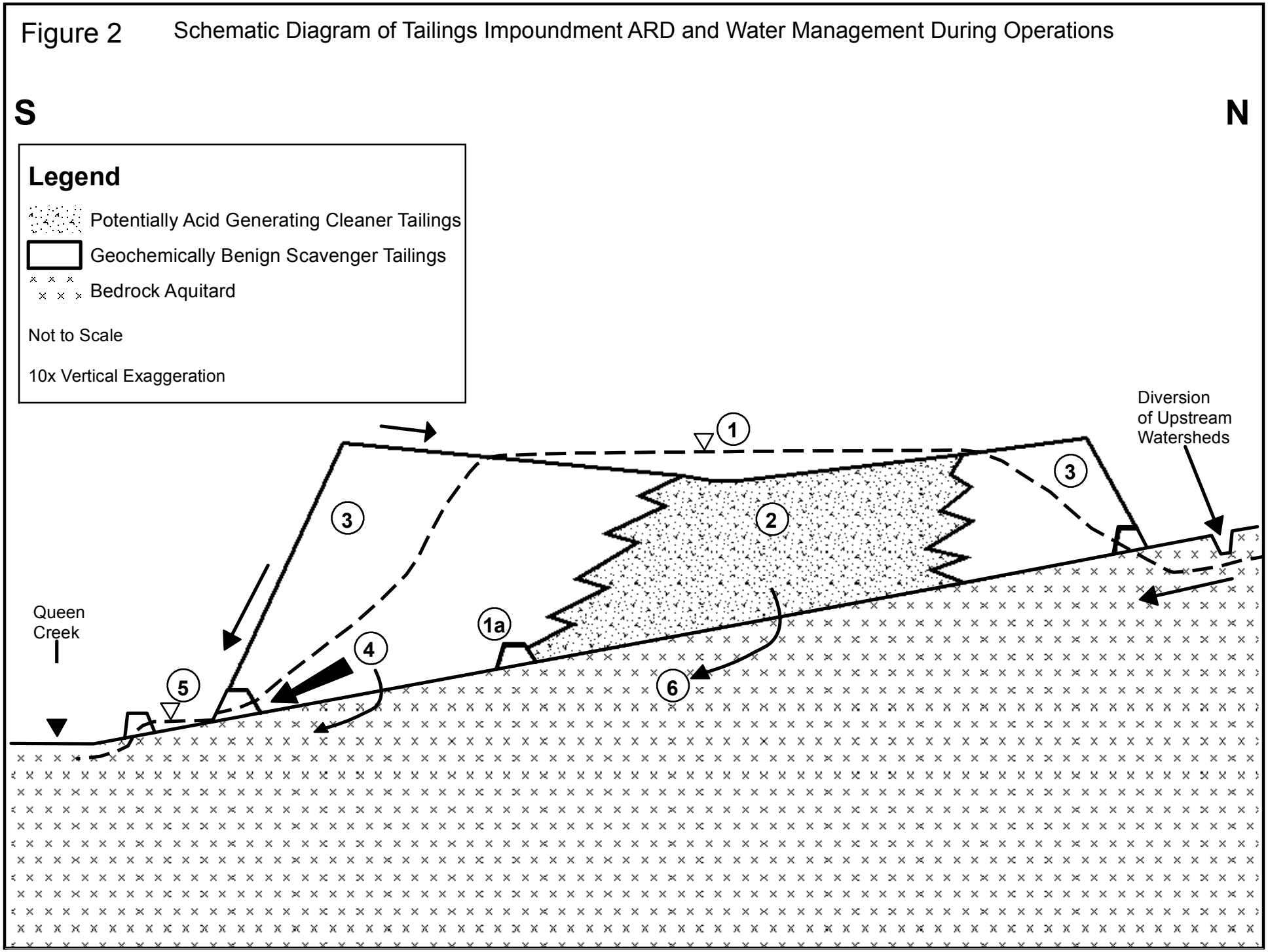
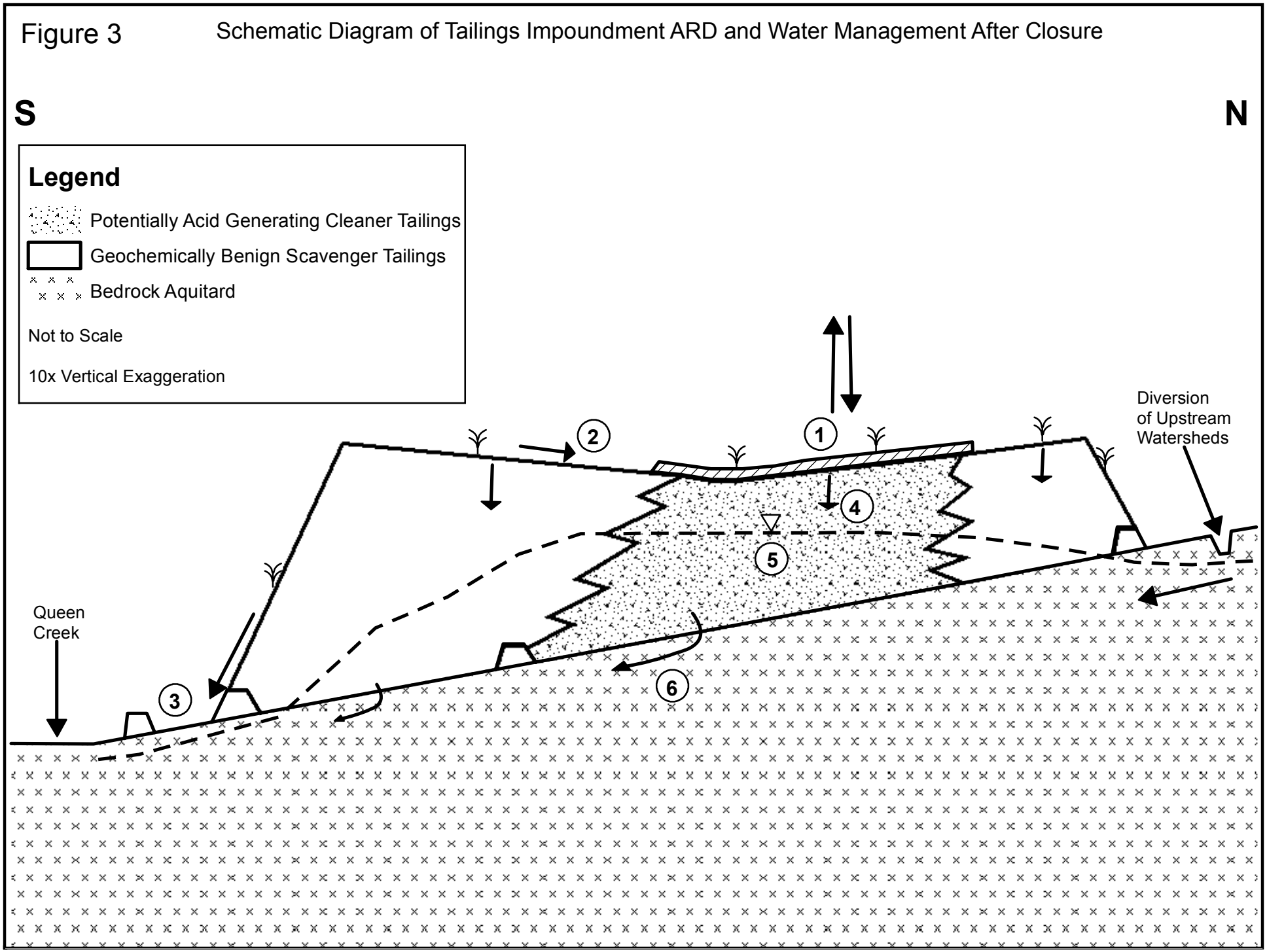


Figure 3 Schematic Diagram of Tailings Impoundment ARD and Water Management After Closure



# APPENDIX S

Resolution Copper's Health, Safety,
and Environment (HSE) Performance Standards

**Standards**

# HSE performance standards - HEALTH

## December 2008

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# B1 - Particulate and gas/vapour exposures

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It applies to dust, fibres, mist and fume (ie particulates), and gas and vapour exposures in the workplace, with emphasis on inhalation as the prime route of exposure. It covers particulate and gas/vapour hazard evaluation, control programme design and control programme evaluation (medical surveillance), to ensure that employees and contractors will not suffer adverse health effects from particulates or gas/vapours, either used or generated by the Business.

## 2 Programme design

2.1 Deleted.

2.2 Designated areas will be created where:

a) it is likely that the 95 per cent upper confidence limit of an SEG's mean exposure concentration for agents resulting in chronic effects, such as total inhalable dust, respirable dust,

respirable crystalline silica, PAH, fluorides, lead, mercury, asbestos or non-asbestos fibrous materials, exceeds the relevant OEL; or

b) agents with an acute effect, such as particulate hazards, or gases (eg CO, SO2, NH3, HF, etc), or vapours exceed 50 per cent of the relevant OEL.

2.3 Designated areas must:

a) be identified and mapped, signposted or otherwise clearly communicated to employees working in the area. Signposting, where necessary, must use appropriate wording or symbols on signs to identify the hazard;

b) have a documented respiratory protection programme based on suitable risk assessment and standards, which is applied to employees, contractors and visitors;

c) have regular monitoring of SEGs working in the area; and

d) have a formal review of the practicality of engineering controls at least every two years, or less where it is a critical control for a significant risk.

2.4 Particulate and gas/vapour monitoring must be appropriate to the exposure conditions and toxicants, and based on the use of equipment approved by local regulatory authorities, as per documented methods.

2.5 There must be a special consideration given to the sampling of hot/volatile/ pressurised toxic process streams where they occur.

2.6 For known human carcinogens, mutagenic and reproductive toxicants, exposure data must be statistically valid on an annual basis. Time-weighted average (TWA) measurements over several shifts, and consistent with the work-day period, must be used. If three or more years of statistically significant data are less than 25 per cent of the OEL, or below the detection limit, then monitoring periodicity can go out to once every three years, provided the process or work organisation (including maintenance) remains unchanged.

2.7 For progressive chronic conditions with a known cause (requiring long-term exposure for an effect to manifest) and suspected carcinogens, mutagenic and reproductive toxicants, exposure data must be statistically valid on an annual basis. TWA measurements over several shifts, and consistent with the work-day period, must be used. If three or more years statistically significant data are less than 50 per cent of the OEL, then monitoring periodicity can go out to once every three years, provided the process or work organisation (including maintenance) remains unchanged.

2.8 Where risk assessment indicates the possible presence of levels of gas or vapour sufficient to cause health effects in less than one shift (eg confined space entry), continuous monitoring is required as long as the potential for harm exists.

# 3 Medical surveillance

3.1 Employees and Category 1 contractors must be covered by a medical surveillance programme when:

a) their SEG TWA mean exposure to respirable crystalline silica, total inhalable dust, respirable dust, lead or asbestos is greater than 50 per cent of the relevant OEL; or

b) the medical adviser considers that it is advisable; or

c) there is a legal requirement for medical monitoring.

3.2 Where risk assessment indicates a risk of a respiratory condition, assessment programmes must include chest x-rays and/or lung function tests. The test or tests chosen must enable the earliest detection of adverse effects from the exposure of concern. Where indicated, they must meet the following standards:

a) high quality chest x-rays will be taken every five years, unless local legislation requires these to be more frequent;

b) all chest x-rays for pneumoconiosis surveillance will be read to ILO standards by an ILO B reader, wherever possible, and if not, by a competent radiologist using verifiable quality criteria;

c) any progression of more than one step on the ILO extended scheme to a reading above 1/0 will be reviewed by a physician;

d) any reading suggesting active lung disease will be reviewed by a physician; and

e) all spirometry will be performed by trained staff following the American Thoracic Society guidelines or equivalent and be offered at a frequency determined by the likely rate of detectable change in lung function.

3.3 All lead monitoring programmes must meet the following standards:

a) all testing will be of venous blood according to local standards;

b) only laboratories using an active quality assurance or quality control scheme will be used for testing;

c) females of reproductive capacity with a whole-blood lead above 20µg/dL will be removed from exposure until the physician declares the worker fit for duty, and exposure to lead should cease when pregnancy is notified to the Company; and

d) all other workers with a whole-blood lead above 40µg/dL will be removed from exposure until the level has fallen below 30 µg/dL, and until the physician declares the worker fit for duty.

3.4 All monitoring programmes for other substances must be documented.

# 4 Exposure controls

4.1 Deleted.

4.2 Deleted.

4.3 Deleted.

4.4 Controls must be of an adequate standard such that surfaces are adequately cleaned to avoid:

a) dust generation due to material dislodgment (eg wind blown), where practicable; and

b) fume generation from accumulated dust during welding/heating or cutting operations.

4.5 Where risk assessment indicates the need to reduce exposures to toxic substances for employees or their families, good personal hygiene must be enforced. The programme must include:

a) no smoking, eating or drinking in designated hazard areas. Cigarette smoking must also be prohibited in all indoor areas and wherever people are likely to be exposed to second-hand smoke;

b) washing of hands and face prior to drinking, eating or smoking;

c) showering at work post shift or after exposure to 'dirty' conditions; and

d) laundering of contaminated clothing by the operation.

4.6 Abrasive blast cleaning must be conducted so as to protect worker health and minimise dust emissions. Substitutes must be used whenever practicable for abrasives containing crystalline silica. However, if such abrasives are used, workers must be aware of the hazards and exposure monitoring conducted. The hazardous properties of alternative materials must be considered before use.

4.7 Fixed station monitors and alarms must be installed where appropriate to warn against accidental or periodic releases of toxic gases/vapours (eg HCN, CO, Cl2, SO2). Such monitors must only be installed after training all affected personnel on the capabilities and limitations of the monitors.

4.8 All fixed station monitors/alarms must be identified, listed and included in a periodic schedule of preventive maintenance and testing, including calibration of detectors. Periodic drills with regard to response to sounding of the alarm must be conducted. Periodicity should be based on level of risk.

4.9 Where required, training in the recognition of signs and symptoms of hazardous particulate and gas/vapour exposure,

emergency procedures and preventative measures must be provided.

# 5 Respiratory protection devices

5.1 Respiratory protection devices (RPDs) must be selected with regard to:

a) the potential particulate size distribution, gas/vapour types, substance toxicity and likely concentrations;

b) compatibility with the work tasks and other PPE; and

c) comfort (as it affects wear-time) and allowance for adequate communication.

Only operation-approved RPDs will be used. The operation must ensure that suitable facilities are available for cleaning and sanitary storage of RPDs, where applicable.

5.2 Half-mask and full-face air-purifying respirators must not be used where:

a) the atmosphere is oxygen deficient (< 19.5 per cent);

b) the atmosphere is immediately dangerous to life or health (eg. in areas where CO concentrations are > 1,500 ppm, HF > 30 ppm or NH4 > 300 ppm);

c) gases and vapours are more than ten times their OEL or greater than 1000 ppm for half-mask respirators, or more than 100 times their OEL for full-face respirators; or

d) particulates are more than five times their OEL for half-mask respirators, or more than 50 times their OEL for full-face respirators.

5.3 For atmospheres that are oxygen deficient, or contain unknown hazards, or have concentrations of gases and vapours that are unknown, or could potentially exceed immediately dangerous to life or health (IDLH) values, an air-supplied type respirator must be worn.

5.4 For effective use of negative pressure RPDs (including disposable RPDs), fit testing must be qualitative and documented as a minimum, although quantitative fit testing is preferred. Fit testing must be performed by a competent person when RPDs are first issued and must be repeated periodically according to legal requirements or at a minimum every two years. There must be a policy requiring a clean shaven face when using a negative or neutral pressure RPD for routine tasks, or the use of a positive pressure RPD will be required. A pulmonary function test and medical evaluation may be required to determine whether or not an individual is medically fit to wear a respirator.

5.5 For air-supplied RPDs, breathing air must be effectively filtered and/or isolated from plant and instrument air, and isolated from

sources of potential contaminants. The quality of the breathing air must be checked for conformance with national standards.

5.6 The respiratory protection programme must include:

a) periodic inspection of RPDs, including before each use;

b) periodic evaluation of cleaning, sanitising, maintenance and storage practices by competent persons;

c) performance of positive and negative fit checks before each use by RPD wearers to ensure that the respirator is functioning properly; and

d) training at first issue of a RPD and regular refresher training there after provided according to regulatory requirements or at least once every two years.

# 6 Asbestos and non-asbestos fibrous silicates

6.1 This section applies to asbestos and bio-persistent non-asbestos fibrous silicates that may display asbestos-like toxicity, related to fibre diameter and length. Local regulations must be followed at a minimum. In any case the following requirements must be met:

a) a management programme compliant with all relevant requirements of the HSEQ management system or the Health A standards, and other sections of this standard, must be in place and actively pursued;

b) no new products containing these materials should be purchased;

c) installed materials of this type must be identified and assessed annually for current safety. Where 'safe in place', it should not be removed, unless there is an opportunity for removal during renovation or construction of buildings or equipment;

d) work areas must be separated by ropes or barriers and signposted to restrict entry; and

e) contaminated material must be placed in appropriate marked plastic disposal bags or covered containers promptly for disposal to an approved landfill.

6.2 All workers exposed to these materials must be on a register. "Exposed" means working on or near such material that has been disturbed, abraded or cut. The register must contain details of their annual medical examination and the results of occupational hygiene monitoring.

6.3 Contractor bid specifications must be reviewed and an individual identified who is responsible for overseeing contractor performance. Asbestos contractors must be competent, registered and have adequate equipment, procedures and monitoring.

6.4 Where required, the asbestos/bio-persistent non-asbestos fibrous silicates management programme must cover work

practices, training, monitoring, medical surveillance, waste handling and disposal, and the above noted detail.

6.5 Maintenance operations must be made aware of potential cristobalite exposure hazards when disturbing non-asbestos fibrous silicates that have undergone high temperature conditions.

6.6 The potential for occurrence of naturally occurring asbestiform materials in exploration or mining production activities must be assessed, the risk of exposure determined and appropriate control measures implemented where required.

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| 5 | December 2008 | Ian Firth; Adrian van Tonder | Manoel Arruda | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# B2 - Hearing conservation

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It applies only to noise exposures in the workplace. It covers noise hazard evaluation, control programme design and control programme evaluation (audiometric surveillance), to ensure that employees and contractors will not suffer adverse health effects from noise generated by the business.

## 2 Programme design

2.1 Deleted.

2.2 Designated areas will be created where:

a) it is likely that the 95 per cent upper confidence limit (UCL) of an eight hour $L_{eq}$ mean exceeds 85 dB(A); or

b) impulse noise exceeds 140 dB(C).

2.3 Designated areas must:

a) be identified and mapped, signposted or otherwise clearly communicated to employees working in the area. Signposting,

where necessary, must use appropriate wording or symbols on signs to identify the hazard;

b) have a documented hearing conservation programme based on suitable risk assessment and standards, which is applied to employees, contractors and visitors;

c) have regular monitoring of SEGs working in the area; and

d) have a formal review of the practicality of engineering controls at least every two years, or less where it is a critical control for a significant risk.

2.4 Monitoring must be based on the use of a dosimeter or sound level meter (SLM), with 3 dB exchange rate, and A-weighting and impulse noise measurement capability, calibrated as per the manufacturer's methods.

2.5 Employees and Category 1 contractors whose eight-hour $L_{eq}$ exceeds 85 dB(A), or impulse noise exposure exceeds 140 dB(C), must be offered and encouraged to undergo annual audiometry. The results should be discussed with the worker.

# 3 Audiometry programme

3.1 Where an audiometry programme is indicated, it must meet the following standards:

a) all testing must be by pure tone audiometry in an audiometry booth or quiet room, with measured noise levels less than 40 dB(A);

b) the initial audiogram must be taken prior (minimum of 24 hours) to exposure to significant noise. Further audiograms must be taken periodically; annually where exposures are over 85 dB(A) $L_{eq}$ or where continued deterioration to hearing is occurring;

c) testing must be performed by trained and competent personnel;

d) audiometers must be calibrated according to the manufacturer's guidelines. As a minimum these will be a weekly biological calibration using a member of staff unexposed to noise, or a bio-acoustic simulator, and an annual quantitative check. All results must be documented; and

e) audiograms must be read by trained persons who will identify any increasing hearing loss and then determine if this is noise induced. Any employee with a significant downward shift in one or both ears (measured as an average non age-adjusted loss from baseline of 10 dB at 2, 3 and 4 kHz) must be retested following removal from noise for a minimum of 24 hours, usually after a days-off period. If the downward shift persists the employee must be reviewed by a physician and improved hearing protection considered.

# 4 Exposure controls

4.1 Deleted.

4.2 Deleted.

4.3 Deleted.

4.4 Where required, training in the recognition of signs and symptoms of hazardous noise exposure and preventative measures must be provided. Training will begin after hire and continue with regular refresher training provided according to regulatory requirements or at least once every three years.

4.5 Hearing protection devices (HPDs) must be selected with regard to the potential type and loudness of noise likely, comfort, and compatibility with the work tasks and other PPE. No employee should be exposed to more than 82 dB(A) at the ear while wearing a HPD, as determined over an eight hour equivalent shift. Only operation-approved HPDs will be used.

## Revision history

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# B3 - Manual handling and vibration

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It focuses on musculo-skeletal damage that can result from manual handling and from vibration. This standard covers musculo-skeletal hazard evaluation, control programme design and control programme evaluation, to ensure that employees and contractors will not suffer adverse health effects from poor task and equipment design, or from inappropriate behavioural practices.

## 2 Programme design

2.1 Deleted in part and moved to clauses 2.5, 2.6 and 2.7

2.2 The workplace must be assessed by a competent person for compliance with good design, layout and practice, to avoid or minimise adverse health consequences due to manual handling and vibration issues.

2.3 The quantitative evaluation of vibration produced by specific equipment must include the following measurement parameters: direction of movement, frequency, intensity, and variation with time and duration, as per documented methods.

2.4 Employees and contractors must be informed of the results of assessments and instructed in appropriate manual handling techniques, where the risk assessment indicates a need.

2.5 Workplace vibration sources that could contribute to the exceedance of OELs (hence potential for impact on worker musculo-skeletal fitness) must be identified and adequately characterised.

2.6 Manual handling tasks assessed as having potential to cause an LTI (ie with potential for impact on worker musculo-skeletal fitness) must be identified and adequately characterised.

2.7 Workplace manual / materials handling tasks risk rated as "significant" must be assessed and recorded to include biomechanical factors (eg posture, bending, twisting, repetitive motions, working overhead, exerting force away from the body).

# 3 Exposure controls

3.1 Design criteria that address ergonomic requirements, and the minimisation of vibration where appropriate, must be available for the purchase or fabrication of all new fixed and mobile workplace equipment, and furniture. This also applies to retrofits to existing equipment.

3.2 The operation must ensure that its management of change mechanisms eliminate or minimise ergonomic risks when designing workplaces, processes, facilities, machines and operational procedures.

3.3 Control measures must be in place to minimise exposures and protect employees and contractors from adverse exposure. Where possible, machines or equipment, or alternative systems of work, must be employed to conduct heavy, awkward or repetitive tasks.

3.4 Deleted.

3.5 Where risk assessment indicates the need, businesses must have within the periodic medical assessment a programme that includes:

a) encouragement of workers to recognise and report the early symptoms of musculo-skeletal disorders;

b) encouragement of workers to recognise unsafe manual handling and vibration conditions;

c) the identification of modifiable risk factors that may impact fitness for work;

d) education and support to address any identified fitness for work risk factors; and

e) education and support to assist workers regain their fitness for work.

3.6 Machines, working equipment and tasks risk rated as "significant" must be evaluated for possible modification or replacement where necessary.

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| 4 | December 2008 | Ian Firth; Adrian van Tonder | Manoel Arruda | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# B4 - Hazardous substances

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It applies to dangerous goods and hazardous substances, both process and non-process. It covers hazard identification and evaluation, control programme design and evaluation, to ensure that employees, contractors and third parties will not suffer adverse health or safety effects from hazardous substances that are transferred, used or generated by the business, and to ensure the minimisation of risks and environmental impacts due to spill or other releases of hazardous substances. Local definitions of dangerous goods and hazardous substances in regulations should be adhered to by businesses.

This standard is an extension of Elements 7.1 through 7.4 of the HSEQ management system.

# 2 Programme design

2.1 A hazardous materials register or inventory system must be available and be used to control the purchase and introduction of new materials to operations, including those brought in by contractors. The register must be updated regularly.

2.2 The properties of materials brought to site, site products, intermediates, by-products and wastes must be adequately understood and documented with regard to their ability to impact on health, safety and environment. Material Safety Data Sheets (MSDS) must be obtained where possible and when required by law prior to using hazardous materials at site.

2.3 MSDS, or equivalent hazard communication document, for products and any process or waste materials sent off site must be sent to customers. These documents must be maintained and identified on the site register.

2.4 MSDS must be used to:

a) provide adequate information regarding health, safety and environmental effects, precautions and safe handling practices to all on site who transport, handle or use hazardous materials/substances;

b) conduct a risk assessment to determine the need for workplace monitoring, medical surveillance and controls;

c) prepare workplace labels as necessary; and

d) provide emergency response and first aid information.

2.5 A coordinator must be assigned the accountability for the hazardous substances management programme, which will include maintenance of the hazardous materials register and MSDS system.

2.6 Safe working procedures and training in the safe use, transport, storage and disposal of hazardous substances (including explosive dusts), as well as the use of appropriate storage facilities and personal protective equipment, must be provided.

2.7 Deleted

2.8 MSDS for site products and process or waste materials must comply with local regulatory requirements and with requirements of the country or location to which the product is shipped. Mandatory use of GHS (Globally Harmonised System) compliant MSDS will be required for those countries that have adopted GHS. MSDS must be revised, as necessary, at least every 5 years.

2.9 Material Safety Data Sheets (MSDS), or a computer database containing MSDS, must be readily available to employees, contractors and other affected parties (eg local community, emergency services), and be in the language(s) commonly used at the operation.

# 3 Material Safety Data Sheets - Deleted

3.1 Deleted and moved to clause 2.8.

3.2 Deleted and moved to clause 2.9.

# 4 Controls

4.1 Deleted

4.2 There must be written procedures for the use, storage and disposal of identified high priority hazardous substances (those with a risk classification of Critical). These must be audited every 12 months.

4.3 Storage facilities must be secure and protected from damage. They must also be designed for easy access for fire fighting. Where applicable, the storage facility must protect chemical containers from physical damage due to temperature extremes, moisture, corrosive mists or vapours, and vehicles.

4.4 Hazardous substances must be adequately stored and segregated based on:

a) quantity of materials stored;

b) physical state of the chemicals (solid, liquid or gas);

c) degree of incompatibility; and

d) known behaviour of the materials.

4.5 All containers must be adequately and clearly labelled to indicate identity, precautionary requirements and date for expiry, where relevant. Pipes or other distribution systems used for hazardous substances must be clearly identified. Directional flow must be indicated where practical.

4.6 Prior to disposal, empty containers/equipment must be properly decontaminated, where applicable.

4.7 There must be a programme to assess safer alternatives to current hazardous chemicals/ substances (based on risk assessment for health, safety or environmental hazards), and to limit worker access to hazardous substances. This programme must also consider product and process re-formulation/re-design activities where technically feasible.

4.8 Appropriate PPE must be selected with regard to the potential hazards, permeability, penetration, resistance to damage and compatibility with the work tasks.

4.9 Emergency showers and eye-wash stations must be available where required by law, or where their need is indicated by risk assessment, and must be appropriately located, maintained regularly and signposted. Workers must be trained as to their location and use.

4.10 Supply chain optimisation practices must be used to minimise the inventory of hazardous substances to necessary quantities for justifiable use.

# 5 Asbestos and non-asbestos fibrous silicates - moved

5.1 Deleted and moved to standard-clause B1-6.1.

5.2 Deleted and moved to standard-clause B1-6.2.

5.3 Deleted and moved to standard-clause B1-6.3.

5.4 Deleted and moved to standard-clause B1-6.4.

5.5 Deleted and moved to standard-clause B1-6.5.

5.6 Deleted and moved to standard-clause B1-6.6.

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# B5 - Radiation

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It applies to workplace radiation issues and includes both ionising and non-ionising radiation. It covers radiation hazard evaluation, programme design, exposure controls and employee education and training, to ensure that employees, contractors and third parties will not suffer adverse health effects from radiation sources.

## 2 Programme design - all types of radiation

2.1 The risks associated with ionising (from naturally occurring radioactive mineral (NORM), radon, and man-made sources), ultra violet (UV) and electromagnetic field (EMF) radiation exposure must be assessed by a competent person.

2.2 There must be an inventory of all relevant types of radiation sources that have a potential for adverse health effect, and should include radiation source type, type of radiation (eg radioisotope, radon, EMF, laser, etc.), strength and unit/material location.

2.3 Where risk assessment indicates the need, a documented radiation management programme must be developed such that:

a) all types of radiation sources are adequately characterised and described;

b) such exposures can be eliminated or reduced to as low as reasonably practicable (ALARP);

c) it provides a clearly defined chain of responsibility, with duties and responsibility documented; and

d) education is provided for employees and contractors regarding radiation safety, including the radiation management programme elements.

# 3 Programme design - ionising radiation

3.1 The ionising radiation management programme must meet all applicable regulatory requirements, and at a minimum include the following elements (as applicable):

a) surveyed radiation areas and quantification of exposure sources/levels;

b) exposure and medical monitoring programmes based on established investigation levels;

c) transport of radioactive materials in compliance with international radiation transport regulations, when no local regulations are in place;

d) waste monitoring and disposal programmes;

e) feedstock and equipment checks for naturally-occurring ionising radiation;

f) clearance and control procedures for all contaminated materials and equipment leaving or arriving at site (including scrap);

g) leak (wipe) tests on sealed radioactive containment equipment;

h) mine ventilation with specific reference to radiation protection (for underground mines);

i) water management and air emission control;

j) lock-out procedures for vessels and equipment containing radioactive sources and radon decay product measurement prior to entry;

k) emergency procedures;

l) environmental impact risk assessment (air, water, waste, foods, etc);

m) product/waste life cycle control; and

n) dose assessment for employees and critical exposure groups, according to documented methods and by a competent person.

3.2 Areas with ionising radiation with annual doses greater than 5 milli Sieverts (mSv) must be designated as restricted access or controlled areas. These areas must be identified and mapped, signposted or otherwise clearly communicated to employees working in the area.

3.3 All underground operations must have conducted a baseline radon survey using passive area monitoring techniques. All underground operations with an identified radon issue must conduct similar surveys once every two years. Areas with levels greater than the International Commission on Radiological Protection (ICRP) action levels must be designated as restricted access or controlled areas.

3.4 These underground designated restricted areas will require the development of engineering controls. Signposting, where necessary, must use appropriate wording or symbols on signs to identify the hazard.

3.5 Each person whose potential exposure exceeds 5 mSv per annum or who is a designated radiation worker must undergo periodic personal radiation monitoring and medical surveillance designed to show continued fitness for radiation work.

# 4 Exposure controls

4.1 Deleted

4.2 All sources of ionising radiation must be managed in use and when they are either disposed of or securely stored in accordance with local regulations. Each operation where individual worker's exposures could exceed 5 mSv per annum must have a trained radiation protection adviser or ready access to a trained protection consultant.

4.3 There must be documented procedures for the inspection, assessment and maintenance of the controls, and emergency procedures to deal with incidents involving ionising radiation sources (including fire and explosions). All controls must be reassessed annually to ensure their continued effectiveness and that operating practices are in accordance with written procedures.

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# B6 - Thermal stress

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It addresses both workplace heat stress and cold stress. It covers high temperature conditions generated by the industrial process or the mining environment, temperatures exacerbated by hot weather, and extreme cold weather conditions, that can pose a risk to health and safety of employees and contractors.

## 2 Programme design

2.1 Hot areas or activities where employees have experienced or could experience excessive fatigue, muscle cramp, dehydration, dizziness and other symptoms of heat stress must be identified and described.

2.2 Where a risk of thermal stress is determined, a competent person must conduct monitoring surveys on site, in consultation with workers.

2.3 For defined extreme thermal conditions and job activities, medical examinations must include information about the

operator's physiological and biomedical aspects, and an assessment of fitness for the working conditions.

2.4 Cold areas or activities where employees have experienced or could experience pain or loss of feeling in extremities, frostbite, severe shivering, excessive fatigue and other symptoms of cold stress must be identified and described.

2.5 Workplace thermal stress levels (temperature, air movement, humidity, etc), activities (work level, etc) and conditions (clothing, health, etc) that have the potential to exacerbate thermal stress effects must be adequately characterised and described. Workplace exposure assessment must be repeated according to regulatory requirements or whenever there is a change in production, work organisation, process or equipment which may impact thermal stress levels.

# 3 Measurement techniques

3.1 Detailed heat stress assessment of identified tasks or jobs must be tiered to:

a) commence with the use of a simple heat stress index as a screening tool; then, if necessary;

b) use rational heat stress indices in an iterative manner to determine the 'best' control methods for alleviating potential heat stress; then

c) undertake physiological monitoring when exposure times are calculated to be less than 30 minutes, or where high level PPE that limits heat loss must be worn.

3.2 Detailed cold stress assessment of identified tasks or jobs must be conducted according to current appropriate guidelines that incorporate a cold stress index, to determine the 'best' control methods for alleviating potential cold stress.

# 4 Exposure controls & treatment

4.1 Deleted.

4.2 When a risk of thermal stress is identified, the following exposure controls must be implemented:

a) an acclimatisation period for new workers and those returning from extended leave or sickness;

b) training in the recognition of signs and symptoms of heat or cold stress, emergency procedures and preventative measures;

c) protective observation (buddy system or supervision); and

d) a requirement for self-paced working.

4.3 The following exposure controls must be considered by a competent person:

a) work/rest regimes and job rotation based on measurements conducted;

b) suitable rest areas with a provision of cool drinking water and cool conditions for high temperatures, or provision of warm drinks and warm conditions for cold temperatures;

c) selection of appropriate clothing or other PPE for extreme temperature conditions;

d) the use of engineering controls; and

e) undertake hot/cold tasks during a cooler/warmer time of the day.

4.4 Where thermal stress is assessed to be a risk, the operation must develop a suitable emergency response plan.

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# B7 - Fitness for work

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It applies where a risk assessment has identified that fatigue or other causes of impaired fitness for work could produce a potential for serious injury, illness or death, significant equipment/plant damage, or significant environmental impact. It covers programme design, management of shift systems, and personal fitness. 'Personal fitness' includes the person's physical, mental and emotional state.

## 2 Programme design

2.1 Safety critical jobs are those where fatigue or other causes of reduced fitness for work could lead to serious injury, illness or death to employees, significant equipment/plant damage, or significant environmental impact. These jobs must be identified and an assessment of the risks from these conditions made.

2.2 For safety critical jobs, a programme to manage these risks is required, and must consider both employees and contractors, to the extent possible by local or regional employment laws. The programme, in addition to the requirements in HSEQ

management system Element 13.7 or Occupational health standard A5, must include:

a) mechanisms for managing fatigue, stress and lack of fitness;

b) an alcohol and other (including prescription, pharmaceutical or illicit) drugs policy that includes testing (where legally possible) and applies to employees and contractors;

c) access to an Employee Assistance Programme providing confidential access to resources and counsellors; and

d) training and awareness programmes.

## 3 Management of shifts and work hours

3.1 Sleep deprivation during shift work or from excessive working hours is a known cause of fatigue. Fatigued employees are at increased risk of accidents. Shift system design must consider:

a) the effect on worker fatigue;

b) the effects of activities carried out during rostered and over time hours;

c) the impact on sleep cycles of activities such as the time for commuting to and from site; and

d) the monitoring and control of working hours.

# 4 Personal fitness

4.1 All workers commencing work in safety critical jobs must have a pre-placement medical examination, followed up by periodic medical examinations, based on risk assessment and detailed position descriptions.

4.2 The medical criteria for fitness must be documented and based on an evaluation of the physical and medical requirements for the jobs.

4.3 All workers in safety critical jobs must report to their supervisor/manager any condition that might impair their ability to safely perform the functions of their position. A mechanism must be in place for such reports to be referred to the medical adviser for consideration as to the worker's fitness for their type of work.

4.4 The periodic medical assessment programme of employees and Category 1 contractors in safety critical jobs must include:

a) the identification of modifiable risk factors that may impact fitness for work;

b) education and support to maintain health or address identified risk factors; and

c) education and support to assist workers regain their fitness for work.

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# B8 - Legionnaires disease

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It applies to Legionnaires disease in the workplace. It covers Legionella hazard evaluation, control programme design and control programme evaluation, to ensure that employees, contractors and third parties will not suffer adverse health effects.

## 2 Programme design

2.1 All equipment with the potential for generating Legionella (such as cooling towers and associated equipment, air-handling systems, hot water services and showers) must be identified and the risks of contamination and aerosol generation assessed.

2.2 Where there is an assessed risk that Legionella could grow in the system and cause harm, a programme must be in place such that:

a) all such equipment is identified on a register. The register must contain details of the regular maintenance, cleaning and checking programmes;

b) control measures are in place to minimise aerosol emissions;

c) there must be a documented water treatment programme, including procedures for inspection, assessment and maintenance of the controls; and

d) new or retrofitted equipment is designed and constructed to minimise the risk of Legionella growth.

## 3 Monitoring

3.1 Where available, the Legionella plate count test should be used if more effective methods are not available.

## 4 Controls

4.1 Good maintenance procedures must be followed to minimise the risk of significant contamination of equipment with other bacteria and microbial organisms.

4.2 Adequate procedures must be available for disinfecting systems if significant concentrations of Legionella bacteria are present. Once disinfected, systems must be retested to confirm effectiveness of treatment.

4.3 Deleted

## Revision history

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|---|---|---|---|---|
| 1 | Feb 2003 | Richard Gaunt & Ian Firth | ExCo | |
| **Version no.** | **Revision date** | **Revised by** | **Authorised by** | **Reason for change** |
| 4 | December 2008 | Ian Firth; Adrian van Tonder | Manoel Arruda | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# B9 - Travel and remote site health

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. It covers the general travel health issues associated with temporary site visits, health issues associated with working in remote areas or at operations that supply food and water, and altitude sickness. It covers travel health programme design and management, to ensure that employees, contractors and third parties will not suffer adverse health effects.

## 2 Programme design

2.1 There must be in place a programme to prevent both chronic and acute illnesses through proper sanitation, food hygiene and control of disease vectors at remote operations. Vector control must be conducted in a manner that prevents the transmission of disease and ensures that control measures are applied in a safe and healthy manner.

2.2 There must be in place a programme to minimise as far as possible the impact of travel related ill-health and safety risks, and ensure that all international travellers (eg visitors, secondees & contractors) are adequately informed before travel. The programme must include information on jet lag,

deep vein thrombosis (DVT), food safety, relevant community health hazards (including infectious diseases), local security and safety threats and emergency procedures.

2.3 Deleted.

# 3 Management

3.1 Deleted.

3.2 The need for immunisations and behavioural precautions (eg sunscreen, insect repellent, appropriate clothing, food preparation, etc) must be documented and communicated to relevant staff. A medical travel kit must be made available for travellers to remote/high risk areas. In addition, a process must be established to manage travel-related health concerns that arise following departure from the site, including the development of malaria type symptoms.

3.3 An in-house occupational health service, a service provider or a general practice must provide relevant pre-travel advice and preparation, as well as a medical review on return to home if there are health concerns. Professional responsibility for the provision of these pre- and post-travel medical services must be defined. Where a service provider or a general practice is used, standards for the level of service provided must be established.

3.4 Consultants, bulletins and the Rio Tinto Intranet must be used to provide up-to-date warnings on health risks for remote area workers and visitors. A nominated person will post warnings received from the operations to the Intranet.

3.5 Deleted.

3.6 Where food and water is provided by the business, there must be a system to ensure that:

a) food is purchased from reputable sources, stored at appropriate temperatures and prepared in a hygienic manner and location. It must be inspected for temperature and signs of spoilage on receipt;

b) potable water sources are located away from potential sources of contamination, and the water be treated to kill disease-producing organisms and periodically checked for potability;

c) waste is treated in a way that will prevent water and air pollution and is not accessible to insects or rodents; and

d) documented procedures are available for the above requirements and relevant employees are trained in these procedures.

# 4 Altitude

4.1 Prior to a visit, a physician must have reviewed all travellers to altitudes above 3000m within the previous 12 months, specifically for travel to high altitudes, and the following must be included in the review:

a) previous history of travel to similar altitudes;

b) lung function to establish the absence of significant restrictions;

c) heart function to establish normal exercise tolerance and absence of significant ischaemic or valvular disease. An electrocardiogram (ECG) should be performed;

d) blood pressure to ensure the absence of significant uncontrolled hypertension. Particular care is required for those with labile or poorly controlled disease;

e) cerebral function to establish the absence of conditions such as epilepsy that may be adversely affected by low oxygen concentrations;

f) any other concern of the traveller about the trip; and

g) the use of medications to reduce the effects of altitude.

4.2 Whenever possible two or three days must be allowed to begin acclimatisation to altitude before work commences.

4.3 Whenever possible, visitors must move to lower levels at night. Practical experience suggests that moving to 3500m or below significantly improves the duration of sleep. Irritability and severe breathlessness or anxiety may be indicators of maladjustment to altitude, and must be treated by moving the sufferer to lower altitude.

4.4 In the first week of a trip considerable caution must be exercised to avoid excessive physical exercise. Thereafter, exercise can increase very slowly.

4.5 Deleted and moved to clause 4.3.

## Revision history

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| 4 | December 2008 | Ian Firth; Adrian van Tonder | Manoel Arruda | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# B10 - Occupational exposure limits

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management. To protect all who work at our operations from occupational illness, workplace hazardous exposures must be controlled to below occupational exposure limit (OEL) and/or biological test limit values. The lists of substances (or agents) are derived from an assessment of business unit exposures, but do not necessarily include all hazardous exposures found within the Rio Tinto Group.

## 2 Definitions

2.1 Deleted.

2.2 Deleted.

2.3 Deleted.

## 3 Programme design

3.1 Each business or operation must establish or adopt an OEL for each hazardous agent for which significant worker exposure is possible. Where, in the absence of a legal or Rio Tinto OEL, a

business/operation standard is developed, this OEL must be documented.

3.2 OEL and biological test limit values must be reviewed annually for relevance and efficacy. Rio Tinto OELs and biological test limit values are documented in Work Cycle WC2080. These mandatory standard limits are reviewed regularly by Rio Tinto HSE.

3.3 Where workers have a working day longer than eight hours or unusual shift rotations are in effect, the TWA OEL may need to be reduced by a suitable factor to ensure adequate worker protection. Such factors require specialist consideration.

3.4 For some agents, the existence of an adverse carcinogenic health effect is known or suspected, but there is no internationally accepted assessment of the appropriate OEL or no agreed practical method to quantify workplace levels. In these cases, exposures to agents meeting these criteria must be as low as reasonably achievable or practicable.

# 4 Rio Tinto OEL values

Deleted (Rio Tinto OELs are now documented in Work Cycle WC2080. These mandatory standard limits are reviewed regularly by Rio Tinto HSE).

# 5 Rio Tinto biological test limit values

Deleted (Rio Tinto biological test limit values are documented in Work Cycle WC2080. These mandatory standard limits are reviewed regularly by Rio Tinto HSE).

## Revision history

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| 4 | December 2008 | Ian Firth; Adrian van Tonder | Manoel Arruda | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# B11 - HIV/AIDS

## 1 Scope

This standard applies to all operations, including projects, in which the community prevalence of HIV is at one per cent or greater (as defined by UNAIDS), or in lower prevalence areas where the presence of HIV/AIDS poses a significant business risk, for example due to the threat to employee health, company reputation or business sustainability. It covers risk assessment, programme design and evaluation to ensure the effective management of the significant risks that HIV poses to workers, their dependents and the communities in which we operate.

Rio Tinto has committed to not discriminating at pre-employment or during employment on the grounds of HIV status; all operations must manage their HIV/AIDS programmes in compliance with this commitment.

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## 2 Programme design

2.1 All operations must assess the risks posed by HIV. For all high or critical risks (as defined in the HSEQ MS – Element 3), a mitigation programme incorporating sustainable development principles, must be implemented covering the life of the operation from exploration, project development and commissioning, to operation and closure.

2.2 The HIV/AIDS risks of all labour contracts must be assessed. For all high and critical risks, control strategies must be implemented.

2.3 The risks posed by HIV/AIDS to the business' workforce and communities must be assessed in the development of the multi-year communities plan. This assessment must include consideration of and seek synergies with the business' workplace HIV strategy, goals and objectives.

2.4 Discrimination towards employees on the basis of actual or perceived HIV status is forbidden.

2.5 All information on the HIV status and condition of employees and community members, including that relating to counselling, care and treatment and receipt of benefits, must be maintained in medical confidence.

2.6 HIV/AIDS screening is not a requirement for recruitment or a condition of employment.

# 3 Programme elements

3.1 Where the HIV prevalence rate is at or above one per cent (as defined by the UNAIDS), operations must ensure that employees and one nominated partner have affordable access to an integrated HIV/AIDS programme that includes antiretroviral therapies (ART). At separation of the employee from employment, transition to alternative, affordable source of ART, such as via government or NGO, must be sought.

3.2 Operations must ensure that employees and their nominated partner have access to medical provider(s) that comply with HIV/AIDS drug protocols consistent with the current WHO Guidelines or (equivalent recognised scheme) applicable to the host country.

3.3 The programmes must address the following components:

i) prevention, awareness and education;

ii) voluntary counselling and testing (VCT);

iii) wellness, counselling and treatment; and

iv) monitoring and evaluation.

3.4 Partnerships must be actively sought with specialist external organisations to assist the business to deliver HIV education, awareness raising and treatment to employees, their dependents and where indicated by the multi-year community plan, to the broader community.

## Revision history

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|---|---|---|---|---|
| 1 (Strategy) | 2004 | Liz Wall | Elaine Dorward-King | |
| **Version no.** | **Revision date** | **Revised by** | **Authorised by** | **Reason for change** |
| 2 | December 2008 | Rob McDonald | Elaine Dorward-King | Strategy revisions approved by ExCo and published as an HSE performance standard. |

Rio Tinto HSEC

Rio Tinto

# Standards

# HSE Performance Standards - SAFETY

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# C1 – Isolation

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, admin/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and - where applicable - for post closure management.

1.1 This standard applies to all sources of hazardous energy and hazardous substances.

1.2 **Hazardous energy:** For example electrical, pneumatic, hydraulic, stored (springs, batteries), potential (by virtue of position), gravitational, heat (hot water, steam), radiation.

1.3 **Hazardous substances:** For example, gases, vapours, liquids, dusts with the potential to cause injury or illness, eg toxic, corrosive or flammable.

1.4 **Isolation officer:** Whenever a piece of plant or equipment is to be isolated, there must be a person designated to carry out the Isolation procedure. That person is referred to as the Isolation officer. No person may be designated as the Isolation officer for a piece of equipment unless s/he has been trained, tested and certified as competent to carry out the Isolation procedure for that piece of plant or equipment. Tests for voltage, for example, require competency in electrical work as outlined in the electrical standard.

1.5 **Isolation procedure:** All designated systems, plant and equipment must have written procedures for isolation. (see Rio Tinto Standard A1.3.1). This procedure will set out how the system, plant or equipment is to be made safe and kept safe. It will include, for example: decontamination; venting of stored energy; securing of rotors or fan blades; chocking of vehicles; and disconnecting, blocking or bleeding of equipment, cables, pipes and vessels. It will show any connections to Distributed control systems. It will also show the isolation points for lockout and test procedures.

## 2 Isolation officer's responsibility

2.1 Before any work is begun on or in a system, plant or equipment, the Isolation officer must first ensure that it is made safe in accordance with the Isolation procedure.

2.2 The Isolation officer's lock and identification tag must be the first to be applied and the last to be removed.

2.3 a) The Isolation officer's lock must be a master series lock since it will remain on the plant or equipment when handing over to subsequent shifts. Keys to the Isolation officer's lock must only be held by other designated Isolation officers; and

b) where isolation involves only one person on jobs to be completed within a single shift and where it is not appropriate for a master series lock to be utilised, the person must be an Isolation officer and s/he must apply his/her personal lock and identification tag.

2.4 After locking and tagging, the Isolation officer must clear the area of personnel before a trial step to ensure that the plant or equipment has been isolated.

2.5 In the case of electrical isolation, a test for voltage must be carried out, after the switching device, to ensure the absence of voltage.

2.6 Where there is a need for work to extend over multiple shifts or where there are large numbers of people involved in the work (such as large maintenance projects) then a project isolation procedure can be implemented. This procedure must, however, have the requirements that personal locks must be used for each person working on the project, an Isolation officer's control lock is in place and this control lock cannot be unlocked without all personal locks being removed.

2.7 Where it is necessary to work on live equipment for the purposes of commissioning, testing, sampling and adjustments, such work shall be carried out in accordance with a written procedure. The written procedure shall require:

a) an isolation officer to confirm effectiveness of controls associated with the live work area; and

b) the work area is controlled to prevent unauthorised access.

# 3 Everyone's responsibility

3.1 Everyone, including the Isolation officer, who has to perform work on the plant, equipment or system, must first apply a personal lock and identification tag in accordance with the Isolation procedure.

3.2 Personal locks must be such that they can only be unlocked by their owner.

3.3 Personal locks may never be removed other than by the person to whom they belong, other than in the presence of and under the supervision of the department or area manager or his/her appointed nominee, and in accordance with a written procedure.

# 4 Revision history

| **Version no.** | **Effective date** | **Prepared by** | **Authorised by** | |
|---|---|---|---|---|
| 1 | Jan 2001 | CEO Safety Adviser | ExCo | |
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| 2 | December 2008 | Paul Dewar; Adrian van Tonder | Rob Davies | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# C2 - Electrical safety

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, admin/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and - where applicable - for post closure management.

1.1 This standard applies to all electrical work above 110 volts DC or 50 volts AC.

## 2 Competency standards and safe work procedures

2.1 There shall be demonstrated job and equipment-specific electrical competency standards and safe work procedures for all electrical work, ie construction, decommissioning and demolition of electrical equipment.

2.2 The competency standards shall specify the frequency for re-certification, which shall be no less than every two years and address job and equipment-specific safe work procedures.

2.3 All electrical work must be conducted by competent personnel in accordance with governing regulation, code, design criteria and safe work procedures.

2.4 There shall be an arc flash protection program in place to determine incident energies and define the appropriate PPE and associated procedures to mitigate the hazard.

# 3 Electrical equipment

3.1 Electrical safety devices such as earth leakage and overload protection shall be installed on all final distribution circuits and the settings established by qualified personnel.

3.2 Electrical equipment, grounding continuity and electrical safety devices shall be inspected and/or tested on a suitable schedule and the findings recorded.

3.3 There must be a system for removing electrical equipment unfit or unsafe for purpose.

3.4 There must be a system for maintaining an up-to-date set of single line diagrams, with supporting documentation showing: system fault calculations; equipment details; electrical protection discrimination curves; and cable ratings.

# 4 Isolation and access

4.1 Equipment shall be isolated in accordance with the site Isolation procedure (see Rio Tinto standard C1 Isolation). All energised electrical work will require a safe work procedure and, with the exception of voltage testing and where no tools are used, will require an Energised Electrical Work Permit.

4.2 Electrical panels, enclosures, control centres, substations and equipment shall be appropriately guarded, labelled, and made inaccessible (except for emergency shut off mechanisms) to unauthorised personnel. Areas containing such equipment are 'controlled areas'.

4.3 Where it is necessary for untrained personnel (eg visitors) to enter controlled areas there shall be a system for communicating the hazards and for escorting them with appropriately trained personnel. Contractors must have a permit to work in controlled areas.

4.4 Access to an electrical cabinet or other enclosure with exposed energised terminals in excess of 1,000 volts is prohibited.

4.5 Employees and contractors exposed to electrical hazards shall receive electrical hazard training at the commencement of their employment and thereafter on an annual basis. The training shall address the equipment and conditions specific to the work area of the personnel and be documented.

4.6 There must be an assessment of overhead and underground power lines and a system in place to mitigate the hazards associated with working in close proximity to prevent contact by personnel or equipment.

# 5 Revision history

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| 2 | December 2008 | Paul Dewar; Adrian van Tonder | Rob Davies | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# C3 - Vehicles and driving

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, admin/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and - where applicable - for post closure management.

1.1 This standard applies to all vehicles, including mobile mining equipment, owned and operated by Rio Tinto or its contractors, which are used on Rio Tinto operations or off-site for Rio Tinto business purposes.

1.2 Tyre and rim safety requirements applies to tyres and rims of size 60 cm (24 inches) and greater. It is supported by the tyre and rim safety work cycle.

## 2 Risk analysis

2.1 A comprehensive risk analysis shall be conducted to clearly identify the conditional and behavioural factors that impact vehicles and driving safety. The risk analysis must cover all aspects of vehicles and driving and will have up-to-date action plans in place to manage identified issues.

# 3 Vehicles

3.1 All vehicles used for work purposes must be subject to a risk assessment. The assessment must:

a) involve operators and maintainers who will use the equipment; and

b) address all aspects of safe operation including handling, driver vision, brake failure, tyre blow out and access/egress for operators and maintainers.

3.2 All vehicles driven for work purposes must be subject to an appropriate pre-operation safety check based on a risk assessment.

3.3 All vehicles used for work purposes must be fitted with:

a) fixed seats and safety belts for driver and all passengers, unless a risk assessment specifies otherwise; and

b) a speedometer or like means of informing operators of vehicle speeds for vehicles capable of exceeding the lowest applicable speed limit.

3.4 All light vehicles used for work purposes must comply with all aspects of the Rio Tinto Light vehicle guidance note unless the risk assessment specifies otherwise.

3.5 Deleted.

# 4 Training and licensing

4.1 No person may drive a vehicle unless they are trained, competent, tested and licensed to operate that vehicle. The training must address hazards assessed for

(a) that vehicle and

(b) the tasks for which it is to be used.

4.2 All persons required to drive/operate vehicles at the operation must have a site license to operate those vehicles. A state or civil driving license is an approved alternative except where

(a) there is a need for a specific set of Company rules/procedures (for example, in a pit area where a pit license or permit is required) or

(b) the state or civil licence does not apply to the class of vehicle being driven.

4.3 The manager shall have a system in place to ensure that the renewal of licenses will be based on an assessment of competency to drive and or operate the equipment. The frequency of assessment will be either annual, or derived from a risk assessment for each vehicle type.

4.4 A system shall be in place that limits the number of people that drive in an open pit. In addition, because of the constant change in conditions, no person shall be licensed to drive in an open pit unless they are required to do so more than once in a two week period.

# 5 Traffic rules

5.1 The driver and all passengers must wear their seat belts, where fitted, at all times.

5.2 Speed limits and traffic rules must be reviewed regularly and rigorously enforced.

5.3 There must be rules to ensure that:

a) in mining operations no vehicle approaches within 50 metres of any heavy mobile machinery without first making positive contact with the operator of that equipment;

b) the interaction between heavy and light vehicles is controlled;

c) if an operations rule permit overtaking in the pit area, then no vehicle will overtake a haul truck or water truck before making positive contact with the driver; and

d) no vehicle tows equipment unless it is engineered to do so.

# 6 Tyre and rim safety

6.1 Operations must establish a Tyre management plan that is approved by the senior manager at the operation and reviewed every 12 months.

6.2 There must be demonstrated job competencies and safe work procedures for all tyre maintenance, servicing activities and tyre fire emergency response. The competencies must specify the frequency for re-certification, which must be no less than every three years.

6.3 No person must approach a vehicle within 24 hours of a lightning strike, contact with high voltage electricity or a tyre fire. An exclusion zone of 300 metres (1000 feet) of a tyre fire must be established and only be accessed by emergency service personnel that are shielded while fighting the fire.

6.4 Restricted work zones (RWZ) and exclusions zones must be established for the tyre installation, removal and handling processes.

6.5 All tyre and rim handling equipment must have fall back prevention in place prior to anyone entering the RWZ.

6.6 Tyres with split rims must be deflated to zero and other tyres to a nominal pressure no greater than 5psi prior to removal of any retaining devices. In a dual assembly both tyres must be deflated.

6.7 Tyre inflation is subject to the following requirements:

a) remote inflation must be used for all tyre inflation;

b) where the risk of ejection of components exists barricading must be in place;

c) a tyre must not be left unattended during inflation; and

d) tyres that have run at less than 80 per cent cold inflation pressure must not be re-inflated. Both tyres in a dual assembly must be dismounted and inspected.

6.8 No welding, cutting or application of heat sources to a rim or wheel must be done while the rim or wheel is fitted with a tyre - whether inflated or deflated.

6.9 A periodic testing and/or inspection regime must be in place for tyres, rims/wheels and assemblies.

6.10 All tyres, rims/wheels must be made unserviceable when deemed unfit for service or before being sent off site for disposal.

6.11 A tracking system must be in place to track the lifecycle of tyres, rims/wheels.

# 7 Revision history

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# C4 - Working at heights

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, admin/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and - where applicable - for post closure management.

1.1 This standard applies to any task where the risk assessment highlights a danger of falling. In any case, fall prevention or protection shall be used for elevated work above 1.8 metres.

1.2 **Fall prevention**. Wherever practical, a safe working area must be provided by means of work platforms or scaffolds. Fall prevention standards are set out below.

1.3 **Fall protection.** In all other cases, Fall protection must be used. This includes situations in which work is being carried out from an elevating work platform or manlift. Fall protection standards are set out below.

1.4 **Ladders.** A person may climb or descend a ladder without fall protection provided that they are able to use both hands and legs to do so; face the ladder and use one step at a time. Ladders shall be tied off or supported below.

1.5 **Barricades.** Where overhead work is being conducted, barricades must be erected around the work area to protect others below from falling objects.

## 2 Fall prevention

2.1 Work platforms and scaffolds must have complete floors, guardrails and toe-boards and safe access and egress must be provided.

2.2 A person must be designated to control the work platform, scissor lift or man-lift ("the basket"), who is trained and competent to do so and qualified as required under local regulations.

2.3 The designated person must be in the 'basket' unless it can be demonstrated that it is not possible.

2.4 Every person in the 'basket' must be secured at all times with proper fall protection equipment and there must be systems in place to prevent tools and equipment from falling.

2.5 There shall be a system for ensuring the design, construction, certification, maintenance and inspection of elevating work platforms and man-lifts.

## 3 Fall protection

3.1 A person has fall protection if s/he is secured with an approved full body harness, shock absorbing lanyard (where the potential to fall is greater than 4 metres) or short restraining lanyards (where the potential to fall is less than 4 metres), double or triple action snap hooks (or karabiner type rings) and secure anchorage points.

3.2 Anchorage points must, where practical, be above the head of the worker, and must ensure that in the event of a fall the worker will neither swing nor touch the ground.

3.3 There must be a system for ensuring that anchorage points are tested and approved by a competent person to ensure that they are secure and can take the required load.

3.4 There must be a system for ensuring that fall protection equipment is:

a) tested and certified for use;

b) inspected by the user before use; and

c) destroyed following a fall or where inspection has shown evidence of excessive wear or mechanical malfunction.

3.5 There must be a system for preparing and testing emergency rescue procedures for fall victims.

# 4 Revision history

| Version no. | Effective date | Prepared by | Authorised by | |
|---|---|---|---|---|
| 1 | Jan 2001 | CEO Safety Adviser | ExCo | |
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| 2 | December 2008 | Paul Dewar; Adrian van Tonder | Rob Davies | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# C5 - Confined spaces

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, admin/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and - where applicable - for post closure management.

1.1 **Confined space** is an enclosed or partially enclosed space that:

a) has been identified as such in a risk assessment;

b) is not intended or designed primarily as place of work;

c) may have restricted entry and exit; and

d) may:

(i) have an atmosphere which contains potentially harmful levels of contaminant or explosive atmospheres;

(ii) not have a safe level of oxygen eg following a nitrogen purge; or

(iii) cause entrapment or engulfment.

1.2 Confined spaces may include, but are not limited to:

a) storage tanks, process vessels, boilers, pressure vessels, tank-like compartments that have only a manhole for entry, ceiling and floor spaces;

b) open-topped spaces such as pits, or grease traps, or excavations more than 1.5 metres deep;

c) pipes, pumps, sewers, shafts, ducts, drains, tunnels, cellars, basements and similar structures; and

d) abandoned workings and exploration audits.

1.3 **Contaminant** is any dust, fume, mist, vapour, gas, or other substance in liquid or solid form, the presence of which may be harmful to health and safety.

1.4 **Entry to confined space** occurs when a person's whole body, upper body or head is within the confined space. However, this is not intended to prevent a person from inserting their hand or arm while holding a test instrument or probe into a confined space as part of the evaluation procedure provided that this procedure is duly authorised.

## 2. Identification

2.1 Confined spaces must be identified and permanent signage erected at the entry points denoting that a permit is required prior to entry. Where signage is impractical, for example with adits other means of highlighting the dangers need to be used.

# 3 Permit system

3.1 Entry to a confined space must only be allowed after a written approval, in the form of a permit, has been issued by a competent person, whom is authorised to issue such permits.

3.2 The permitting process must include the following elements:

a) a risk assessment, including the need for a competent person to assess such things as oxygen levels, contaminants, temperature extremes, and concentrations of flammable substances;

b) isolation procedures for contaminants and other energy sources;

c) the requirement for breathing apparatus;

d) the sign-in and sign-out of all persons entering the confined space;

e) display of the permit;

f) communication process and/or equipment between standby person and personnel within confined space;

g) safety specification of equipment to be taken into the confined space;

h) barricading;

i) rescue plan and equipment;

j) standby person; and

k) a completion procedure.

# 4 Other requirements

4.1 All persons required to work in a confined space, or to act as a standby person, must be trained, competent and tested.

4.2 Specific safe work procedures must be developed for work activities that are more hazardous when carried out in a confined space than elsewhere. These activities would include hot work (cutting and welding), chemical cleaning, steam cleaning, and abrasive blasting.

4.3 The standby person will have no other duties and is to be positioned outside the confined space entry point at all times while personnel are within the space.

4.4 Where the risk assessment has identified the need for ventilation, then this must be covered by a documented procedure.

# 5 Revision history

| Version no. | Effective date | Prepared by | Authorised by | |
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| 1 | Jan 2001 | CEO Safety Adviser | ExCo | |
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| 2 | December 2008 | Paul Dewar; Adrian van Tonder | Rob Davies | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# C6 - Cranes and lifting equipment

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, admin/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and - where applicable - for post closure management.

1.1 This standard applies to all cranes, including vehicle-mounted cranes, equipment used as cranes, hoists and lifting equipment such as elevated work platforms (EWP) and rigging equipment. The standard does not apply to hoisting operations in underground mines.

## 2 Planning

2.1 Each operation must develop a register of critical lifts and a documented plan for each critical lift to address the associated hazards. Critical lifts include all multiple crane lifts; lifts over operating facilities where this may endanger personnel; lifts over power lines; lifts involving personnel cages; and lifts at maximum rated loads. The lift plan must include:

- **lift data**: equipment weight, rigging weight, total weight, height of lift, radius of lift and equipment surface area, centre of gravity;

- **equipment data:** manufacturer, model, size, boom length, jib length, load block, material size;

- **rigging data:** sling diameter, length, sling configuration, capacity, hook type, shackle size and capacity;

- **lift computation:** boom length, radius of lift, equipment capacity, size of outrigger footplates, and wind speed;

- **proximity to power lines and process areas:** Mobile cranes working in proximity to energised power lines must operate under a proximity permit, which must define exclusion zones and spotter duties; and

- **local hazards and their controls:** including the route for the crane, ground stability, proximity of people or equipment and agreed communication method.

2.2 Crane drivers and rigging crews involved in critical lifts must have input into the lifting plan and be consulted prior to finalisation of the plan.

2.3 Lifts not subject to detailed lift plans must be subject to a risk assessment.

2.4 Where practicable or where the weight of a lift is uncertain, cranes should be fitted with a load cell with the weight of the load displayed in the visual range of the operator.

2.5 Where practicable, cranes should be equipped with an anti two-block device or limit switch that includes audible and visual alarms.

# 3 Operation

3.1 There must be a documented process that ensures all critical components are inspected and in place prior to a crane being commissioned and put into service.

3.2 Operators must undertake a pre-operational safety check for each shift the crane or lifting equipment is used and this should be kept with the equipment. The detail required in the pre-operational safety check must be based on a risk assessment for the equipment.

3.3 Cranes and lifting equipment must not be operated with an inoperable or defective safety device.

3.4 There must be documented procedures that require:

- all rigging connections to be checked and correct prior to commencing a lift;
- checks that the load being lifted is within the rated capacity of the crane and lifting attachments and is also within the limits set out in the lift plan; and
- checks of all safety devices or overload limiters to ensure they are not overridden or cut out.

3.5 All lifting hooks (except for grab and chain shortening hooks) will be fitted with a safety latch to prevent the load from accidentally detaching, unless otherwise specified in a risk assessment.

3.6 Loads must not swing over people or occupied buildings and no person shall be under a suspended load or in a position where they could be struck by a falling load. Where there is a risk of a load falling and striking a person, barricading or similar controls to prevent access must be in place.

3.7 The operator shall not leave the crane controls while a load is suspended.

3.8 Overhead travelling cranes must be fitted with audible travel alarms or an equivalent warning device.

3.9 Tag lines must be attached to loads that require steadying or guidance while suspended. The load must be well secured and properly balanced in the sling or lifting device.

3.10 There must be a documented and approved method for communication between the crane driver and those assisting with the lift.

3.11 A procedure must be in place to prevent the use of lifting or rigging equipment in lifting operations if such equipment has been used for towing.

3.12 Mobile cranes must have a rating capacity chart available in the crane cabin.

3.13 Operator control stations for vehicle-mounted cranes must be located in an area protected from swinging loads and from the crane jib.

3.14 Slew pins must be secured in place in mobile cranes while travelling.

3.15 Slewing to test the integrity of outriggers on mobile cranes must be conducted prior to commencing lifts.

# 4 Maintenance and inspection

4.1 A register of cranes and lifting equipment must be established.

4.2 Any crane or lifting equipment brought to site must have a current test certificate and a pre-use safety inspection to ensure the equipment is fit for purpose. As a minimum, this inspection must satisfy regulatory and manufacturer requirements for frequency of inspection and physical condition of the machine.

4.3 There must be a system for the inspection, maintenance and approval of cranes and lifting equipment, including a process that verifies the equipment is able to function to its design specifications and the integrity of:

- mechanical and electrical components;
- controls for each piece of lifting or rigging equipment;
- crane cables and all lifting attachments;
- structural components for example: boom, hoist, brakes, wheels, hooks, baskets, out-riggers, hook-blocks and rails; and

- integrity of load limiting devices, safety devices, limit switches and control systems required for individual equipment eg independent fail-safe braking systems, a device to stop the crane such as a "dead-persons" switch, and emergency shut-off switch.

4.4 Inspections and repairs to cranes, cables and lifting equipment must comply with the manufacturer's specifications and regulatory requirements as a minimum.

4.5 Records of maintenance inspections and cable tests must be kept.

# 5 Training

5.1 Personnel must be trained, competent and authorised to:

- operate cranes and lifting equipment;
- set-up or rig loads;
- provide signals for controlling lifts; and
- inspect, maintain or test cranes and lifting equipment.

5.2 There must be a system for establishing minimum operating time, frequency of operation and testing to ensure competency for each class of crane and elevated work platform.

# 6 Revision history

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# C7 - Aviation safety

## 1 Scope

This standard applies to all Rio Tinto business units and managed operations, including new acquisitions. It covers exploration, through all development phases and construction, operation to closure and, where applicable, post closure management.

This standard covers aviation activities throughout Rio Tinto, including the use of aircraft by Rio Tinto employees, contractors and visitors, and applies to both charter operations and commercial airline travel.

## 2 Specialist aviation services

2.1 Businesses must seek advice on all aviation activities from the Rio Tinto HSEC principal adviser, Aviation Safety, or from an approved aviation safety consultant.

2.2 Aviation safety consultants must be approved by Rio Tinto HSEC.

2.3 Each Rio Tinto business that incorporates the use of aviation services within its operations must have a nominated responsible manager – Aviation [NRM – Aviation] for the implementation of this standard and associated work cycle and work practice. The responsibilities of the NRM – Aviation are in section 6 of the work cycle WCSC701 – Aviation Safety. For this role, the NRM – Aviation should complete the Rio Tinto approved training course defined by HSEC.

2.4 Businesses can seek advice from the Rio Tinto HSEC principal adviser, Aviation Safety, when appointing the NRM – Aviation.

# 3 Aviation safety auditing

3.1 The NRM – Aviation of any business that uses charter operations must ensure the audits required under this standard are undertaken, registered on the Rio Tinto Aviation Safety database, and findings are closed.

3.2 All aircraft charter companies must be audited by an approved aviation safety consultant prior to using their services. The audits must be conducted against the requirements of this standard, associated work cycle, local civil aviation rules and regulations and aircraft operator standards and manuals as a minimum.

3.3 Where an audit is impractical, an approved aviation safety consultant or the Rio Tinto HSEC principal adviser, Aviation Safety, after considering the specific flight details, may provide advice based on a 'desktop assessment', with subsequent approval by the NRM – Aviation. For an audit to be considered impractical, all of the following must apply.

a) The charter is a one-off event.

b) The logistics of conducting the audit are unreasonable.

c) Approved charter companies were not available within the region.

3.4 Audits conducted against the standard must have an expiration date, after which a new audit must be conducted. Audits must be undertaken at intervals agreed to by the aviation safety consultant and nominated responsible manager – Aviation, and will be specific to the company being audited. Audits will generally be annual but this can be varied on advice of the aviation safety consultant.

3.5 Audits conducted by an approved aviation safety consultant but performed for other companies may be acceptable as an audit against this standard. To meet this requirement, audits must:

a) have been carried out in the last three months;

b) have been carried out by an approved aviation safety consultant;

c) cover the planned Rio Tinto flying activity and, as a minimum, be conducted to Rio Tinto standards; and

d) have an agreement in place to allow the sharing of the report between all parties involved.

# 4 Aviation incident investigation

4.1 Aviation incidents must be reported, investigated and final reports submitted in accordance with Rio Tinto requirements.

4.2 Investigation teams for aviation incidents with an actual or potential risk of high or critical must include an approved aviation safety consultant. Safety consultants used for such investigations must be independent of audits conducted on the aviation company. Investigation of all aviation incidents must reference the requirements of the standard.

# 5 Flight operations

5.1 The use of single-engine, fixed-wing aircraft must be authorised by an approved aviation safety consultant or the Rio Tinto HSEC principal adviser, Aviation Safety.

5.2 Flight operations must be managed in accordance with the Rio Tinto Aviation work cycle WCSC701 – Aviation Safety.

5.3 Preference must be given to the use of turbine-powered, multi-engine, fixed-wing aircraft.

# 6 Commercial airlines

6.1 Only commercial airlines included in the Rio Tinto Approved Airlines lists may be used for scheduled airline travel.

6.2 The number of executive directors and senior officers travelling together on the same aircraft must be controlled to protect the viability of Rio Tinto and its product groups. The NRM – Aviation must consider appropriate restrictions when executive travel is being planned, in line with the requirements of the Rio Tinto travel policy.

# 7 Other requirements

7.1 Deviations from requirements of this standard must be based on an assessment of the associated risks and advice from an approved aviation safety consultant or the Rio Tinto HSEC principal adviser, Aviation Safety.

7.2 A written contract or letter of agreement must be in place for all charter flights. Should a situation occur where this is not possible, the responsible manager must seek advice on the associated risks from an approved aviation safety consultant. In such cases the NRM – Aviation must be accountable for approving such charter operations.

7.3 Where applicable, commercial and logistical activities such as tendering, airfield construction, airfield security, aircraft refuelling systems, heliports and passenger handling, must, at a minimum, meet local regulatory requirements and be managed in accordance with established aviation manuals or with guidance from an approved aviation safety consultant or the Rio Tinto HSEC principal adviser, Aviation Safety.

**Rio Tinto plc. Registered office: 2 Eastbourne Terrace, London W2 6LG, United Kingdom. Registered in England No. 460473.**

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| 3.0 | 01 August 2011 | Geoff Want | Suresh Rajapakse | • Complete review. |

Rio Tinto

# Underground safety

# D1

## Underground performance safety standard

An integrated set of performance safety standards for the management of underground mine safety

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# D1.1 Ground control

## 1.0 Scope

1.1 This standard applies to all underground mines at existing operations and new acquisitions as well as at all shafts and adits including those developed for exploration or mine construction purposes.

1.2 All prevailing government regulations must be complied with.

1.3 Each operation must establish a Ground Control Management Plan that consists of three elements: design, implementation and verification.

## 2.0 Design

2.1 Only suitably qualified and experienced (in-house or external) geotechnical engineers must be used to develop the design rationale, calculations, support systems and specification of materials.

2.2 All underground excavations, drives and stopes must be designed to specified and documented minimum stability criteria for all relevant rock types. The design must ensure that all personnel work in a secure environment.

2.3 The design must take into account local and regional hydrology and hydrogeology to ensure that the potential for major water ingress is understood and prevented.

2.4 The materials used for all support types must be specified.

2.5 Where pillars are required for reasons of safety they must be mathematically derived and clearly marked on all mine plans and sections.

## 3.0 Implementation

3.1 Protocols must be developed to ensure that no personnel work beneath ground that has been inadequately secured.

3.2 Protocols must be developed and documented for all aspects of ground control activity. These protocols must specify:

a) the persons authorised to install support in accordance with approved

design and the training they require;
b) the persons authorised to install additional, unplanned support and the training they require;
c) the tools and equipment used to install ground support to cater for all sizes of excavation encountered in the mine;

d) the tools and equipment used for scaling to cater for all sizes of excavation encountered in the mine and, which will allow the removal of loose material without exposing the person performing the work to injury;
e) the persons authorised to scale and the training they require; and
f) planned job observations of scaling and support practices at a frequency defined by supervisors and senior management.

**3.3** All underground employees and contractors must be trained in awareness and communication of rockfall hazards. Supervisors will undergo specific training in rockfall hazard identification and mitigation.

**3.4** Supervisors will be trained in how to develop standard work practices and carry out planned job observations for key aspects of the mining cycle.

**3.5** Up-to-date mine plans must be maintained in locations that are easily accessible to the workforce. Any potential ground control hazards must be clearly identified on these plans.

**3.6** Any change to the Ground Control Management Plan must be fully documented and must be authorised by the mine manager.

**3.7** Protocols must be defined for information flow between shifts and between technical and operations management.

# 4.0Verification

**4.1** Procedures must be in place that define:
a) the frequency and responsibility for inspecting, monitoring, evaluating and reporting on ground conditions in:
- active work places, i.e. development ends and stopes, etc;
- shafts, declines, access ramps, airways, escape ways, etc; and
- other key sections of the mine i.e. workshops, stores, shaft stations, etc.

b) the frequency and method of testing rock bolts, cables and other support elements together with the necessary record keeping.

**4.2** In addition to these routine inspections, all underground workings must be reviewed on a periodic basis to:

a) evaluate conformance to the Ground Control Management Plan and local regulatory requirements;
b) re-evaluate possible failure modes and up-date risk management studies;
c) arrange for peer review of standard work procedures; and

d) arrange periodic external review of the Ground Control Management Plan.

4.3 Programmes to measure over-break in development drives and stopes, as compared with design, must be in-place and the necessary records maintained.

4.4 Survey accuracy of underground development must be checked against the mine's standards and recorded.

# 5.0Revision history

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| 3 | 1st August 2012 | Larry Jaudon; Scott Philpott | Kevin McLeish | Formatted to align with the D1 standard review following the outcomes of the Underground Standards working group |
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# D1.2 Emergency procedures

## 1.0 Scope

**1.1** This standard applies to all underground mines at existing operations and new acquisitions as well as at all shafts and adits including those developed for exploration or mine construction purposes.

**1.2** All prevailing government regulations must be complied with.

**1.3** An Underground Emergency Response Plan that incorporates the elements in sections 2 through 8 must be established.

**1.4** The Underground Emergency Response Plan must be incorporated as a section in the Emergency Response Plan within the Business Resilience and Recovery Programme.

## 2.0 Underground risk assessment

**2.1** A risk assessment must be undertaken to identify the possible types of emergency situations that might occur within the mine. This risk assessment must be approved by the mine manager.

**2.2** Written procedures must be developed in response to potential emergencies that have been identified and the workforce trained accordingly.

**2.3** Where reversible ventilation fans are installed, procedures and responsibility must be established for operating the fans in reverse.

**2.4** The risk assessment must be reviewed annually and the procedures updated as necessary.

## 3.0 Warning system

**3.1** The minimum acceptable time for an emergency warning to reach all personnel in the mine must be determined; including those personnel engaged in non-routine work such as ventilation engineers in return airways, diamond drillers and geologists in remote locations, etc.

**3.2** Each underground operation must have an effective system, together with at least one back up system, to warn all personnel underground, within the determined minimum time period, that an emergency exists.

# 4.0 Emergency egress

**4.1** Each operation must establish and maintain evacuation routes/secondary egress as close as practicable to existing and planned working areas.

**4.2** A maximum period of time from the moment the emergency warning is activated to the time the last personnel evacuate the mine or are able to reach the safety of an underground refuge chamber must be set. In setting this period the non-availability of man-hoisting and vehicular access must be considered.

**4.3** Clear and highly visible signs must be used to demarcate all evacuation routes.

**4.4** All persons who work underground must be instructed in the escape and evacuation plans. Procedures must be in place to advise all persons who work underground when a change in the emergency egress takes place.

**4.5** Test evacuations must take place such that, as far as reasonably practical, all personnel participate once a year. This test must include, where relevant, the use of safety refuge stations.

# 5.0 Co-ordination with other emergency services

**5.1** The Emergency Response Plan must incorporate the involvement of the in-house mine rescue teams, third party mine rescue teams (where available) and the use of local emergency services, as appropriate.

# 6.0 Personnel tagging system

**6.1** Each operation must have an effective system to identify who is underground.

# 7.0 Single entry/self-contained refuges

**7.1** Safe Working Practice (SWP) for single entry systems (these are working areas with one way in and the same way out) must be established. The SWP must state the maximum distance allowed before an alternate secondary means of egress or a refuge chamber is required. The SWP must also

quantify the maximum number of personnel allowed in a single entry system and any particular PPE or other precautions that are necessary.

7.2 Each operation must establish the need, location and capacity for self-contained refuge chambers.

# 8.0 Emergency training

8.1 All persons who work underground (including all contractors) must be trained in what to do in the event of an emergency. Visitors must receive instruction in the use of safety equipment and emergency procedures and must remain with the operations representative at all times while underground.

# 9.0 Revision History

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# D1.3 Fire precautions

## 1.0 Scope

1.1 This standard applies to all Rio Tinto managed, underground mining operations and projects, including;

- Existing sites and new acquisitions
- Exploration, through all development phases and construction
- Operation through to closure
- Post-closure management (where applicable)

## 2.0 Design

2.1 Each operation must identify and assess potential fire risks.

2.2 The operation will nominate a manager who must establish and implement a Fire Control Plan. The Fire Control Plan must:

a) Be designed by a **competent person** or group
b) Establish a Fire Risk Register that is reviewed annually
c) Apply fire prevention and mitigation control to the design, placement, and operation of **infrastructure/plant**, fuel, combustibles and explosive materials storage areas
d) Establish a system for the installation, inspection, and maintenance of fire detection, warning, and suppression systems
e) Provide for real-time carbon monoxide monitoring in major ventilation circuits of the mine
f) Establish fire response capabilities available at all times when people are underground
g) Identify and designate "No Smoking" areas
h) Identify prohibited items and establish a system to prevent these items entering underground areas
i) Include the requirement for self-contained self rescuers (SCSR) with a minimum 30-minute oxygen supply
j) Provide for caches of additional SCSR, determined by a **risk assessment**
k) Be reviewed annually by a **competent person** or group

2.3 A **competent person** or group must design the following systems:

- Fixed and portable fire detection
- Warning
- Suppression
- Alarms
- Equipment

2.4 Where likelihood for spontaneous combustion of **in situ** materials exists, a Spontaneous Combustion Management Plan must be implemented.

# 3.0 Implementation

3.1 Where the risk of fire from **hot work** exists, hot work procedures and permit systems must be implemented.

3.2 Petrol (gasoline) powered equipment must not be permitted underground.

### Mobile equipment

3.3 Where mobile equipment is used underground, the following controls must be implemented:

a) Mobile equipment is fitted with a hand held extinguisher mounted on the unit in an accessible location, the size and type of which is determined by a risk assessment
b) Mobile equipment containing more than 100 litres (26 gallons) of flammable hydraulic fluid is fitted with an automatic fire suppression system with suitable manual activation
c) Fire suppression systems must be able to be activated from inside and outside of the operator's cabin
d) Pre-shift inspections are carried out for mobile equipment to check for leaks and associated accumulations of hydrocarbons
e) Engine components that are a potential ignition source are shielded from exposure to fuel sources, where practicable

### Flammable and combustible materials

3.4 Flammable storage, fuel dispensing, workshops, sub-stations and explosive storage should, where practicable, be placed in exhaust airway locations.

3.5 Where there is a risk of fire from flammable and combustible materials, the following controls must be implemented:

a) Storage of flammable and combustible materials is minimised
b) Flammable and combustible materials are isolated from ignition sources
c) Fire resistant hydraulic fluids are used, where practicable
d) Pipelines delivering hydrocarbons are periodically inspected and identified leaks are repaired
e) Pipelines delivering hydrocarbons are run empty at the end of filling

cycles

### Electric cables

**3.6** All new electrical installations must use fire retardant, low-toxicity cables, where practicable.

### Heating, ventilation and air-conditioning systems

**3.7** Heating, ventilation and air-conditioning (HVAC) and intake air heater systems must:

a) Have emergency shutdown capabilities
b) Be provided with a fire suppression system

# 4.0 Key terms

The following key terms are found throughout this standard as **bold text**.

| | |
|---|---|
| **Competent person** | Someone who has demonstrable knowledge, experience and skills in all of the areas/disciplines that are covered by the Terms of Reference. Demonstration of this may be through appropriate tertiary qualification, accreditation, membership of professional association, work within the industry or by recognition by peers within the industry as being qualified to participate in the assessment. |
| **Hot Work** | Heat and spark producing operations such as welding, flame cutting and grinding. |
| **Infrastructure/Plant** | Buildings, structures, fixed equipment, electrical substations, hydrocarbon dispensing facilities, mine ventilation systems and heating, ventilation and air-conditioning (HVAC) systems. |
| **In situ** | In the natural or original position. Applied to a rock, soil, or stress etc., occurring in the original, unaltered state. |
| **Risk assessment** | The method of evaluating the consequence and likelihood of identified hazards or opportunities, and comparing against a defined risk acceptance threshold. The health, safety, environment and quality (HSEQ) risk framework contains three levels of assessment for consideration during risk evaluation. |

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# 5.0 Revision history

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| | | | | |

# D1.4 Hoisting and shaft sinking

## 1.0 Scope

1.1 This standard applies to all Rio Tinto managed, underground mining operations and projects, including;

- Existing sites and new acquisitions
- Exploration, through all development phases and construction
- Operation through to closure
- Post-closure management (where applicable)

## 2.0 Design

2.1 Each operation must identify and assess potential hoisting and **shaft sinking** risks.

2.2 Where there is a **hoisting system**, the operation must nominate a manager who will develop a Hoisting Plan. The Hoisting Plan must:

a) Be designed by a **competent person** or group
b) Establish **hoist** control methods
c) Establish maximum **hoist** speeds and deceleration rates
d) Provide for soft stopping and emergency stopping
e) Provide overwind and underwind prevention
f) Specify maximum allowable load
g) Establish the frequency and method for testing of all safety devices and control systems
h) Establish a plan for the inspection, maintenance, and modification of the **hoisting system**
i) Be reviewed by an independent **competent person** or group every two years, or more frequently as determined by a **risk assessment** or event

2.3 Where **shaft sinking** is conducted, the operation must nominate a manager to develop a Shaft Sinking Management Plan. The Shaft Sinking Management Plan must:

a) Be designed by a **competent person** or group
b) Provide specifications for the **shaft**, **winches**, **work-stage** and other **shaft sinking** equipment

c) Establish controls specific to **shaft sinking** hazards
d) Be reviewed by an independent **competent person** or group before construction is commenced
e) Establish a system of periodic structural inspection of the **work-stage**
f) Be reviewed by an independent **competent person** or group every two years or more frequently as determined by a **risk assessment** or event

**2.4** A **competent person** must design **shaft infrastructure**. An independent **competent person** or group must then review this design prior to construction or installation.

**2.5** Any modifications to shaft infrastructure, work stages, or hoisting equipment must be subject to engineering review by a **competent person** or group.

# 3.0 Implementation

### Hoists

**3.1** **Hoisting systems** must be provided with the following safety devices:

a) **Hoists** used for transporting personnel shall have at least two sets of mechanical brakes to stop and hold the drum, one of which must apply directly to the drum
b) Primary and secondary protection against over travel and over speed
c) An interlock system, for all **hoists** fitted with a clutch, to ensure the free drum is braked and the driven drum is limited to creep speed
d) A device to stop the **hoist** in the event that the conveyance does not move in relation to the amount of rope paid out.
e) Indicators to show the location and speed of conveyances in the **shaft**
f) An emergency off switch
g) Ammeter to indicate the winder motor current

**3.2** All conveyances used for transporting personnel must have a:

a) Secondary emergency egress should the primary conveyance becomes inoperable
b) System to prevent the conveyance from falling in the event of a rope failure except in **shaft sinking** and **major shaft rehabilitation** or **refurnishing** applications

**3.3** Any rope used as part of the hoisting system must have established:

a) Rope manufacturing quality assurance and quality control criteria for all rope procurements

b) Rope inspection and maintenance criteria for all ropes either in storage or in service
c) The method and frequency of rope end cuts and rope end cut testing
d) Discard criteria that addresses strength loss, corrosion, deformation and physical impairment

**3.4** Operations must maintain records of **hoist** rope data including, date of installation, serial number, maximum admissible legal life, end cut test results, manufacturing date, and safety factors.

**3.5** Conveyances and rope connecting **attachments** must be:

a) Designed or selected by a **competent person**
b) Provided with up to date engineering drawings
c) Provided with manufacturing quality assurance and control established for procurement
d) Maintained on a register that includes their serial number and rated load

**3.6** Conveyances used for transporting people must have two independent means of communication with the hoist operator.

**3.7** Persons who operate, inspect, maintain, or test any part of the hoisting system must be trained, **competent** and authorised to do so.

### Maintenance of hoists and shaft infrastructure

**3.8** Operations must implement a Maintenance and Inspection Plan for:

a) Mechanical and electrical components of the hoists and **shaft infrastructure**
b) Hoist rope **attachments** and conveyances
c) Structural integrity of **hoists** and **shaft infrastructure**
d) Safety devices and control systems
e) **Non-destructive testing (NDT)** of critical **hoist** components, ropes, **attachments**, conveyances and infrastructure

**3.9** Communication protocols between management and those carrying out maintenance and inspections must be established to ensure the timely notification of adverse findings

### Shaft sinking

**3.10** **Shaft sinking** safety devices must include:

a) Stage rope load indicators that are visible to the **hoist** operator
b) Engineered fall protection devices for conveyances and **work-stage**
c) Bucket movement controls above and below work stage
d) Fully enclosed bucket wells with signalling devices

**3.11** Persons must be tied off while travelling in a conveyance, unless the conveyance is fully enclosed.

# 4.0 Key terms

The following key terms are found throughout this standard as **bold text**.

| | |
|---|---|
| **Attachment** | Any device or equipment that connects a conveyance to the **hoist** rope. |
| **Competent person** | Someone who has demonstrable knowledge, experience and skills in all of the areas/disciplines that are covered by the Terms of Reference. Demonstration of this may be through appropriate tertiary qualification, accreditation, membership of professional association, work within the industry or by recognition by peers within the industry as being qualified to participate in the assessment. |
| **Hoist** | An electrically driven rope winder used for hoisting and lowering a conveyance in a vertical shaft or incline. Synonymous with winder. |
| **Hoisting equipment** | Hoisting arrangements and shaft furnishings used for the transport of men and materials within a vertical excavation. Includes: **hoist**, ropes, **head-frame**, conveyances, guides, sheaves, etc. |
| **Hoisting system** | A system that includes, for example; **hoists**, **head-frames**, ropes, conveyance and other equipment, used for the safe raising or lowering people, equipment or materials. |
| **Head-frame** | The frame at the top of a shaft, which supports the rope sheave and/or dumping gear. |
| **Major shaft rehabilitation** | Large-scale process of restoring a sub-standard or neglected product to its original or prime condition. |
| **Major refurnishing projects** | Comprehensive provision for and installation of: new equipment, infrastructure or utilities to enhance fundamental service requirements. |
| **Non-destructive testing (NDT)** | Analysis techniques used in industry to evaluate the properties of a material, component or system, without causing damage. |

| | |
|---|---|
| **Risk assessment** | The method of evaluating the consequence and likelihood of identified hazards or opportunities, and comparing against a defined risk acceptance threshold. The health, safety, environment and quality (HSEQ) risk framework contains three levels of assessment for consideration during risk evaluation. |
| **Shaft** | A vertical or inclined excavation in rock developed for the purpose of providing access to an ore body. |
| **Shaft infrastructure** | **Head-frames**, collars, sub-collars, and shaft furnishings including steel sets, guides, loading pockets, water rings, station landings, piping and electrical services, etc. |
| **Shaft sinking** | The method of excavating a vertical or near-vertical tunnel from the top down |
| **Winch** | A mechanical device that is used to wind up, wind out or adjust the tension of a wire rope. For **shaft sinking**, stage winches are used to support and adjust the position of the **work-stage**. |
| **Work-stage** | The suspended platform upon which shaft sinking operations are carried out, e.g. galloway, work deck. |

# 5.0Revision history

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|---|---|---|---|---|
| 1st August 2012 | 1st January 2013 | Steve Wood, Mike Egosque | Rio Tinto ExCo | |
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# D1.5 Explosive and hazardous atmospheres

## 1.0 Scope

1.1 This standard applies to all Rio Tinto managed, underground mining operations and projects, including;

- Existing sites and new acquisitions
- Exploration, through all development phases and construction
- Operation through to closure
- Post-closure management (where applicable)

1.2 This standard is to be read in conjunction with the Rio Tinto Health Performance Standards; most particularly:

- B1 - Particulate and gas/vapours exposures
- B6 - Thermal stress
- B10 - Occupational exposure limits

## 2.0 Design

2.1 Each operation must identify the potential for a **hazardous atmosphere** that may be harmful to personnel in the underground environment.

2.2 The **risk assessment** for a **hazardous atmosphere** must consider the potential for harmful effects from:

a) Naturally occurring gases within the strata and ore body
b) Gases liberated or created due to operational activities
c) Pre–existing gas reservoirs in the vicinity of operations
d) Spontaneous combustion of ore or waste
e) Combustible dust forming an explosive mixture

**2.3** Where there is a risk of **hazardous atmospheres**, the operation will nominate a manager who must develop a Ventilation Management Plan. The Ventilation Management Plan must:

a) Be designed by a **competent person** or group
b) Specify a **ventilation system** that provides a sufficient volume, velocity, and quality of air to prevent **hazardous atmospheres**
c) Provide for real-time carbon monoxide monitoring in major ventilation circuits of the mine
d) Establish a program of inspection and maintenance of the **ventilation system**
e) Establish a program of periodic monitoring and testing of the **ventilation system** carried out by a **competent person** or group
f) Incorporate a **Trigger Action Response Plan (TARP)** prescribing the pre-planned response to escalating levels of risk for explosive gases, thermal stresses, toxic and asphyxiating gases
g) Establish a system of monitoring for potentially harmful or explosive gases and dust that is designed by a **competent person** or group

# 3.0Implementation

### Combustible dust

**3.1** Where the potential for hazardous levels of combustible dust exist, the following controls must be implemented:

a) Limiting the amount of dust generated.
b) Suppression, collection and removal of dust at points of generation
c) Regular inspection for and removal of dust accumulation from infrastructure
d) **Inertisation** to treat coal dust

**3.2** Where the potential for a combustible dust explosion exists, there must be the means to minimise propagation of an explosion.

### Gases

**3.3** Where there is a risk of accumulation of harmful levels of gases, the following controls must be implemented:

a) Predetermined limits with appropriate factors of safety
b) Provision of sufficient volume, velocity, and quality of air to reduce the gas to an acceptable level
c) Assessment and monitoring of gases prior to entry and while working in the location
d) Trigger Action Response Plan (TARP) prescribing the pre-planned response to escalating levels of risk
e) Controls to prevent unauthorised access to areas containing a hazardous atmosphere

**3.4** Where there is a risk of a gas ignition or explosion, the following controls must be implemented:

a) Elimination or control of ignition sources
b) Use of intrinsically safe equipment

**3.5** Where continuous monitoring is used, the system must alarm at predetermined concentrations and activate a notification system.

**3.6** Where potential for **explosive** or **hazardous atmospheres** exist:

a) Underground personnel must be trained in the recognition of signs, indicators, and hazards of mine gases
b) Preventive measures and emergency procedures must be provided for

# 4.0 Key terms

The following key terms are found throughout this standard as **bold text**.

| | |
|---|---|
| **Competent person** | Someone who has demonstrable knowledge, experience and skills in all of the areas/disciplines that are covered by the Terms of Reference. Demonstration of this may be through appropriate tertiary qualification, accreditation, membership of professional association, work within the industry or by recognition by peers within the industry as being qualified to participate in the assessment. |
| **Explosive atmosphere** | Atmospheres, which may contain concentrations of gas or dust within explosive limits. |
| **Hazardous atmosphere** | Atmospheres, which may compromise the health and safety of workers; may include conditions that create thermal stress and hazardous concentrations of dust, toxic/asphyxiating gases, fumes etc. This concerns concentrations, which result in immediate risk. |
| **Inertisation** | The process of introducing inert gas or dust into an environment to prevent chemical **propagation** of a fire or explosion. |
| **Factor of safety** | It is the ratio or multiplier applied to a critical safety limit that manages the system while allowing for a margin of error. |

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| **Propagation** | The spread of flame or explosion through extensive areas of the mine as a result of initiating medium such as coal or sulphide dust. |
| **Risk assessment** | The method of evaluating the consequence and likelihood of identified hazards or opportunities, and comparing against a defined risk acceptance threshold. The health, safety, environment and quality (HSEQ) risk framework contains three levels of assessment for consideration during risk evaluation. |
| **Trigger Action Response Plan (TARP)** | A proactive risk management system that defines ascending pre-planned responses to escalating levels of risk. A TARP recognises that normal operating conditions may adversely change and proactively establishes pre-set levels of deviation known as triggers. When a trigger is realised a corresponding set of actions is initiated in response to the escalation. |
| **Ventilation system** | A designed methodology and supporting infrastructure which:<br>• Provides adequate quantities of fresh air to the underground workings<br>• Dilutes and transports hazardous atmospheres into exhaust air-ways and out of the mine |

# 5.0 Revision history

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|---|---|---|---|---|
| 1st August 2012 | 1st January 2013 | John Coughlan, Russell Uhr | Rio Tinto ExCo | |
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# D1.6 Inflow or inundation of liquids

## 1.0 Scope

1.1 This standard applies to all Rio Tinto managed, underground mining operations and projects, including;

- Existing sites and new acquisitions
- Exploration, through all development phases and construction
- Operation through to closure
- Post-closure management (where applicable)

## 2.0 Design

2.1 Each operation must identify and characterise the geological, hydrogeological and geotechnical feature(s) to determine the potential for **uncontrolled inflow** and **inundation**.

2.2 Where the hazard of **uncontrolled inflow** and **inundation** exists, the operation will nominate a manager who must establish and implement an Inflow and Inundation Management Plan. The Inflow and Inundation Management Plan must:

a) Be based on a **risk assessment** of potential **uncontrolled inflow** and **inundation** carried out by a **competent person** or group
b) Implement controls specific to identified risks
c) Incorporate a **Mine Water Management System**
d) Be reviewed by an independent **competent person** or group every two years or more frequently as determined by a **risk assessment**, event or when there is a material change to the **mine plan**

2.3 The **risk assessment** for **inflow** and **inundation** must consider the following sources as a minimum:

a) From a major water bearing structure/feature
b) Along each high risk structure/feature as determined by a **competent**

**person**

c) From drill holes, flooded historical workings, and/or adjacent mines
d) Due to failure of a **water retaining pillar**
e) Due to failure of a **water retaining structure**
f) Due to **surface waters** entering the mine
g) From improper design or operation of a **Mine Water Management System**

# 3.0 Implementation

**3.1** The design and location of mine entry points must consider the potential for **inflow** and **inundation**.

**3.2** **Inflow** and **inundation** hazards specific to the work areas must be included on up-to-date **mine plans**. Potential inaccuracies in the location of the historical workings and/or workings from adjacent mines must be indicated on up-to-date **mine plans**.

**3.3** Procedures must be established for managing an intersection with a drill hole or breakthrough to a historical working or adjacent mines.

**3.4** The operation must retain relevant available information including:

a) Historical mine workings within the zone of influence of the operating mine
b) Adjacent mines within the zone of influence of the operating mine
c) Drill hole information with associated treatment records
d) Major water bearing structure(s)/feature(s)

**3.5** When excavating in areas of limited knowledge, with high **inflow** risk potential, a program of **probe drilling** ahead of the excavation must be in place.

**3.6** Where the risk of **uncontrolled inflow** from major structures and/or features, drill holes, flooded historical workings, and/or adjacent mines exists, the following controls must be implemented:

a) All drill holes which pose an **inflow** risk must be plugged/grouted upon completion of service life
b) All drill holes which pose an **inflow** risk must be clearly identified on relevant **mine plans**
c) Major structures and/or features must be portrayed on relevant **mine plans** and clearly identified as inflow risks.

**3.7** Where the risk of **uncontrolled inflow** due to failure of a **water retaining pillar** exists, the following controls must be implemented:

a) The Ground Control Management Plan (GCMP) must specifically address the design of **water retaining pillars** (i.e. **crown pillar**, **barrier pillar**), provisions for assessing on-going stability (monitoring/inspection) and a clear decision making process for

evaluating monitoring data

b) **Water retaining pillar**(s) must be designed by a **competent person**

**3.8** Alterations to any **water retaining pillar**(s) require a **risk assessment** performed by a **competent person** or group.

**3.9** Where the risk of **uncontrolled inflow** due to failure of a **water retaining structure** exists, the following controls must be implemented:

a) The location of mine entry points must consider the proximity of **water retaining structures** and appropriate controls implemented
b) Surface and underground **water retaining structures** must be designed by a **competent person** or group
c) Procedures must be established for the monitoring and inspection of **water retaining structures**

**3.10** Where the risk of **uncontrolled inflow** due to **surface waters** entering the mine exists, the following controls must be implemented:

a) Potential **surface water inflow** quantities (e.g.1:100 year event for storms) must be incorporated into the mine pumping system design and water management programs
b) Clear **Trigger Action Response Plans (TARP)** must be in place for storm events

**3.11** Where failure of the **Mine Water Management System** poses an **inundation** risk, the system shall:

a) Be designed by a **competent person** or group
b) Be designed based on hydrogeological measurements, predicted inflows, and modelling
c) Be aligned with the current site **water balance** data
d) Have continuous monitoring and alarm systems for critical elements of the **Mine Water Management System**
e) Include systems to actively monitor flow that are routinely calibrated
f) Include procedures for the operation, monitoring, inspection, and maintenance of critical elements of the **Mine Water Management system**
g) Include provision of spares for critical components of the **Mine Water Management System**
h) Provide protection from inundation for electrical installations that are critical to the **Mine Water Management System**
i) Have a reliable power supply. The need for a secondary power feed to the **Mine Water Management System** must be evaluated and documented through a formal **risk assessment**

# 4.0Key terms

The following key terms are found throughout this standard as **bold text**.

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|---|---|
| **Auxillary pumping/piping** | Pumping/piping capacity that exists outside of the normal operating mine water management system that is available for use in the event of an emergency. Examples include: back up/spare electrical pumps and starters; portable diesel pumps; redundant pipelines, large diameter hose. May also include resources from neighbouring operations. |
| **Barrier pillar** | A rock pillar, which forms the boundary between working areas or between adjacent mines. |
| **Competent person** | Someone who has demonstrable knowledge, experience and skills in all of the areas/disciplines that are covered by the Terms of Reference. Demonstration of this may be through appropriate tertiary qualification, accreditation, membership of professional association, work within the industry or by recognition by peers within the industry as being qualified to participate in the assessment. |
| **Crown pillar** | The rock pillar, which separates underground workings from the surface. |
| **Historical mine workings** | Old or abandoned mine workings that are no longer active. Examples of mine workings include: tunnels, shafts, raises, stopes, and inaccessible or collapsed areas. This also includes workings from adjacent mines if applicable. |
| **Inflow** | Unplanned and/or **uncontrolled inflow** of water into mine workings that pose a hazard to the safety of personnel. Potential sources of origin: Intersection of **surface water** bodies, aquifers, fault zones, historical mine workings, drill/probe holes, failure of a **water retaining structure** or **water retaining pillar**, or atmospheric conditions in which storm water enters the mine. The volume of water is such that it is not generally manageable with normal operating water management capacity. |
| **Inundation** | The risk of mine flooding due to potential inflows that exceed the capacity of the **Mine Water Management System**; either through under-design of the system or through failure of part or all of the system. The risk of mine flooding is such that it poses a hazard to the safety of personnel. |
| **Major water bearing structure/feature** | Term used for a geological feature that has potential to act as a major water conduit or reservoir. Examples include: faults, |

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| | persistent joints, bedding planes, dykes, shear zones, geological contacts, buried channels, aquifers, seams, strata, and limestone voids that may hold water. |
| **Mine plan** | Design drawings that define the specific location of underground openings, utility services, and infrastructure items that are used for planning, scheduling, and mining related purposes. |
| **Mine Water Management System** | The network of pumps, piping, and associated energy sources used throughout the mine to manage water. |
| **Probe Drilling** | The activity of drilling in advance of development or production drifts to check for the presence of **water bearing structures** or features. Common drill types include: diamond drills, jumbos or production drills |
| **Risk assessment** | The method of evaluating the consequence and likelihood of identified hazards or opportunities, and comparing against a defined risk acceptance threshold. The health, safety, environment and quality (HSEQ) risk framework contains three levels of assessment for consideration during risk evaluation. |
| **Surface water** | Examples include: tidal waters, lakes, creeks, rivers, oceans, flood planes, surface impoundments or reservoirs, pipelines, storm events, melt water. |
| **Trigger Action Response Plan (TARP)** | A proactive risk management system that defines ascending pre-planned responses to escalating levels of risk. A TARP recognises that normal operating conditions may adversely change and proactively establishes pre-set levels of deviation known as triggers. When a trigger is realised a corresponding set of actions is initiated in response to the escalation. |

| | |
|---|---|
| **Water balance** | Describes flow of water *in* and *out* of a system and includes the effects of precipitation, run off, evaporation, transpiration, and changes in storage. Hydrogeological modelling commonly supports complex water balances. |
| **Water retaining pillar** | Any rock pillar, which prevents or may prevent water from entering an underground mine. **Crown pillars** and **barrier pillars** may be considered **water retaining pillars**. To be considered relevant for this standard, failure of the pillar must pose a safety risk to underground workers. |
| **Water retaining structure** | A man made structure designed to hold back water. To be considered relevant for this standard, failure of the structure must pose a safety risk to underground workers. Examples include: dams, dykes, bulkheads, weirs, and impoundment areas. |

# 5.0Revision history

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|---|---|---|---|---|
| 1st August 2012 | 1st January 2013 | Lyndon Clark<br>Bill Forsyth | Rio Tinto ExCo | |
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# D1.7 In-rush solids

## 1.0 Scope

1.1 This standard applies to all Rio Tinto managed, underground mining operations and projects, including;

- Existing sites and new acquisitions
- Exploration, through all development phases and construction
- Operation through to closure
- Post-closure management (where applicable)

## 2.0 Design

2.1 Each operation must identify the potential for **in-rush of solids** that may be harmful to personnel in the underground environment.

2.2 Where there is a risk from the **in-rush of solids**, the operation will nominate a manager who must establish and implement a Draw Control Plan. The Draw Control Plan must:

a) Incorporate a protocol based on a **risk assessment** to identify **draw points** that have a high risk potential for in-rushes
b) Incorporate a Trigger Action Response Plan (TARP) for extraction from draw points
c) Be reviewed by an independent, **competent person** or group every two years or more frequently as determined by a **risk assessment**, event or when there is a material change to the **mine plan**

2.3 The **risk assessment** for the **in-rush of solids** must consider the potential for:

a) The presence of wet and fine material in **draw points**
b) **Bulkhead** failure that could result in the sudden in-rush of material into working areas where personnel may work or travel
c) The build-up of cuttings/chippings created by the reaming action of the **raise borer**
d) Backfill failure

## 3.0Implementation

3.1 A **competent person** must conduct periodic surveys of all draw points to monitor:

a) Changes in moisture content
b) Fragmentation

**3.2** Where there is a risk of uncontrolled **in-rush of solids** from a **draw point**, the following controls must be implemented:

a) A method of communicating high risk **draw points**
b) A Draw Control Plan that specifies an extraction rate
c) Monitoring of **draw point** extraction rates to reduce the potential for water build up
d) Controls to prevent unauthorised access to all draw points
e) Impedance methods to control the flow of muck where there is a high risk of in-rush

**3.3** There must be a method of stabilising the muck pile before any maintenance or rehabilitation takes place in a **draw point**.

**3.4** Where the risk of uncontrolled **in-rush of solids** from **bulkhead** failure is identified, the following controls must be implemented:

a) **Bulkheads** must be designed and installed by a **competent person** or group
b) Active **bulkheads** must be periodically inspected by a **competent person**

**3.5** Where there is a risk of uncontrolled **in-rush of solids** from **ore passes**, **chutes**, or **raise boring**, the following controls must be implemented:

a) Ore passes and **chutes** must be designed by a **competent person** or group
b) Controls to prevent unauthorised access
c) **Chute** controls are located to ensure the safety of the **chute** operator
d) Procedures established for the operation, maintenance, and inspection of the **chute** under all operating conditions
e) Procedures and methods established to minimise the potential for the build-up of **raise bore** cuttings during the reaming processes

**3.6** Where the risk of **in-rush of solids** from backfill failure is identified, the following controls must be implemented:

a) Backfill operations, placement, materials, and procedures must be designed by a **competent person** or group
b) A system of quality control and assurance is established for backfill operations and materials

# 4.0 Key terms

The following key terms are found throughout this standard as **bold text**.

| | |
|---|---|
| **Backfill** | The process of placing material into an excavated void, filling the mined out area with solid material. |

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| **Bulkhead** | A barrier designed to protect areas of a mine from in-rushes. |

| | |
|---|---|
| **Competent person** | Someone who has demonstrable knowledge, experience and skills in all of the areas/disciplines that are covered by the Terms of Reference. Demonstration of this may be through appropriate tertiary qualification, accreditation, membership of professional association, work within the industry or by recognition by peers within the industry as being qualified to participate in the assessment. |
| **Chute** | A steel structure that is used to control the flow of material from an ore pass. |
| **Draw point** | A loading point on the **extraction** level where caved rock is **extracted** from the cave using Load Haul Dump (LHD) vehicles, slushers or any other means of loading. |
| **Extraction (pulling or drawing)** | The process of **extracting** caved or broken ore from a cave or stope. |
| **Impedance** | Means to deliberately obstruct or slow down the flow of rock |
| **In-rush of solids** | The unplanned/uncontrolled sudden inflows of dry or liquefied solids into the mine from **draw points**, **bulkhead**s, **chutes**, **ore passes** or **raise bore passes**. |
| **Ore pass** | Steeply inclined excavation used to transfer or store broken rock between levels. |
| **Mine plan** | Design drawings that define the specific location of underground openings, utility services, and infrastructure items, which are used for planning, scheduling, and mining related purposes. |
| **Raise bore** | A method of developing a raise by reaming. |
| **Risk assessment** | The comparison of the results of a risk analysis with risk acceptance criteria or other decision parameters. |
| **Trigger Action Response Plan (TARP)** | A proactive risk management system that defines ascending pre-planned responses to escalating levels of risk. A TARP recognises that normal operating conditions may adversely change and proactively establishes pre-set levels of deviation known as triggers. When a trigger is realised a corresponding set of actions is initiated in response to the escalation. |

# 5.0 Revision history

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|---|---|---|---|---|
| 1st August 2012 | 1st January 2013 | Wayne Southey<br>Expect Ntsepe | Rio Tinto ExCo | |
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# D1.8 Air blast

## 1.0 Scope

1.1 This standard applies to all Rio Tinto managed, underground mining operations and projects, including;

- Existing sites and new acquisitions
- Exploration, through all development phases and construction
- Operation through to closure
- Post-closure management (where applicable)

## 2.0 Design

2.1 Each operation must identify the potential for an **air blast** that may be harmful to personnel in the underground environment.

2.2 Where there is a risk of an **air blast**, the operation will nominate a manager who must establish:

a) A Cave Management Plan that defines the strategies used in the management of all aspects of the cave, and the coordination of the interrelated elements
b) A system designed to measure, model, or approximate the changing size and three dimensional characteristics of the cave back and muck pile shall be developed and implemented
c) **Air blast** modelling and methodologies used to define air gap parameters and associated risk levels
d) A management system for the geotechnical monitoring system
e) A **Trigger Action Response Plan (TARP)** prescribing the pre-planned response to escalating levels of risk
f) A **Trigger Action Response Plan (TARP)** for defective or malfunctioning geotechnical monitoring systems. Each operation shall have performed geotechnical investigations to determine local and regional rock properties, stresses, and strengths, to facilitate the building of relevant models
g) Suitably qualified and experienced geotechnical engineers to interpret, and develop the data and resultant models

2.3 Geotechnical investigation methodologies, models, plans, and recommendations shall be reviewed by a competent third party.

# 3.0 Implementation

**3.1** **Cave back** propagation and muck pile monitoring systems shall utilise multiple types of geotechnical monitoring systems to facilitate the cross-examination and validation of data.

**3.2** All openings to the cave, which exist above the **extraction level**, shall have barriers installed to protect workers from hazardous wind velocities.

**3.3** Protective barriers must be designed, installed, periodically inspected, and maintained by a **competent person** or group.

**3.4** Underground personnel must be trained in the recognition of signs, indicators, and energies of potential **air blast** events.

### Geotechnical monitoring

**3.5** The operation must establish real time **geotechnical** and **subsidence** monitoring which a **competent person** or group must review.

**3.6** An independent **competent person** or group must periodically assess results of **geotechnical** and **subsidence** monitoring systems.

### Subsidence

**3.7** Each operation must identify the potential for **subsidence** that may be harmful to personnel underground and/or persons on the surface.

**3.8** Where there is a risk of surface **subsidence**, the operation must ensure the Cave Management Plan provides for:

a) Only suitably qualified and experienced geotechnical engineers to interpret relevant data, and develop the resultant **subsidence** models
b) **Subsidence** zone identification that includes the predicted surface area to be impacted (foot-print) and a suitable **factor of safety** applied
c) The **subsidence** zone must be proactively provided with remote monitoring capabilities
d) An effective means of securely controlling access to the entire surface area of the **subsidence** zone must be implemented prior to causal mining activities

### Pillar dependent mines

**3.9** Pillar system modelling and design must be developed by a **competent person** and reviewed by an independent **competent person** or group.

**3.10** A **competent person** must design pillar extraction activities.

**3.11** Procedures must be established for the regular inspection and monitoring of pillars to ensure their integrity is maintained.

**3.12** Pillar alterations resulting in a reduction of **factors of safety** must be designed by a **competent person** and be subject to management of change procedures.

**3.13** To control Cascading Pillar Failure; compromised pillar integrity must be evaluated for stresses which may be transferred and applied to neighbouring pillars resulting in loading beyond their design capacity.

**3.14** Roadways/Haulage-ways/Headings must be inspected on a regular basis and maintained as necessary to protect the integrity of pillars.

### Goaf

**3.15** A **competent person** shall monitor the goaf to ensure failure is occurring as designed.

**3.16** A Trigger Action Response Plan (TARP) prescribing the pre-planned response to escalating levels of risk will be developed and implemented to respond to hazards associated with goaf failure and corresponding air blast potentials.

**3.17** Measures to induce collapse in non-failing **goaf** must be implemented as soon as practicable to reduce the magnitude of the potential **air blast**.

# 4.0 Key terms

The following key terms are found throughout this standard as **bold text**.

| | |
|---|---|
| **Air blast** | The rapid flow of air through an underground opening following compression of the air in a constrained area. The rush of air, at times explosive in force, is caused by the ejection of air from large underground openings, resulting from the sudden fall of large rock masses, the collapse of pillars, slippage along a fault. |
| **Back** | Term used mainly for the roof or upper part of any underground mining cavity. As applied to an arch, the outer or upper surface. |
| **Cave back (Cave crown)** | The under-surface of the in situ, but possibly disturbed, rock above a cave or muckpile (caved ore). |
| **Cave monitoring** | Measurements of the rock mass' response to caving, typically focussed on tracking the cave propagation, cave subsidence and underground infrastructure stability. |
| **Cave propagation** | The process of propagation of an initiated cave by the progressive drawing of broken ore in a planned and |

| | |
|---|---|
| | controlled manner. |
| **Competent person** | Someone who has demonstrable knowledge, experience and skills in all of the areas/disciplines that are covered by the Terms of Reference. Demonstration of this may be through appropriate tertiary qualification, accreditation, membership of professional association, work within the industry or by recognition by peers within the industry as being qualified to participate in the assessment. |
| **Draw (pull)** | The process of extracting caved or broken ore from a cave or stope |
| **Draw point** | A loading point on the extraction level where caved rock is extracted from the cave using LHDs, slushers or any other means of loading. |
| **Extraction level (production level)** | The level in a caving mine through which the caved or broken ore is extracted and transported away from the cave. |
| **Factor of safety** | It is the ratio or multiplier applied to a critical safety limit that manages the system while allowing for a margin of error. |
| **Geotechnical** | The application of scientific methods and engineering principles to the acquisition, interpretation, and use of knowledge of materials of the Earth's crust for the solution of engineering problems. It embraces the fields of soil mechanics and rock mechanics, and many of the engineering aspects of geology, geophysics, hydrology, and related sciences. |
| **Goaf** | That part of a mine from which the ore has been removed and the excavated area filled with caved rock, or mechanically placed waste rock. |
| **In situ** | In the natural or original position. Applied to a rock, soil, or stress etc., occurring in the original, unaltered state. |
| **Securely controlled** | An engineered means of control which provides a physical barrier designed to restrict and manage access to a specified area. Engineering controls will be additionally supported by administrative controls which provide for management of controlled area, e.g. entry protocols and procedures, training, documentation, inspection, and maintenance of systems, etc. |
| **Suitably qualified** | Has direct experience and educational background in |

| | |
|---|---|
| | subject matter specialization and is able to produce documented evidence of such. |
| **Trigger Action Response Plan (TARP)** | A proactive risk management system that defines ascending pre-planned responses to escalating levels of risk. A TARP recognises that normal operating conditions may adversely change and proactively establishes pre-set levels of deviation known as triggers. When a trigger is realised a corresponding set of actions is initiated in response to the escalation. |

# 5.0Revision history

| First issue | Effective date | Prepared by | Approved by | |
|---|---|---|---|---|
| 1st August 2012 | 1st January 2013 | Larry Jaudon<br>Ian Ross<br>Andre Van As | Rio Tinto ExCo | |
| **Revision no.** | **Revision date** | **Revised by** | **Approved by** | **Reason for change** |
| | | | | |
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# D1.9 Explosive agents

## 1.0 Scope

1.1 This standard applies to all Rio Tinto managed, underground mining operations and projects, including;

- Existing sites and new acquisitions
- Exploration, through all development phases and construction
- Operation through to closure
- Post-closure management (where applicable)

## 2.0 Design

2.1 Each operation that manufactures, stores, handles, transports or uses **explosives** must have a nominated manager responsible for the implementation of this standard.

2.2 The nominated manager must ensure that **risk assessments** are performed for all aspects of managing, manufacturing, storing, handling, transporting and using **explosives** on site and approve these assessments.

2.3 The nominated manager must arrange for the development of and approve an **Explosives** Management Plan that:

a) Is designed by a **competent person**
b) Is reviewed by an independent **competent person** or group every two years or more frequently as determined by **risk assessment**
c) Includes procedures to control the risks associated with manufacturing, transport, storage, handling, use and disposal of **explosives**
d) Establishes **exclusion zones** to control risk of ignition from extraneous sources e.g. electricity, lightning, projectiles, fire, and impact by mobile equipment
e) Establishes controls that restrict unauthorised access to **explosives**
f) Includes procedures for **explosives** inventory management, control and reconciliations, with records kept for a minimum of two years
g) Includes an assessment and annual review of the likely footprint from an unplanned explosion at an explosive manufacturing or storage facility, by a **competent person**
h) Establishes controls to mitigate the potential effects and impacts an explosion may have on site infrastructure including, but not limited to:

- Commonly used transport routes

**2.3 (cont)**

- Permanently and temporarily occupied buildings such as:
  - Offices
  - Workshops
  - Control rooms

i) Includes procedures to control the risk of explosions from activities associated with maintenance and servicing of plant and equipment that is used to manufacture, store, transport or handle **explosives**

j) Includes procedures to control the risks of explosions from lightning, dust storms or other significant natural events

k) Establishes the competency and authorisation requirements for all activities associated with **explosives**

l) Establishes an "**explosives** awareness" training programme for all personnel who may:
- Come in contact with **explosives**
- Be in the vicinity of a blast zone

**2.4** **Explosives** manufacturing and storage facilities must be designed and annually audited by a **competent person** or group

# 3.0Implementation

### Transporting explosives

**3.1** Vehicles and other conveyances used to transport explosives must:

a) Display signage indicating that explosives are being carried

b) Be under the direct supervision of an authorised person (unless parked in a designated and secure blast area or explosive compound)

**3.2** During transport; packaged **explosives**, **high explosives** and **initiating explosives** must:

a) Be stowed in lockable receptacles, which are clearly signed to indicate the nature of the contents

b) Be secured in a manner such that they will remain in a stable position

c) Not be transported with any non-compatible substances, e.g. dangerous goods, chlorate based products or fire risk substances

**3.3** **Initiating explosives** must not be stowed in the same airspace as packaged or **high explosives**.

### Use of explosives

**3.4** All operations that conduct blasting must develop plans and procedures for charging, blasting and reporting processes.

**3.5** Blast sites (loaded blast holes/patterns) must be adequately demarcated and made secure to prevent unauthorised or inadvertent access.

**3.6** The location of blast sites must be communicated to personnel who work or travel in the vicinity of the blast site.

**3.7** Procedures must be in place that ensures drill holes will not intersect previously charged blast holes.

**3.8** **Loading** of **explosives** must be under the direct supervision of an authorised person.

**3.9** Where **non routine blasting** is carried out, specific procedures must be established and implemented to control the risks

**3.10** All operations that conduct blasting must develop and implement a blast firing procedure that includes:

a) The appointment of a qualified blaster/shot-firer as the person responsible for the blast
b) A process for establishing a blast clearance zone based on a **risk assessment** that takes into account the impact for:
    - The immediate blast area
    - Assets outside the immediate blast zone area including:
        - People,
        - Plant/equipment,
        - Facilities/infrastructure
        - Ventilation pathways etc.
c) An assessment of the interactions/impacts on the following, which are outside the blast clearance zone:
    - People
    - Plant/equipment
    - Facilities/infrastructure
    - Ventilation pathways etc.
d) process for notifying, clearing, securing, initiating and subsequently re-entering, the blasting area
e) A process for identifying, addressing, reporting, and investigation of misfires

# 4.0 Key terms

The following key terms are found throughout this standard as **bold text**.

| | |
|---|---|
| **Competent person** | Someone who has demonstrable knowledge, experience and skills in all of the areas/disciplines that are covered by the Terms of Reference. Demonstration of this may be through appropriate tertiary qualification, accreditation, membership of professional association, work within the industry or by recognition by peers within the industry as being qualified to participate in the assessment. |
| **Exclusion zone** | A designated area, which is used solely for a specific purpose and disallows activities, materials and energies, which are incompatible with its safety and usage. |
| **Explosives** | Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i.e., with substantially instantaneous release of gas and heat. For the purpose of this standard all forms of ammonium |

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| | nitrate, **high explosives**, **initiating explosives** and explosive devices are identified as **explosives.** |
| **High explosives** | Molecular **explosives** such as nitro-glycerine, TNT, HMX, PETN etc. and are usually found in mines as boosters and detonating cord. |
| **Initiating explosives** | Devices containing **explosives** that are used to initiate explosive charges (i.e. detonators). |
| **Loading** | Placement of explosive charges into drilled holes in preparation of blasting activities. |
| **Non routine blasting** | Blasting that is atypical or unconventional by it nature, examples include (blasting in):<br>• Reactive ground<br>• Elevated-temperature ground<br>• Oversize materials<br>• Crushers<br>• Surface blasting near underground workings or facilities |
| **Risk assessment** | The method of evaluating the consequence and likelihood of identified hazards or opportunities, and comparing against a defined risk acceptance threshold. The health, safety, environment and quality (HSEQ) risk framework contains three levels of assessment for consideration during risk evaluation. |

# 5.0Revision history

| First issue | Effective date | Prepared by | Approved by | |
|---|---|---|---|---|
| 1st August 2012 | 1st January 2013 | Alan Cameron | Rio Tinto ExCo | |
| **Revision no.** | **Revision date** | **Revised by** | **Approved by** | **Reason for change** |
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**For further information contact:**

**Prospect**
http://prospect.riotinto.org and search for **HSE**

**Rio Tinto plc.**
Office 5, Aldermanbury Square
London, EC2V 7HR
United Kingdom

# D2 – Molten Materials

22 February 2011

## 1 Scope

This standard is applicable to all Rio Tinto business units and managed operations, including new acquisitions, administration/corporate offices and research facilities located off site; during exploration, through all development phases and construction, operation to closure and, where applicable, for post closure management.

1.1 This standard applies to all activities and equipment involving molten materials.

1.2 Molten materials are, for example, molten metals, alloys, slags, matte, electrolyte bath and liquid pitch.

1.3 Personnel involved in the handling of molten material must be trained and competent in relation to the controls required to safely manage the hazards.

## 2 Charge materials

2.1 There must be a system for the specification, purchase, inspection and storage of materials, including scrap, used to charge furnaces and ladles.

2.2 The level of moisture and the reactivity of other materials must be such that it does not lead to an explosion or violent reaction.

2.3 There must be a system in place to ensure that bottles, cans and other closed liquid or gas containers are not charged to furnaces and ladles.

2.4 An assessment must be made to determine the potential for hazardous levels of radioactivity to be present in charge materials, including purchased scrap metal. Where the potential for hazardous levels of radioactivity in charge materials exists, then appropriate measures must be taken to manage the risk.

# 3 Furnaces, ladles, launders, granulation and casting equipment

3.1 All equipment must be designed to prevent the likelihood and implications of a spill, "breakout", "foaming" or splashing of molten material including exposure to excess heat. Appropriate emergency exits must be provided to allow for safe exit from the furnace or vessel area in the event of an emergency.

3.2 Water sumps, drains, piping and potential water accumulation spots should, as far is practicable, be located in areas where contact with molten materials is not possible. To the extent that this cannot be achieved, they must be protected from contact by molten material by suitable heat resistant barriers and diversions.

3.3 Electrical systems, hydraulic, air and water systems (piping), control systems, fuel and oxygen systems and compressed gas cylinders should, as far as is practicable, be located in areas where contact with molten material is not possible. Where contact by molten materials is possible, suitable heat resistant barriers and diversions must be provided.

3.4 The integrity of furnaces, ladles, etc must be checked regularly, i.e. through the frequent monitoring of surface temperatures and/or visual checks for wear, cracking and mechanical damage.

3.5 The structural elements of furnaces must be kept within their operating temperature design limits. A system must be in place to ensure that these are known and monitored. The system must also include a means of managing factors that could impact control, such as the accumulation of dust or other insulating material.

3.6 Furnace binding tie rods will be fitted with retention chains.

3.7 All direct chilled water-cooled continuous casting equipment and water-cooled furnaces must have an assured water supply in the event of power failure, equipment breakdown or other emergency. Procedures for re-establishment of cooling water after an outage must be established.

3.8 Granulation water supply systems must be designed with automatically acting back up supply in the event of failure of the primary water supply.

3.9 Equipment must be designed to "fail safe" in the event of any power or energy source failure.

3.10 Hazard analysis must be used to establish the requirement for explosion containment or vents to allow the controlled release of gases in a low risk direction and to mitigate the effects of explosions.

3.11 Standard operating procedures and adequate indicators and alarms are required for both normal and emergency operations and maintenance. Emergency shutdown procedures shall be reviewed at least once every three years, updated where necessary and operating personnel must conduct drills at least annually.

# 4 Process management

4.1 Hazard analysis must be used to define access, standard operating conditions and control measures for all molten material processes and take into account risks due to such things as run-outs, hot work, explosions, hazardous fumes, foaming and spillage.

4.2 Operating procedures must exist for inspection, cleaning, blasting and other process maintenance activity.

4.3 The operating temperature of molten materials shall be maintained within the defined limits required by the process. Temperature ranges must be established and a system for identifying, recording and managing any deviations must be in place.

4.4 Fuel combustion systems must be fitted with appropriate flame safety systems to prevent conditions that could lead to an explosion or fire.

4.5 Best practicable technologies and practices must be employed to capture hazardous fumes and gaseous products as low as reasonably practical.

4.6 Working procedures should avoid the necessity of working over an opening into a hot vessel or molten bath by applying engineering controls, i.e. protective covers, barricades etc or suitable mitigation.

Work in the vicinity of an open vessel containing molten material must be performed at a safe distance with appropriate tools and safety equipment. When this is not possible, a risk assessment must be used to define appropriate operating conditions, practices and control measures to be implemented in order to prevent an accidental fall and contact with the molten material within the vessel.

# 5 Molten material transfer

5.1 A risk analysis of on-site molten material transport roads and rail lines must be carried out to identify and control the hazards that could result in molten metal spillage or loss of vehicle control. Radius of turns, camber and bends, road surface condition and maintenance, operational speeds and vehicle design requirements must be considered as part of this analysis.

The hazards associated with molten material transfer off and on public roads and rail lines must be subjected to a risk analysis and the practice must be authorised by the appropriate government authorities.

Traffic rules for molten material transport vehicles must be developed and rigorously enforced. On-site molten material transport vehicles must be kept away from other vehicles and pedestrians unless effective risk controls have been established and implemented.

5.2 Controls must be implemented to safeguard against the consequences of a dropped load, spill or leak of molten material.

5.3 Transfer systems, e.g. launders, must be built so that excessive flows will be readily diverted to a pit or a designated overflow vessel or receptacle of adequate size to accommodate spills of any size identified during the risk analysis.

5.4 Exposure to extreme temperature must be taken into consideration when specifying design, inspection and operating requirements for lifting equipment used for molten material transfer e.g., ladles, hooks, bail beams, chains.

5.5 There must be a back-up system to control molten material pouring equipment to a safe position in the event of equipment or power (energy source) failure. Suspended loads must be securely held in the event of a power (energy source) failure and a specific emergency procedure must exist.

# 6 Protective equipment

6.1 A risk assessment must be carried out to establish access control and personal protective equipment (PPE) requirements in areas and for tasks where there is the potential for spillage, emissions of flame or gases, or explosion.

6.2 Vehicle cabs and operating positions (where reasonably practical) exposed to splashes, falling material, explosion or projected particles must be protected or screened with appropriate material, e.g. heat resistant glass or plastic where visibility is a requirement or by metal or fabric shields.

# 7 Revision history

| Version no. | Effective date | Prepared by | Authorised by | |
|---|---|---|---|---|
| 1 | Jan. 2001 | CEO Safety Adviser | Exco | |
| Version no. | Revision date | Revised by | Approved by | Reason for change |
| 2 | Dec. 2008 | Paul Dewar, Adrian van Tonder | Rob Davies | Incorporation of suggested changes from operations and alignment with HSEQ management system. |
| 3 | Jan. 2011 | Patrick James | Suresh Rajapakse | Business review. |

# D3 – Management of pit slopes, stockpiles, spoil and waste dumps September 2010

## 1 Scope

1.1 This standard applies to all Rio Tinto business units and managed operations, including new acquisitions. It covers exploration, through all development phases and construction, operation to closure and, where applicable, post closure management.

1.2 This standard covers the geotechnical hazards associated with temporary or permanent slopes excavated for the purposes of mining an ore reserve. It also covers waste dumps, stockpiles, spoil, and land bridges (collectively called "dumps").

1.3 The business unit or managed operation must comply with prevailing mining law and government legislation in the country or state in which it operates and comply with relevant mining title licence conditions.

## 2 Design

2.1 Each operation with a pit slope or waste dump must have a nominated manager responsible for the implementation of this standard.

2.2 The nominated manager must arrange for the development of a Slope Management Plan (SMP) and Dump Management Plan (DMP) to meet the requirements defined in the Rio Tinto work cycle – Management of pit slopes, stockpiles, spoil and waste dumps – process steps and work practices.

2.3 SMPs and DMPs must:

a) be developed using suitably qualified and experienced engineers, geotechnical and other technical specialists;

b) be based on adequate geologic, geotechnical and hydrogeologic data;

c) include operating and slope monitoring procedures based on adequate geologic, geotechnical and hydrogeologic data;

d) document that slopes and dumps are designed and constructed to specified minimum stability criteria using industry-accepted design techniques;

e) document that the slopes and dumps are designed and constructed to minimise risk during operation and closure;

f) define accountabilities and those roles authorised to change either the design or mine plans; and

g) be reviewed by an independent competent person or group every two years, or more frequently, as determined by a risk assessment or event.

2.4 Risks associated with slopes and dumps must be included in the site HSE risk register and updated at least on an annual basis.

# 3 Implementation

3.1 A suitably qualified and experienced site representative must be appointed by the nominated manager to be responsible for the slope/dump performance monitoring.

3.2 Personnel exposed to hazards associated with pit slopes and dumps must be trained in geotechnical hazard awareness, evidence of ground movement, rock fall hazards and dump instability.

3.3 Slope failures, dump failures and rock fall travel exceeding controls must be investigated. Records of those events must be maintained.

# 4 Verification

4.1 Operations must complete routine monitoring on a periodic basis, the intervals for which must be determined by risk assessment.

4.2 Procedures and accountabilities must be in place to verify the conformance of the pit slopes, stockpiles, spoils and waste dumps to design and current conditions.

4.3 Management of change processes must be employed if changes are made to the excavation or dump geometries that depart from the design.

4.4 Accurate surveys of the dump location(s) must be checked against the property and permit boundaries and recorded.

# 5 Revision history

| First issue | Effective date | Prepared by | Approved by | |
|---|---|---|---|---|
| Sept. 2010 | July 2011 | Martyn Robotham | Suresh Rajapakse | |
| Revision no. | Revision date | Revised by | Approved by | Reason for change |

# D4 – Marine Safety

March 2011

## D4.1 – Mooring operations at wharves and shipping terminals

### 1 Scope

1.1 This standard applies to all Rio Tinto Group businesses and managed operations, including new acquisitions, admin/corporate offices and research facilities located off site, during exploration through all development phases and construction, operation to closure and, where applicable, for post closure management. This standard is underpinned by the Rio Tinto Health, Safety, Environment and Quality (HSEQ) management system standard.

1.2 This standard applies to the management, operation and use of wharf facility or shipping terminals by Rio Tinto Group businesses for loading and unloading of cargo.

1.3 'Critical plant and equipment' for the purpose of this standard is defined as plant and equipment that is used for mooring and accessing the vessel, eg. bollards, quick-release hooks, capstans, dolphins, access control systems, gangways and protective barriers.

1.4 Each Group businesses must comply with relevant international, national or regional legislation, codes of practice, conventions and the Rio Tinto Marine Vessel Acceptance policy.

## 2 Design

2.1 All mooring operations at wharf facilities and shipping terminals must be subject to a risk assessment. The assessment must involve operators and maintainers of critical plant and equipment, as well as relevant ship-to-shore interface stakeholders.

2.2 Each operation with a wharf facility or shipping terminal must have a nominated manager responsible for the implementation of this standard.

2.3 The nominated manager must arrange for the development of a Shipping Terminal Management plan.

2.4 There must be a system to control access to the wharf and/or shipping terminal.

2.5 There must be a register of critical plant and equipment.

2.6 There must be task and equipment-specific, safe work procedures for the operation of critical plant and equipment.

2.7 There must be a documented inspection and maintenance regime for all critical plant and equipment.

2.8 There must be a documented process for pre-arrival information exchange between the operation and the vessel that complies with relevant codes/guides and meets the minimum requirements set out in the Rio Tinto Mooring operations at wharves and shipping terminals guidance note.

2.9 There must be a ship-to-shore checklist that complies with relevant codes/guides and which meets the minimum requirements set out in the Rio Tinto Mooring operations at wharves and shipping terminals guidance note.

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2.10 Procedures must be established to confirm that vessels are safely moored and that they will not pose a safety hazard due to displacement or configuration while moored at the berth.

2.11 Environmental/weather parameters must be established for berthing, working and evacuation of the berth. The parameters must be developed in conjunction with the port operating authority and other relevant parties and consider the time required for the vessel to safely clear the port, as well as notice periods necessary to mobilise pilots and tugs.

## 3 Berthing and mooring

3.1 The potential for a person to be struck by any parted mooring line must be assessed and appropriate controls implemented.

3.2 There must be a periodic assessment of the wharf to identify and remove obstructions and snag hazards for mooring lines. The frequency of assessment must be a minimum of monthly unless otherwise derived from a risk assessment.

3.3 Bollards used for mooring must be marked with their Safe Working Loads.

3.4 Where practicable, mooring hooks and bollards must be fitted with load cells or other devices that indicate dynamic line tension.

3.5 Procedures must be established to enable warning and response to conditions which may lead to mooring line failure.

3.6 Where mooring hooks are used, they must:

a) be of the quick release type;

b) have a means of releasing lines from outside the snap-back zone;

c) be provided with protective barriers or marked snap back zones; and

d) wherever practicable, be provided with mechanical means for the hauling of mooring lines.

# 4 Wharf and terminal design criteria

4.1 Unless authorised by the business unit Managing Director, all new cargo handling equipment/facilities must be designed to meet the requirements set out in Rio Tinto *Mooring operations at wharves and shipping terminals* guidance note.

# 5 Revision history

| First issue | Effective date | Prepared by | Approved by | |
|---|---|---|---|---|
| March 2011 | January 2012 | Mark Slater | Suresh Rajapakse | |
| Revision no. | Revision date | Revised by | Approved by | Reason for change |
| | | | | |

Rio Tinto

# Standards

# HSE Performance Standards - ENVIRONMENT

## Printed: February 2012

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# E2 - Air quality control

## Scope

This standard is applicable to all Rio Tinto business units and managed operations including corporate/administration offices and research facilities located off site. It covers emissions from all sources, including fugitive emissions, during exploration, mining, mineral processing, materials handling, smelting, refining and on-site transport, and also their incremental impacts on the ambient air quality. Where the business or operation is also responsible for ancillary activities (eg power generation) or off-site transport (rail, truck and ship), those activities are also under the scope of this standard. Persons living in construction or company accommodation at the operation are included as part of the local community.

**Intent:** The intent of this standard is to ensure that Rio Tinto operations have identified and minimised air pollutant emissions and their potential impacts from their activities. This is to be accomplished by evaluating and prioritising them according to the significance of their impact, and taking effective measures to design and implement appropriate controls of emissions to ensure protection of ambient air quality.

**Other relevant documents:**

- HSEQ management system (or standard E1 EMS for non ABS operations)
- Greenhouse gas emissions standard
- Land use stewardship standard
- Occupational health standards (occupational hygiene aspects)
- Cleaner production principles
- Air quality guidance note

## Programme design

# 1 Planning

1.1 Determine and maintain records of background ambient air quality, meteorological characteristics affecting pollutant dispersion and other sources of emission in the vicinity of the operation.

1.2 Identify, characterise and document significant pollutant emissions from all sources at the operation, including fugitive emissions, and their method of release into the environment.

1.3 Identify and document community health (and nuisance) hazards and environmental impacts associated with the exposure to individual and combined air pollutant emissions from the operation's facilities. Prioritise emission controls and abatement targets on the basis of risk levels determined through a documented risk assessment.

1.4 Employ environmental hazard identification and change management procedures for new developments or substantive changes to existing facilities to determine and manage potential adverse risks to ambient air quality.

1.5 Demonstrate that, under normal and worst case operating conditions and adverse meteorological conditions, emissions from the operation, current or after a modification, will not cause violation of regional or national air quality regulations, internally derived air quality criteria, and/ or licence conditions.

1.6 Develop internal criteria on ambient air quality when government regulations are absent or incomplete to ensure protection of local community health and the environment. The criteria must have formal approval from the operation's managing director (MD) and be in line with internationally accepted regulations, guidelines and methodologies.

# 2 Implementation and operation

2.1 Implement appropriate control procedures or control technologies to manage those emissions selected in the risk assessment as having potential or actual significant environmental or community health impacts.

2.2 Prepare emergency procedures to respond to emergency situations, abnormal emission and dispersion conditions, and exceedences of air quality criteria, including immediate measures to protect community health.

# 3 Performance management

3.1 Implement monitoring programmes or use estimation to quantify all significant emissions (point source and fugitive) to an acceptable degree of accuracy. Implement monitoring programmes for relevant ambient air quality parameters using receptor measurements or dispersion models validated to an adequate degree of accuracy to demonstrate protection of environment and community health, and to comply with regulations.

3.2 In any monitoring program, identify and use the specifications of local regulatory authorities for:

- monitoring equipment and scheduling;
- modelling assumptions;

- modelling programmes; and
- emissions factor.

In the absence of such regulatory requirements, or if incomplete or inadequate adopt recognised internationally acceptable specifications, which must have formal approval from the operation's MD.

# 4 Revision history

| Version no. | Effective date | Prepared by | Authorised by | |
|---|---|---|---|---|
| 1 | June 2005 | Adelino Taboada | ExCo | |
| **Version no.** | **Revision date** | **Revised by** | **Authorised by** | **Reason for change** |
| 2 | December 2008 | Adrian van Tonder | Bruce Kelley | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# E3 - Acid rock drainage prediction and control

## Scope

This standard is applicable to all Rio Tinto business units and managed operations including, where applicable, admin/corporate offices and research facilities located off site. The requirements of this standard are to be followed by all operations that indicate existing or potential Acid Rock Drainage (ARD) conditions. The standard covers the management of sulphide-bearing materials and ARD through the complete mineral project development timeline from exploration through project development, approval and mining, changes in the orebody mineralogy and/or process conditions, through to closure and post-closure periods.

**Intent:** The intent of the standard is to ensure that ARD risks for Rio Tinto projects and operations are effectively identified through all phases of a business and managed to prevent or minimise adverse environmental impacts and to reduce long-term costs and liabilities. The standard applies to issues related to the potential release of sulphide oxidation products including the formation of acidic and/or saline soils and wastes, the release of low pH water or water with a neutral pH but elevated sulphate-dominated salinity or metals concentrations. The term ARD as used in this standard refers to the

potential environmental impacts that could result from the oxidation of sulphide minerals such as pyrite. The emphasis is on timely and thorough analysis of the risks, early identification and implementation of control (management) strategies and thorough integration of controls with mine planning and operational activities.

**Other relevant documents:**

- HSEQ management system (or standard E1 EMS for non ABS operations)
- Land use stewardship standard
- Mineral waste management standard
- Water use and quality control standard
- Closure standard
- Acid rock drainage prediction and control guidance note

## Programme design

# 1 Planning

1.1 Identify and document the geological setting and the mineralogy of sulphide containing rocks, adjacent lithologies and unconsolidated sediments that will be disturbed or exposed in order to support ARD potential and prediction studies.

1.2 Assess the ARD potential of any new development as part of exploration, order of magnitude, pre-feasibility and feasibility studies, due-diligence reviews for acquisitions, and also for changes in process and/or mineralogy. Ensure that realistic

ARD management costs are estimated and included in project financial evaluations.

1.3 Undertake appropriate environmental baseline studies for ARD before the commencement of a development project or any significant expansions of existing operations.

1.4 Due diligence studies as part of potential project acquisitions must include an assessment of the project's current and potential ARD issues and liabilities.

1.5 Maintain an ARD prediction program for forecasting the short-term and long-term behaviour under local weathering conditions of sulphide-bearing materials such as:

a) The rocks and unconsolidated sediments exposed in open pits and underground mines;
b) Ore, waste rock, block cave rubble, acid sulphate soils and other materials that have been disturbed; and
c) Tailings, spent heap leach ore and other process wastes that have been generated.

1.6 Ensure the ARD prediction program reduces uncertainty about potential risk and liability to a level which permits a decision to be made to either reject the project or initiative, or to put in place effective mining and waste management strategies.

1.7 Ensure that recognised ARD experts are consulted for the initial assessment to determine whether there is an ARD issue at the site, design of the prediction program, the interpretation of its results, and the development of the management plan.

1.8 Develop an ARD management plan, commensurate with the ARD potential of mineral wastes and products and in line with the ARD prediction program, addressing as a minimum:

a) a summary assessment of the ARD setting, hazards and potential impacts;

b) the discharge limits and receiving environment objectives;

c) the ARD management strategy designed to meet the environmental objectives in a reliable and cost effective manner during operation and after closure;

d) the procedures and responsibilities for implementing the management strategy on an ongoing basis under actual field conditions;

e) ongoing ARD characterisation, monitoring and data collection requirements; and

f) contingency measures for response to unplanned conditions or unexpected impacts.

# 2 Implementation and operation

2.1 Implement the ARD management plan and make sure that it is integrated with mine and processing design, waste scheduling, closure planning, relevant operational procedures, and the business plan.

2.2 Maintain an inventory comprising quantities, location and representative characteristics of materials extracted from a mine or exposed to oxidation with respect to their abilities to generate or mitigate ARD.

2.3 Assign accountabilities at each affected operation for undertaking the ARD prediction program and for developing and implementing the ARD management plan.

2.4 Ensure that induction, general awareness and job specific training contains additional elements relating to ARD risks and how they are managed, where ARD is a significant issue for the operation. In such operations, the management team must have an appropriate knowledge of ARD prediction and control.

# 3 Performance management

3.1 Maintain a monitoring procedure appropriate to the potential ARD impacts, which, as a minimum, allows adequate early warning of unacceptable impacts, facilitates management

decisions, supports the ongoing prediction program and confirms assumptions used in the management plan.

3.2 Arrange for independent review of the ARD management plan at regular intervals (at least every four years, or more frequently when operational or environmental conditions so dictate). The review must be carried out by an ARD expert and produce an independent document attesting the status of the prediction program and control strategies in place and indicating any potential threats to the operation and the Rio Tinto Group.

# 4 Revision history

| Version no. | Effective date | Prepared by | Authorised by | |
|---|---|---|---|---|
| 1 | June 2005 | Adelino Taboada | ExCo | |
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| 2 | December 2008 | Adrian van Tonder | Buce Kelley | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# E4 - Greenhouse gas emissions

## Scope

This standard is applicable to all Rio Tinto business units and those managed operations, including admin/corporate offices and research facilities located off site, that significantly (more than 50, 000 tonne CO2Eq or more than 500 TJ energy per annum) contribute to Rio Tinto's total GHG emissions and energy use. It covers all sources of greenhouse gas (GHG) emissions (direct and indirect) during exploration, mining, mineral processing, materials handling, smelting refining and on-site transport. Where the business unit or operation is also responsible for ancillary activities (eg power generation) or off-site transport (rail, truck and ship) those activities will be covered under the scope of this standard.

GHG issues associated with product life cycles are covered in the Product Stewardship guidance note.

**Intent:** The intent of this standard is to ensure continuous improvement in GHG emission minimisation in Rio Tinto, including through improved efficiency in energy use. This is to be accomplished by identifying GHG sources, evaluating and prioritising them according to significance, and then designing and implementing a Greenhouse gas and energy

efficiency action plan containing the appropriate control, reduction and mitigation measures.

**Other relevant documents**:

- Rio Tinto Climate change position
- HSEQ management system (or standard E1 EMS for non ABS operations)
- Air quality control standard
- Project evaluation guidelines (for carbon and energy pricing guidance)
- Greenhouse gas emissions guidance note

## Programme design

# 1 Planning

1.1 Develop, document and maintain knowledge of GHG emissions and energy use. This must include an understanding of current and future GHG emission and energy use inventories and the factors that affect these inventories. It must also include comparisons of the operation's (and/or individual processes') performance against external or internal benchmarks. Internal benchmarking must be used where no data for comparative operations or processes are available.

1.2 Identify, document and assess GHG emission reduction and energy efficiency improvement opportunities for the business or

operation. Opportunities include on-site operational and engineering controls, emissions trading and offsets.

1.3 Develop a Greenhouse gas and energy efficiency action plan with GHG emission reduction and/or energy efficiency targets that will lead to benchmark performance. The action plan must include suitable actions and milestones that are adequately resourced and linked to the business planning process.

1.4 Regularly review GHG emission reduction and energy efficiency opportunities for financial and technical viability. Ensure that carbon and energy prices that can be reasonably anticipated (including costs inferred by government imposed carbon tax schemes or CO2 emissions regulations) are used in these reviews and in all project evaluations including:

a) annual business plans and valuations;

b) new project evaluations;

c) capital expenditure programs; and

d) due diligence reviews for divestments and acquisitions.

Factor-in the reviews and changes that can reasonably be anticipated in national and international policies and measures.

## 2 Implementation and operation

2.1 Implement the Greenhouse and energy efficiency action plan and associated programmes for GHG emission control and reduction and energy efficiency. Upgrade the action plan as the business needs and external requirements change and as there is technological advancement and progress in GHG emission and energy efficiency management.

2.2 Assign clear responsibilities and accountabilities for GHG emission and energy efficiency management. Responsibilities must include those for progressing the Greenhouse and energy efficiency action plan. Maintain access to the necessary GHG emission abatement and energy efficiency knowledge and skill.

## 3 Performance measurement

3.1 Ensure that the appropriate measures are in place for metering, or estimating where appropriate, GHG emissions and energy use.

3.2 Conduct periodic reviews to identify potential risks (threats and opportunities) associated with achieving best benchmark GHG emission performance and energy efficiency at the business or where appropriate operation. Businesses must regularly review milestones towards achieving targets.

# 4 Revision history

| Version no. | Effective date | Prepared by | Authorised by | |
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| 2 | December 2008 | Adrian van Tonder | Bruce Kelley | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# E5 - Hazardous materials and contamination control

## Scope

This standard is applicable to all Rio Tinto business units and managed operations, including admin/corporate offices and research facilities located off site, from exploration/development and acquisition through to closure and post closure. It covers the management of bulk materials to prevent spillage and environmental contamination, secure storage and transport, contamination investigations, site remediation and emergency response. Where the business or operation is also responsible for ancillary activities (eg power generation) or off-site storage or transport (rail, truck and ship), those activities are also under the scope of this standard. Note that the need for purchase controls, Material safety data sheets (MSDS) and environmental risk assessment are now included in Occupational health standard B4, Hazardous substances (OH-B4).

**Intent**: The intent of this standard is to prevent spillage and environmental contamination from handling, storage and processing of materials. Control measures must be commensurate with risks to the environment, and ensure that environmental impacts due to spills or other releases are minimised. For those cases where site contamination has occurred, the intent of the standard is to ensure that contamination is properly characterised, managed and remediated where necessary.

**Other relevant documents**:

- HSEQ management system (or standard E1 EMS for non ABS operations)
- Occupational health standard B4 (Hazardous substances)
- Non-Mineral waste management standard
- Water use and quality control standard
- Land use stewardship standard
- Mineral waste management standard
- Product stewardship guidance note
- Hazardous materials and contamination control guidance note

## Programme design

# 1 Planning

1.1 Deleted (requirements incorporated into OH-B4 clause 2.2).

1.2 Identify and assess the environmental contamination risks and implement spill prevention controls associated with the transport, storage, use, transfer and disposal of hazardous materials, including failures of secondary containment structures.

1.3 Develop internal criteria for assessment of site contamination when government regulations are absent or incomplete. The criteria must be approved by the managing director (MD) and

be in line with internationally accepted regulations, guidelines, definitions and methodologies.

1.4 Deleted.

1.5 Develop and maintain a contaminated site register, with geographical references, for land currently or previously owned, leased and/or managed (legacy sites). Identify existing contamination and assess its environmental impact. The register must include known contamination for sites previously owned or leased regardless of whether remediation liabilities are retained. Ensure that registers are developed as part of the due diligence process for acquisitions. Key components of the contaminated site register for each site must include:

a) coordinates;

b) description of the wastes and/or potential contaminants of concern and impacted media (soils, sediments, groundwater, surface water);

c) estimated mass, volume and geometry of the contamination (surface area, thickness, buried depth);

d) summary of the site history;

e) exposure risks and related land use and access restrictions if any; and

f) required remedial or administrative actions if any.

1.6 Deleted.

## 2 Implementation and operation

2.1 Ensure that employees and contractors involved with hazardous materials handling or remediation of contamination are fully aware of the associated environmental hazards and risks and are appropriately trained in routine activities and emergency actions.

2.2 Ensure that hazardous materials, including those brought by contractors, do not adversely impact the environment, can not be accessed by unauthorised personnel and, based on risk, can not come into contact with birds and other animals.

2.3 Deleted

2.4 Maintain effective containment barriers for preventing spills of hazardous material from reaching the environment. All tanks (including flow through process tanks) and drum storages containing hazardous material must have properly designed secondary containment:

a) containment drainage valves must remain closed and locked with the exception of rainwater draining events. Appropriate

signage must be provided, indicating correct valve position and requirement for locks;

b) containment systems must be free from product spillage and other materials; rainwater or snow must be removed to ensure adequate capacity is maintained; and

c) measures must be in place to ensure spills from secondary containment and portable containers can not enter sewers or any body of water or soil.

2.5 Storage tanks and pipelines containing or transporting hazardous materials must be above ground. Any exception must be justified and authorised by the managing director. Any such exception must be based on a risk assessment and provision of additional controls including secondary containment (such as double-wall design), inventory monitoring and reconciliation, and other leak detection or environmental monitoring systems.

2.6 Dispensing hazardous materials must have effective spill prevention and leak/spill detection measures in place. Construction materials must be compatible with the fluid contained in the system.

2.7 Implement selection criteria and control procedures for third party transporters, purchasers and other recipients of

hazardous materials and implement follow-up procedures for any hazardous material sent off the premises.

2.8 Maintain and test emergency response procedures, associated equipment and personnel for responding to potential hazardous material releases.

2.9 Develop, document and implement a remediation strategy for those existing contaminated sites where site investigation has shown there is an unacceptable environmental impact to current land uses, ecological function, surface or ground water resources, or where off-site impacts are occurring or are likely to occur.

# 3 Performance measurement

3.1 Implement routine inspections, monitoring procedures for leaks and integrity testing for deterioration of storage tanks and pipelines with a frequency and methodology commensurate with the associated environmental hazards and local legislation.

3.2 Maintain spill and leakage detection equipment and emergency response plans that are adequate for the risk posed by the hazardous material to the environment and linked to the appropriate operational control and emergency response unit.

3.3 Deleted

# 4 Revision history

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|---|---|---|---|---|
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| 2 | December 2008 | Adrian van Tonder | Bruce Kelley | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# E6 - Noise and vibration control

## Scope

This standard is applicable to all Rio Tinto business units and managed operations including admin/corporate offices and research facilities located off site. It covers noise and vibration arising from exploration and operations, including mining, mineral processing, materials handling infrastructure and on-site transport, which may significantly impact on people, communities and the surrounding environment. Where the business or operation is also responsible for ancillary activities (eg power generation) or off-site transport (rail, truck and ship), those activities are also under the scope of this standard. Persons living in construction or company accommodation at the operation are included as part of the local community.

Occupational noise and vibration exposure is not covered by this standard but rather by the Occupational health standards B2 and B3.

**Intent**: The intent of this standard is to ensure that Rio Tinto operations minimise their noise and vibrations impacts on the surrounding environment and communities. This includes impacts on biota, people, heritage aspects and surrounding land use. Control is to be accomplished by identifying noise and vibration sources, evaluating and prioritising the sources according to significance of potential impacts

then taking effective measures to design and implement appropriate controls.

**Other relevant documents**:

- HSEQ management system (or standard E1 EMS for non ABS operations)
- Land use stewardship standard
- Occupational health standards
- Biodiversity guidance note
- Noise and vibration control guidance note

## Programme Design

# 1 Planning

1.1 Develop, document and maintain knowledge of:

a) the baseline, and for existing operations, background noise and vibration levels; and

b) the key receptors and impacts that may result from noise and vibration emissions.

1.2 Employ change management procedures and predictive modelling of near and far field noise and vibration levels as part of the pre-feasibility and feasibility study for:

a) new developments;

b) significant expansions; and

c) changes to existing activities and facilities.

The model will, where applicable, incorporate baseline/background data, community expectations, and regulatory requirements and identify significant exposures to sensitive receptors.

1.3 Identify which components of the facility and which activities are the key contributors to external noise and vibration levels; understand the generation and propagation of noise and vibration and evaluate the potential environmental impact under a range of meteorological and operating conditions.

1.4 Develop internal criteria on noise and vibration performance when government regulations are absent or incomplete to ensure protection of local community health and the environment. The criteria must have formal approval from the operation's managing director (MD) and be in line with internationally accepted regulations, guidelines and methodologies.

## 2 Implementation and operation

2.1 Implement a procedure to manage noise and vibration where an assessment based on modelling and/or monitoring results indicates the need, in order to meet regulatory requirements and accommodate community expectations.

2.2 Deleted.

2.3 Adopt a hierarchy of noise and vibration controls, with engineering or design controls for noise sources being the first option implemented. If due to safety reasons this is not permissible consider other control processes.

2.4 Incorporate and maintain noise and vibration control requirements into design and operational criteria for relevant exploration and mining activities, including drilling and blasting, processing activities and new facilities.

2.5 Incorporate noise and vibration performance criteria into purchasing requirements for relevant, equipment and machinery.

## 3 Performance measurement

3.1 Have a procedure in place for monitoring of noise and vibration levels in potentially affected neighbouring areas, including employee/contractor accommodation units.

3.2 Implement a monitoring program to assess noise and vibration impact on the environment and communities under normal and worst case operating conditions and adverse meteorological conditions. The monitoring programme will:

a) support operational control;

b) verify compliance with targets and legal requirements; and

c) periodically validate and maintain the relevance of near and far-field noise and vibration models.

# 4 Revision history

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| 2 | December 2008 | Adrian van Tonder | Bruce Kelley | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# E7 - Non-mineral waste management

## Scope

This standard is applicable to all Rio Tinto business units and managed operations, including admin/corporate offices or research facilities located off site, from exploration/development and acquisition through to closure and post closure. It covers non-mineral wastes generated by the activities of the operation, or non-mineral wastes received by the operation to dispose or manage on behalf of others.

**Definition**: Non-mineral wastes include but are not limited to used oil, antifreeze, greases, batteries, solvents, coolants, spent reagents and paints, tyres, contaminated soils and debris, solid sewage residues, construction debris, spent pot liners, bath, anode wastes, refractory bricks and any other waste materials from processing, maintenance and medical facilities, canteens, offices, workshops, laboratories and gardens, including off-specification raw materials (other than ore) used in processes. Non-mineral wastes do not include residues directly derived from the mining or processing of rock and unconsolidated sediments.

Mineral wastes generated as a direct result of mining or processing, are addressed in the Mineral waste management standard. Process related

liquid effluents are covered in the Water use and quality control standard.

**Intent**: The intent of this standard is to ensure sound non-mineral waste management in Rio Tinto operations by the minimisation of waste generation and ensuring the safe handling, treatment and disposal of all generated wastes.

**Other relevant documents**:

- HSEQ management system (or standard E1 EMS for non ABS operations)
- Hazardous materials and contamination control standard
- Mineral waste management standard
- Water use and quality control standard
- Land use stewardship standard
- Air quality control standard
- Non-Mineral waste management guidance note

## Programme design

# 1 Planning

1.1 Identify, assess and document the quantities, characteristics, environmental hazards and risks associated with non-mineral

wastes generated, disposed on-site or transported and disposed off-site or managed on behalf of others.

1.2 Develop and maintain a documented inventory, including quantity per year and cumulative total, of non-mineral wastes generated or received and disposed on or off-site.

1.3 Maintain measurable indicators and targets for hazard and/or quantity reduction of significant non-mineral wastes destined for disposal.

1.4 Develop internal criteria for waste classification and management when government regulations are absent or incomplete. The criteria must have formal approval from the operation's managing director (MD) and be in line with internationally accepted regulations, guidelines, definitions and methodologies.

1.5 Develop and implement a Non-mineral waste management plan. The plan shall give priority to those wastes identified as having significant hazards and the actions must demonstrate that the waste management hierarchy has been considered, as follows in order of preference:

a) waste avoidance and reduction at source;

b) re-use and recycling; and

c) waste storage, treatment and/or disposal.

## 2 Implementation and operation

2.1 Ensure that non-mineral wastes are segregated at generation and that wastes awaiting further treatment, transport or disposal are securely contained and monitored. Persons that manage or handle hazardous waste must be appropriately trained.

2.2 Maintain operational procedures and effective controls for the safe handling, on-site and off-site transportation, storage and disposal of non-mineral wastes commensurate with their degree of hazard and compatibility.

2.3 Maintain records of wastes sent off-site, and a documented inventory and location of on-site waste landfills and storage areas. Historical and abandoned landfills shall be included in this inventory and their location documented.

2.4 Disposal of waste must only be carried out in engineered and approved facilities and in accordance with established operational procedures and applicable local laws and regulations.

2.5 Undertake verification assessments of contractors and facilities used for wastes sent off-site for disposal or treatment, to verify that the wastes have been dealt with appropriately.

# 3 Performance measurement

3.1 Establish a procedure to inspect and monitor waste handling and storage facilities commensurate with the degree of hazard of the waste. Corrective action must be taken where unacceptable conditions are identified.

3.2 The Non-mineral waste management plan must be reviewed at least every four years or more frequently when operational or environmental conditions so dictate.

# 4 Revision history

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| 2 | December 2008 | Adrian van Tonder | Bruce Kelley | Incorporation of suggested changes from operations and alignment with HSEQ Management System. |

# E8 - Mineral waste management

## Scope

This standard is applicable to all Rio Tinto business units and managed operations, including – where applicable - admin/corporate offices and research facilities located off site, and covers the management of mining and process waste generated by their activities, or which are taken by the operations to dispose or manage on behalf of others.

**Definition**: Mineral waste includes: waste rock and overburden, tailings and spent heap leach ore from mineral processing, rock masses disturbed by block caving, rejects from beneficiation or concentration of coal and other minerals, bauxite residue from alumina production, dross, refinery discards and sludges, smelter and other furnace slags, ashes, water treatment sludges, dredging materials and soils contaminated by mineral waste.

**Intent**: The intent of this standard is to ensure environmentally sound and effective management of mining and process wastes generated or handled by Rio Tinto operations. Waste disposal facilities and sites must be physically, biologically and chemically safe. Waste production and disturbed footprint shall be minimised and waste re-use, in-pit backfill, progressive rehabilitation and recycling maximised.

**Other relevant documents**:

- HSEQ management system (or standard E1 EMS for non ABS operations)
- Air quality control standard
- Non-Mineral waste management standard
- Hazardous materials and contamination control standard
- Closure standard
- Acid rock drainage prediction and control standard
- Land use stewardship standard
- Water use and quality control standard
- Mineral waste management guidance note
- Rio Tinto guideline for six-monthly social and environmental reporting

## Programme design

# 1 Planning

1.1 Identify, assess and document the quantities, physical and chemical characteristics and hazards of the wastes that will be generated by mining and processing of each distinct section of the mineral deposit.

1.2 Develop and maintain an inventory of mineral wastes generated, handled and disposed of, whether on or offsite,

including descriptions of hazard and other characteristics, quantity disposed of per year, total stored on site and details of location and techniques used for handling and disposal.

1.3 Maintain a procedure, including evaluation criteria, for identification of hazards, potential modes of failure and assessment of risks posed by tailings dams and other large waste disposal facilities.

1.4 Maintain, for each waste disposal facility or site, an up to date conceptual and/or numeric model of the long-term physical and chemical waste behaviour and impacts on the environment. The model must be validated using data from prediction tests and monitoring.

1.5 Ensure that design and construction of all waste disposal facilities or sites are:

a) compatible with the waste behaviour, addressing any threats to the environment, particularly those posed by contaminated run-off and seepage, wind and water erosion, direct exposure to chemical hazards, asbestiform minerals, and geotechnical instability;

b) engineered to best available or applicable technology for stability and safety; and

c) located within permit boundaries in a manner that minimises impacts to sensitive receiving environments and water resources.

1.6 New developments will not use tailings disposal facilities for water storage functions. Any existing dual storage of wastes and water must undergo a risk assessment and a study of potential alternatives.

1.7 Apply a change management procedure for the approval of any significant modification to waste disposal facilities, waste generation processes or waste handling and disposal procedures.

1.8 Avoid any uncontrolled riverine disposal of mineral wastes.

1.9 Develop targets to drive improvements in aspects of mineral waste management. Progress towards the targets must be supported by a suitable set of actions.

1.10 Establish and maintain a documented Mineral waste management plan that covers all stages of waste management from generation to final use and/or disposal and that includes at a minimum:

a) a summary assessment of the chemical and physical hazards posed by the waste and disposal facilities;

b) the management plan designed to mitigate the chemical and physical hazards;

c) assignment of clear accountabilities and responsibilities for mineral waste management and for implementing the management plan on an ongoing basis under actual field conditions;

d) ongoing monitoring and data collection requirements; and

e) emergency plans and contingency measures for response to unplanned conditions or unexpected impacts.

## 2 Implementation and operation

2.1 Maintain operational procedures commensurate with the identified hazards of each waste disposal facility for managing:

a) the waste mass and its physical and chemical reactions;

b) the containment structure and its stability issues;

c) waste placement, segregation and handling requirements; and

d) spills and improperly placed materials.

2.2 Ensure that the supervision and operation of disposal and storage facilities are commensurate with the environmental and safety hazards posed by the waste and the facility. Persons that manage or handle hazardous waste must be appropriately trained.

2.3 Undertake assessments of contractors and facilities used for wastes sent off-site for disposal or treatment, to verify that the wastes have been dealt with appropriately.

# 3 Performance measurement

3.1 Monitor physical stability parameters of waste disposal structures as an early detection and warning mechanism for potential failure.

3.2 Conduct regular monitoring of the geochemical behaviour of the waste repositories for validation or review of the waste behaviour model and early warning of potential pollution problems.

3.3 Conduct independent and external review by qualified engineering specialist(s) of all major waste storage facilities according to protocols and frequencies adequate to their physical and chemical hazards and level of risks. Frequency of external reviews must not be less than once every two years for physical hazards and once every four years for chemical

hazards. Any significant findings must be reported according to Rio Tinto requirements.

3.4 Maintain an emergency system, including communication with stakeholders, for responding to potential incidents involving waste storage facilities and transport to disposal facilities.

# 4 Revision history

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| 2 | December 2008 | Adrian van Tonder | Bruce Kelley | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# E9 - Land use stewardship

## Scope

This standard applies to all land owned, leased or managed by Rio Tinto (Rio Tinto land) and covers all activities of the Rio Tinto Group, from exploration through project planning, construction and operation to closure. It also includes land managed by administrative and corporate offices or research facilities. It particularly applies to land that is not used directly for mining, processing or ancillary activities and operational land that has been rehabilitated but remains under Rio Tinto control.

**Intent**: The intent of this standard is to develop management plans, programmes and procedures to ensure sustainable stewardship of the land that Rio Tinto owns, leases or manages. This requires an understanding of the current use and value of the land combined with its potential to fulfil corporate, community and other stakeholders' expectations for beneficial land-uses that can be supported and sustained into the future.

**Other relevant documents**:

- Land use stewardship guidance note
- HSEQ management system (or standard E1 EMS for non ABS operations)
- Water use and quality control standard and guidance note
- Acid rock drainage prediction and control standard and guidance note
- Mineral waste management standard and guidance note
- Hazardous materials and contamination control standard and guidance Note
- Non-Mineral waste management standard and guidance note
- Rio Tinto closure guidance notes
- Rio Tinto biodiversity strategy
- Rio Tinto communities standard and guidance note
- Rio Tinto cultural heritage guidelines
- Five-year communities plan
- Site operations plans

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# Programme design

## 1 Planning

1.1 Develop and maintain a documented description of all Rio Tinto land under the control of the business or operational unit. This must include the following, where relevant:

a) records of land ownership and tenure, including property boundaries, legal title, customary/traditional ownership and leasehold/rental/land access agreements between Rio Tinto and third parties;

b) historic and current land-uses within Rio Tinto land and the surrounding area, including potential legacy issues;

c) current environmental and social conditions, including natural features, known cultural/heritage sites, and other statutorily designated and protected areas;

d) future land-uses within Rio Tinto land and the surrounding area, where these are known; and

e) the policy and regulatory framework, including statutory restrictions for specific types of land-use.

1.2 Develop land-use zones and management objectives for Rio Tinto land that is permanently used as well as those areas

which are temporarily surplus to direct operational requirements. This process must:

a) identify land-use zones where these have been determined by the statutory authorities or, in their absence, develop appropriate sustainable development based land-use zones in consultation with key stakeholders;

b) identify limitations for certain types of land-uses and opportunities to manage land beneficially within specific land-use zones;

c) incorporate Rio Tinto policies and strategies for aspects such as communities development, land rehabilitation, water conservation, biodiversity, environmental offsets, heritage sites and sustainable development; and

d) develop strategic local partnerships that will achieve long-term sustainable management of the land once mining ceases.

1.3 Develop targets to drive improvements in land management. Targets must:

a) be related to specific land-use objectives and land-use zones;

b) identify appropriate performance indicators;

c) be clearly measurable; and

d) be subject to regular reporting and review.

1.4 Develop a Land-Use management plan that promotes an integrated and sustainable approach to land management. The plan must satisfy the current needs of the operation and anticipate what may be required in the future. It must address the following:

a) description of Rio Tinto land;

b) policy and regulatory context;

c) land-use objectives and land-use zones;

d) management plans for land-use zones, including procedures, targets and action plans;

e) programmes and resources; and

f) supporting documentation.

## 2 Implementation and operation

2.1 Integrate the Land-Use management plan with business unit and/or operations planning, site environmental management plans, closure planning, the Five year communities plan, project evaluations and capital expenditure reviews.

2.2 Assign clear responsibilities and accountabilities for land-use management that include preparation and implementation of the Land-Use management plan.

2.3 Implement an authorisation procedure to ensure that development and land-uses on Rio Tinto land are compatible with the Land-Use management plan.

2.4 Develop management procedures to ensure the content of the Land-Use management plan is regularly reviewed, the objectives and targets are being achieved and significant changes to the Plan are authorised by the general manager (GM or equivalent).

## 3 Performance measurement

3.1 Conduct a systematic auditing procedure of all aspects of the standard to verify their adequacy, performance and areas of risk and opportunity.

# 4 Revision history

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| 2 | December 2008 | Adrian van Tonder | Bruce Kelley | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# E10 - Water use and quality control

## Scope

This standard is applicable to all Rio Tinto business units and managed operations from exploration and development through to closure. It includes corporate/admin offices and laboratory facilities situated off site. It covers all water management activities for all types and sources of water.

**Intent**: The intent of this standard is to ensure efficient, safe and sustainable management and protection of water resources and ecosystems in and around Rio Tinto operations. This requires an understanding of the water resources, their spatial and temporal interrelationships, their ownership in the region and the needs of catchment stakeholders. This provides the basis for the development of an integrated and strategic approach to water management including social, environmental, operational and economic aspects.

**Other relevant documents**:

- HSEQ management system (or standard E1 EMS for non ABS operations)
- Water use and quality control guidance note
- Rio Tinto water strategy
- Acid rock drainage prediction and control standard
- Hazardous materials and contamination control standard
- Mineral waste management standard
- Rio Tinto closure standard
- Surface mining standard design and management of slopes; and related guidance
- Surface mining standard design and management of dumps; and related guidance
- Legionnaires disease guidance note
- Annual S & E survey guidelines

## Programme design

# 1 Planning

1.1 Deleted (requirements incorporated into 1.2).

1.2 Develop and maintain an appropriate understanding of the cumulative demands and impacts being placed on water resources and ecosystems in the catchments in which the

operation works. This must include understanding the current and future water requirements of key upstream and downstream users and stakeholders, and the flow regime and quality required to maintain ecosystem integrity.

1.3 Develop and maintain a site water balance that is appropriate to manage the site's water risks and that predicts future water requirements, includes climate variability and identifies opportunities for water management improvements. Where there is significant risk, a solute balance for key contaminants must also be implemented.

1.4 Implement a change management process to ensure that new developments, expansions, modifications or replacement of existing facilities do not degrade the catchment quality, function, use and integrity of surface and subsurface aquatic ecosystems and water resources.

1.5 Develop and implement criteria on water abstraction, dewatering, effluent/discharge or water quality when government regulations are absent, insufficiently protective or ambiguous to ensure protection of surface water and ground water resources. The criteria must have formal approval from the operation's managing director (MD) and be consistent with internationally accepted limits, thresholds, guidelines and methodologies.

1.6 Develop site specific targets for operational areas that drive improvements in site specific risks associated with water management. Progress towards the targets must be supported by appropriate actions as part of the site business plan.

1.7 Develop and implement a Water management plan that describes the operational aspects for water management to comply with the intent of this standard and with regulations and requirements of the pertinent authorities. This plan must be integrated with the site business plan and be updated at least every four years or more frequently when operational, social or environmental conditions so dictate.

## 2 Implementation and operation

2.1 Assign clear responsibilities and accountabilities for water management considering representation from across the organisational structure. Responsibilities must include tracking and reviewing progress in implementing the Water management plan.

2.2 Design, construct and operate water withdrawal, storage, treatment and discharge facilities in accordance with appropriate practices and:

a) ensure the design includes a risk assessment to identify and correct any potential failure scenarios and facilities will be able

to handle expected flows and quality, including significant storm events;

b) ensure that construction meets relevant standards and regulatory requirements and addresses all the identified significant risks; and

c) ensure that operation of the facility conforms to approved design criteria and operational procedures and includes trigger and response criteria to protect aquatic ecosystems and aquifers.

2.3 Prepare emergency and contingency plans for:

a) drought;

b) flood;

c) failures of large water retention structures; and

d) unplanned effluent discharges.

This must be coordinated and compatible with the similar requirements for large waste storage facilities as contained in the Mineral waste management standard.

# 3 Performance measurement

3.1 Maintain safety inspection procedures, including the detailed verification of all identified hazards, for major water storage facilities. These requirements must be compatible with the major waste storage facilities inspection and signoff requirements detailed in the Mineral waste management standard.

3.2 Implement a monitoring, checking and corrective action program to:

a) support operational control;

b) verify compliance with targets and regulatory requirements;

c) compare actual and predicted water balances;

d) update water and solute balances, and catchment and ground water models;

e) compare actual and predicted ground water and surface water impacts;

f) assess impact on the environment;

g) assess, where appropriate, cumulative impacts of the operation on the catchment and other users;

h) meet reporting requirements; and

i) meter flows and measure storages that are significant to the site water balance including recycle and reuse streams.

The frequency of monitoring must be based on site water risk or when there are significant changes in the process, operations or the environment impacting water usage and/or quality.

# 4 Revision history

| Version no. | Effective date | Prepared by | Authorised by | |
|---|---|---|---|---|
| 1 | June 2005 | Adelino Taboada | ExCo | |
| **Version no.** | **Revision date** | **Revised by** | **Authorised by** | **Reason for change** |
| 2 | December 2008 | Adrian van Tonder | Bruce Kelley | Incorporation of suggested changes from operations and alignment with HSEQ management system. |

# APPENDIX T

MSDS Sheets

**MSDS:** 0015277
**Print Date:** 03/25/2011
**Revision Date:** 03/25/2011

# MATERIAL SAFETY DATA SHEET

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

**Product Name:** **AERO® 8989 Promoter**
**Synonyms:** None
**Chemical Family:** Dithiophosphates
**Molecular Formula:** Mixture
**Molecular Weight:** Mixture

CYTEC INDUSTRIES INC., FIVE GARRET MOUNTAIN PLAZA, WOODLAND PARK, NEW JERSEY 07424, USA
For Product Information call 1-800/652-6013. Outside the USA and Canada call 1-973/357-3193.

**EMERGENCY PHONE (24 hours/day) - For emergency involving spill, leak, fire, exposure or accident call:**
**Asia Pacific:**
Australia - +61-3-9663-2130 or 1800-033-111
China (PRC) - +86 10 5100 3039 (Carechem24 China)
New Guinea - +61-3-9663-2130
New Zealand - +61-3-9663-2130 or 0800-734-607
All Others - +65 3158 1074 (Carechem24 Singapore)
**Canada:** +1-905-356-8310 (Cytec Welland, Canada plant)
**Europe/Africa/Middle East (Carechem24 UK):**
Europe, Middle East, Africa, Israel - +44 (0) 1235 239 670
Middle East, Africa (Arabic speaking countries) - +44 (0) 1235 239 671
**Latin America:**
Brazil - 0800 0111 767 (SOS Cotec)
Chile - +56-2-247-3600 (CITUC QUIMICO)
All Others - +52-376-73 74122 (Cytec Atequiza, Mexico plant)
**USA:** +1-703-527-3887 or 1-800-424-9300 (CHEMTREC #CCN6083)

® indicates trademark registered in the U.S. Outside the U.S., mark may be registered, pending or a trademark. Mark is or may be used under license.

## 2. HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW

**APPEARANCE AND ODOR:**

| | |
|---|---|
| Color: | amber |
| Appearance: | liquid |
| Odor: | sulfur |

**STATEMENTS OF HAZARD:**
DANGER! CAUSES BURNS OF EYES AND SKIN

**POTENTIAL HEALTH EFFECTS**

EFFECTS OF EXPOSURE:

The acute oral (rat) LD50 and dermal (rabbit) LD50 values are estimated to be > 4,200 mg/kg and > 2,000 mg/kg, respectively. Direct contact with this material may cause severe eye and skin irritation. Contact with acid may cause liberation of hydrogen sulfide. Hydrogen sulfide has a strong rotten-egg odor, however, some people are unable to smell the gas and exposure will deaden the sense of smell. Therefore, odor is an unreliable indicator of exposure. Overexposure to hydrogen sulfide gas may cause severe eye or respiratory tract irritation, rapid development of coma and respiratory failure. Low levels of hydrogen sulfide may cause headache, dizziness, staggering gait, neurological damage and gastritis. Refer to Section 11 for toxicology information on the regulated components of this product.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

**OSHA REGULATED COMPONENTS**

| Component / CAS No. | % | Carcinogen |
|---|---|---|
| Monothiophosphate<br>- | 10 - 30 | - |
| Dithiophosphates<br>- | 50 - 70 | - |
| p-Cresol<br>106-44-5 | 1 - 5 | - |
| Sodium hydroxide<br>1310-73-2 | 1 - 3 | - |

## 4. FIRST AID MEASURES

**Eye Contact:**
Rinse immediately with plenty of water for at least 15 minutes. Obtain medical attention immediately.

**Skin Contact:**
Take off immediately all contaminated clothing. Wear impermeable gloves. Wash immediately with plenty of water and soap. Pay particular attention to skin crevices, nail folds, etc. Do not reuse contaminated clothing without laundering. Do not reuse contaminated leatherware.

**Ingestion:**
If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person.

**Inhalation:**
Remove to fresh air. If breathing is difficult, give oxygen. Obtain medical advice if there are persistent symptoms.

## 5. FIRE-FIGHTING MEASURES

**Suitable Extinguishing Media:**
Use water spray, alcohol foam, carbon dioxide or dry chemical to extinguish fires.

**Protective Equipment:**
Firefighters, and others exposed, wear self-contained breathing apparatus. Wear full firefighting protective clothing. See MSDS Section 8 (Exposure Controls/Personal Protection). Use approved air-supplied full face respirator.

**Special Hazards:**
Sulfur dioxide or hydrogen sulfide may be formed under fire conditions. Do not flush to sewer which may contain acid. This could result in generation of toxic and explosive hydrogen sulfide gas.

## 6. ACCIDENTAL RELEASE MEASURES

**Personal precautions:**
Where exposure level is not known, wear approved, positive pressure, self-contained respirator. Where exposure level is known, wear approved respirator suitable for level of exposure. In addition to the protective clothing/equipment in Section 8, wear a two piece PVC suit with hood or PVC overalls with hood.

**Methods For Cleaning Up:**
Cover spills with some inert absorbent. Sweep up into containers for disposal. Flush spill area with water.

**Environmental Precautions:**
None known

## 7. HANDLING AND STORAGE

**HANDLING**

**Precautionary Measures:** Do not get in eyes, on skin or on clothing. Wash thoroughly after handling.

**Special Handling Statements:** Large quantities of undiluted product should not be mixed with acids, since evolution of toxic and explosive hydrogen sulphide gas could result. In particular, precautions most be taken to avoid the accidental discharge of large volumes of the product in acid storage tanks or any tank or containment containing acidic materials. This precaution does not, of course, apply to addition of this reagent to flotation pulps in amounts customarily used in flotation, were the reagent amounts are small and instantly diluted to concentrations well below the solubility limits.

**STORAGE**
None

**Storage Temperature:** Room temperature >20 °C 68 °F
**Reason:** Quality.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Engineering Measures:**
Utilize a closed system process where feasible. Where this material is not used in a closed system, good enclosure and local exhaust ventilation should be provided to control exposure.

**Respiratory Protection:**
Where exposures are below the established exposure limit, no respiratory protection is required. Where exposures exceed the established exposure limit, use respiratory protection recommended for the material and level of exposure.

**Eye Protection:**
Prevent eye and skin contact. Provide eye wash fountain and safety shower in close proximity to points of potential exposure. Wear eye/face protection such as chemical splash proof goggles or face shield.

**Skin Protection:**
Prevent contamination of skin or clothing when removing protective equipment. Wear impermeable gloves and suitable protective clothing.

**Additional Advice:**
Food, beverages, and tobacco products should not be carried, stored, or consumed where this material is in use. Before eating, drinking, or smoking, wash face and hands thoroughly with soap and water.

### Exposure Limit(s)

**1310-73-2 Sodium hydroxide**

| | |
|---|---|
| OSHA (PEL): | 2 mg/m$^3$ (TWA) |
| ACGIH (TLV): | 2 mg/m$^3$ (Ceiling) |
| Other Value: | Not established |

**106-44-5 p-Cresol**

| | |
|---|---|
| OSHA (PEL): | Not established |
| ACGIH (TLV): | (skin)<br>20 mg/m$^3$ inhalable fraction and vapor (TWA) |
| Other Value: | Not established |

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **Color:** | amber |
| **Appearance:** | liquid |
| **Odor:** | sulfur |
| **Boiling Point:** | 103 °C 217.4 °F |
| **Melting Point:** | ~-10 °C 14 °F (freezing point) |
| **Vapor Pressure:** | Not available |
| **Specific Gravity/Density:** | 1.16 |
| **Vapor Density:** | Not available |
| **Percent Volatile (% by wt.):** | Not available |
| **pH:** | >12.5 (as is) |
| **Saturation In Air (% By Vol.):** | Not available |
| **Evaporation Rate:** | Similar to water |
| **Solubility In Water:** | Complete |
| **Volatile Organic Content:** | Not available |
| **Flash Point:** | No flash up to boiling point. |
| **Flammable Limits (% By Vol):** | Not available |
| **Autoignition Temperature:** | Not available |
| **Decomposition Temperature:** | Not available |
| **Partition coefficient (n-octanol/water):** | Not available |
| **Odor Threshold:** | Not available |

## 10. STABILITY AND REACTIVITY

| | |
|---|---|
| **Stability:** | Stable |
| **Conditions To Avoid:** | None known |
| **Polymerization:** | Will not occur |
| **Conditions To Avoid:** | None known |
| **Materials To Avoid:** | Avoid contact with strong acids and oxidizing agents. |
| **Hazardous Decomposition Products:** | Carbon monoxide (CO)<br>Carbon dioxide<br>oxides of sulfur (includes sulfur di and tri oxides) |

## 11. TOXICOLOGICAL INFORMATION

## 11. TOXICOLOGICAL INFORMATION

Toxicological information for the product is found under Section 2. HAZARDS IDENTIFICATION.
Toxicological information on the regulated components of this product is as follows:

Monothiophosphates with direct contact can cause eye burns and skin corrosion.

Direct contact with dithiophosphates can cause eye burns and skin corrosion.

p-Cresol has acute oral (rat) and dermal (rabbit) LD50 values of 207 mg/kg and 301 mg/kg, respectively. Direct contact with p-cresol can cause severe irritation to eyes and skin. Inhalation overexposure can cause irritation of the eyes, nose and throat.

Sodium hydroxide is corrosive to eyes, skin, and the soft tissues of the digestive and respiratory tracts. Even dilute solutions of sodium hydroxide can produce irreversible damage to eyes and skin. A one percent solution/24 hrs. caused severe eye irritation in monkeys. Acute overexposure to sodium hydroxide mists or dusts causes severe respiratory irritation. The acute oral (rat) and dermal (rabbit) LD50 values are 104-340 mg/kg and 1250 mg/kg, respectively. The human oral LDLo is 1.57 mg/kg.

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## 12. ECOLOGICAL INFORMATION

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
The ecological assessment for this material is based on an evaluation of its components.

## 13. DISPOSAL CONSIDERATIONS

The information on RCRA waste classification and disposal methodology provided below applies only to the product, as supplied. If the material has been altered or contaminated, or it has exceeded its recommended shelf life, the guidance may be inapplicable. Hazardous waste classification under federal regulations (40 CFR Part 261 et seq) is dependent upon whether a material is a RCRA `listed hazardous waste`or has any of the four RCRA `hazardous waste characteristics.`Refer to 40 CFR Part 261.33 to determine if a given material to be disposed of is a RCRA `listed hazardous waste`; information contained in Section 15 of this MSDS is not intended to indicate if the product is a `listed hazardous waste.`RCRA Hazardous Waste Characteristics: There are four characteristics defined in 40 CFR Section 261.21-61.24: Ignitability, Corrosivity, Reactivity, and Toxicity. To determine Ignitability, see Section 9 of this MSDS (flash point). For Corrosivity, see Sections 9 and 14 (pH and DOT corrosivity). For Reactivity, see Section 10 (incompatible materials). For Toxicity, see Section 3 (composition). Federal regulations are subject to change. State and local requirements, which may differ from or be more stringent than the federal regulations, may also apply to the classification of the material if it is to be disposed. The Company encourages the recycle, recovery and reuse of materials, where permitted, as an alternate to disposal as a waste. The Company recommends that organic materials classified as RCRA hazardous wastes be disposed of by thermal treatment or incineration at EPA approved facilities. The Company has provided the foregoing for information only; the person generating the waste is responsible for determining the waste classification and disposal method.

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## 14. TRANSPORT INFORMATION

# 14. TRANSPORT INFORMATION

This section provides basic shipping classification information. Refer to appropriate transportation regulations for specific requirements.

**US DOT**

Dangerous Goods? X
Proper Shipping Name: Caustic alkali liquid, n.o.s.
Hazard Class: 8
Packing Group: II
UN/ID Number: UN1719
Transport Label Required: Corrosive
Technical Name (N.O.S.): Contains dithiophosphate salt and sodium hydroxide, p-Cresol, m-Methylphenol

| Component / CAS No. | Hazardous Substances / Reportable Quantity of Product (lbs) |
|---|---|
| p-Cresol | 6250 |
| m-Methylphenol | 14285.71 |

Comments: Hazardous Substances/Reportable Quantities - DOT requirements specific to Hazardous Substances only apply if the quantity in one package equals or exceeds the product reportable quantity.

**TRANSPORT CANADA**

Dangerous Goods? X
Proper Shipping Name: Caustic alkali liquid, n.o.s.
Hazard Class: 8
Packing Group: II
UN Number: UN1719
Transport Label Required: Corrosive
Technical Name (N.O.S.): Contains dithiophosphate salt and sodium hydroxide

**ICAO / IATA**

Dangerous Goods? X
Proper Shipping Name: Caustic alkali liquid, n.o.s.
Hazard Class: 8
Packing Group: II
UN Number: UN1719
Transport Label Required: Corrosive
Technical Name (N.O.S.): Contains dithiophosphate salt and sodium hydroxide

**IMO**

Dangerous Goods? X
Proper Shipping Name: Caustic alkali liquid, n.o.s.
Hazard Class: 8
UN Number: UN1719
Packing Group: II
Transport Label Required: Corrosive
Technical Name (N.O.S.): Contains dithiophosphate salt and sodium hydroxide

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# 15. REGULATORY INFORMATION

**Inventory Information**

**United States (USA):** All components of this product are included on the TSCA Chemical Inventory or are not required to be listed on the TSCA Chemical Inventory.

**Canada:** One or more components of this product are NOT included on the Canadian Domestic Substances List (DSL). These components are included on the Canadian Non-Domestic Substances List (NDSL).

**Australia:** All components of this product are included in the Australian Inventory of Chemical Substances (AICS) or are not required to be listed on AICS.

**China:** One or more components of this product are NOT included on the Chinese (IECSC) inventory.

**Japan:** One or more components of this product are NOT included on the Japanese (ENCS) inventory.

**Korea:** One or more components of this product are NOT included on the Korean (ECL) inventory.

**Philippines:** One or more components of this product are NOT included on the Philippine (PICCS) inventory.

**OTHER ENVIRONMENTAL INFORMATION**

The following components of this product may be subject to reporting requirements pursuant to Section 313 of CERCLA (40 CFR 372), Section 12(b) of TSCA, or may be subject to release reporting requirements (40 CFR 307, 40 CFR 311, etc.) See Section 13 for information on waste classification and waste disposal of this product.

| Component / CAS No. | % | TPQ (lbs) | RQ(lbs) | S313 | TSCA 12B |
|---|---|---|---|---|---|
| p-Cresol<br>106-44-5 | 1 - 5 | None | 100 | Yes | No |
| Sodium hydroxide<br>1310-73-2 | 1 - 3 | None | 1000 | No | No |

**PRODUCT HAZARD CLASSIFICATION UNDER SECTION 311 OF SARA**

- Acute

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## 16. OTHER INFORMATION

**NFPA Hazard Rating (National Fire Protection Association)**

Health: 3 - Materials that, under emergency conditions, can cause serious or permanent injury.

Fire: 1 - Materials that must be preheated before ignition can occur.

Instability: 0 - Materials that in themselves are normally stable, even under fire exposure conditions.

**Reasons For Issue:** Revised Section 14

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Randy Deskin, Ph.D., DABT +1-973-357-3100

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*Maximizing the Value of Flotation Chemicals Technology*

# MATERIAL SAFETY DATA SHEET

## 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

| **PRODUCT NAME:** | **Flottec SIPX Collector** |
|---|---|
| SYNONYMS: | Sodium isopropyl xanthate |
| CHEMICAL FAMILY: | Xanthate |
| MOLECULAR FORMULA: | C4H7OS2Na |
| MOLECULAR WEIGHT | 158.2 |
| MANUFACTURER: | Flottec, LLC • 338 West Main Street • Boonton, New Jersey 07005 • USA |
| PRODUCT INFORMATION: | Tel: +1.973.588.4717 • Fax: +1.973.588.4719 • Web Site: www.flottec.com |
| EMERGENCY PHONE: | CHEMTREC • North America: +1.800.424.9300 • International: +1.703.527.3887 |
| ISSUE DATE: | November 1, 2009 |

## 2. COMPOSITION/INFORMATION ON INGREDIENTS

### OSHA REGULATED COMPONENTS

| COMPONENT | CAS No. | % (w/w) | OSHA (PEL) | ACGIH (TLV) | Carcinogen |
|---|---|---|---|---|---|
| Carbonodithioic acid, O-Isopropyl ester, sodium salt | 140-93-2 | > 85 | Not established | Not established | - |
| Sodium hydroxide | 1310-73-2 | 0 - 1 | 2 mg/m³ (Ceiling) | 2 mg/m³ (Ceiling) | - |
| Sodium sulfide | 1313-82-2 | 0 - 1 | Not established | Not established | - |
| Sodium carbonate | 497-19-8 | 0 - 3 | Not established | Not established | - |

## 3. HAZARDS IDENTIFICATION

### EMERGENCY OVERVIEW

**APPEARANCE AND ODOR**

Color: Yellow-green
Appearance: Pellets, flakes, or powder
Odor: Disagreeable

**STATEMENT OF HAZARD**

**DANGER!**

**SELF-HEATING MATERIAL**
**MAY BE SPONTANEOUSLY COMBUSTIBLE**
**MAY FORM EXPLOSIVE DUST-AIR MIXTURES**
**HARMFUL IF ABSORBED THROUGH SKIN**
**DUST IRRITATING**
**CAUSES EYE AND SKIN IRRITATION**

### POTENTIAL HEALTH EFFECTS

**EFFECTS / ROUTES OF EXPOSURE**

The acute oral (rat) LD50 and acute dermal (rabbit) LD50 value for this material are estimated to be >800 mg/kg and >1000 mg/kg, respectively. Airborne dust may cause significant eye, skin or respiratory tract irritation. Skin or eye contact with solutions of this product may cause moderate eye and skin irritation. Repeated or prolonged dermal contact may cause allergic skin reactions. Refer to Section 11 for toxicology information on the regulated components of this product.

## 4. FIRST AID MEASURES

| | |
|---|---|
| **INGESTION:** | If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person. |
| **SKIN CONTACT:** | Remove contaminated clothing and shoes without delay. Wash immediately with plenty of water. Do not reuse contaminated clothing without laundering. Get medical attention if pain or irritation persists after washing or if signs and symptoms of overexposure appear. |
| **EYE CONTACT:** | Rinse immediately with plenty of water for at least 15 minutes. Obtain medical attention immediately. |
| **INHALATION:** | Remove to fresh air. If breathing is difficult, give oxygen. Obtain medical advice if there are persistent symptoms. |

## 5. FIREFIGHTING MEASURES.

### EXTINGUISHING MEDIA AND FIRE FIGHTING INSTRUCTIONS

| | |
|---|---|
| **Extinguishing Media:** | Use carbon dioxide, dry chemical or large quantities of water. |
| **Protective Equipment:** | Firefighters, and others exposed, wear self-contained breathing apparatus. Wear full firefighting protective clothing. See MSDS Section 8 (Exposure Controls/Personal Protection). |
| **Special Hazards:** | Solid xanthates are stable when kept cool and dry. Exposure to heat and moisture can cause decomposition to flammable and explosive vapor of carbon disulfide. Since xanthates decompose in solution, even at room temperature, fire and explosion hazards can develop with aging. |

## 6. ACCIDENTAL RELEASE MEASURES

| | |
|---|---|
| **PERSONAL PRECAUTIONS:** | Where exposure level is not known, wear approved, positive pressure, self-contained respirator. Where exposure level is known, wear approved respirator suitable for level of exposure. Refer to Section 8 (Exposure Controls/Personal Protection) for appropriate personal protective equipment. |
| **METHODS FOR CLEAN UP:** | Sweep up into containers for disposal. Flush spill area with water. |
| **ENVIRONMENTAL PRECAUTIONS:** | Dispose of in accordance with EPA rules and regulations. |

## 7. HANDLING AND STORAGE

### HANDLING

| | |
|---|---|
| **Precautionary Measures :** | Avoid excessive heat or moisture. Avoid contact with eyes, skin and clothing. Avoid breathing dust. Keep container closed. Wash thoroughly after handling. Use non-sparking tools and do not smoke when opening drum. Use with adequate ventilation. Contains finely divided material. Dust suspended in air may ignite with static discharge, sparks or flame. Equipment, including venting systems, should be grounded. Provide adequate ventilation in areas of use to remove dust. Wash contaminated clothing before reuse. |
| **Special Handling Statements :** | Minimize dust. Special precautions against fire and explosion must be observed in (1) pumping xanthate solutions, (2) draining mobile tanks, (3) cleaning mobile tanks, and (4) performing maintenance work on storage tanks and pipelines leading to and from tanks. Use non-sparking tools and do not smoke when opening drums of xanthate. DUST EXPLOSION HAZARD CLASS - 2 Handling of material should be in accordance with standards for venting of deflagrations (e.g. NFPA-68). If handled with flammable or combustible materials the explosion hazard may increase |
| **STORAGE** | Heating or overexposure to moisture of solid xanthates or heating or aging of xanthate solutions causes some decomposition to poisonous and flammable carbon disulfide. Storage tanks should have certain design features for maximum safety, and the vapor space should be free of sources of ignition. |
| **Storage Temperature:** | Store at <32.2 - 10 °C 90 - 50 °F<br>**Reason:** Safety |

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

| | |
|---|---|
| **ENGINEERING MEASURES** | Where this material is not used in a closed system, good enclosure and local exhaust ventilation should be provided to control exposure. |

**PERSONAL PROTECTIVE EQUIPMENT**

| | |
|---|---|
| **RESPIRATORY PROTECTION:** | Where exposures are below the established exposure limit, no respiratory protection is required. Where exposures exceed the established exposure limit, use respiratory protection recommended for the material and level of exposure. |
| **EYE PROTECTION:** | Wear eye/face protection such as chemical splash proof goggles or face shield. Eyewash equipment and safety shower should be provided in areas of potential exposure. |
| **SKIN PROTECTION:** | Avoid skin contact. Wear impermeable gloves and suitable protective clothing. |
| **ADDITIONAL ADVICE:** | Food, beverage and tobacco products should not be carried, stored or consumed where this material is used. Before eating, drinking, or smoking, wash face and hands with soap and water. |

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **COLOR:** | Yellow-green |
| **APPEARANCE:** | Pellets, flakes, or powder |
| **ODOR:** | Disagreeable |
| **BOILING POINT:** | Not applicable |
| **MELTING POINT:** | Not available |
| **VAPOR PRESSURE:** | Not applicable |
| **SPECIFIC GRAVITY:** | 1.35 at 20°C |
| **VAPOR DENSITY:** | Not applicable |
| **% VOLATILE (BY WT.):** | Not available |
| **pH:** | Not applicable |
| **SATURATION IN AIR (% by Vol):** | Not applicable |
| **EVAPORATION RATE:** | Negligible |
| **SOLUBILITY IN WATER:** | 37g/100 g at 20°C |
| **VOLATILE ORGANIC CONTENT:** | Not available |
| **FLASH POINT:** | Not applicable |
| **FLAMMABLE LIMITS (% BY VOL.):** | Not applicable |
| **AUTO IGNITION TEMPERATURE:** | >248°F; 120°C (value for carbon disulfide) |
| **DECOMPOSITION TEMPERATURE:** | >246.2°F; 119°C |
| **PARTIAL COEFFICIENT (n-octanol/water):** | -1.82 (Log Kow) |
| **ODOR THRESHOLD:** | See Section 2 for exposure limits |

## 10. STABILITY AND REACTIVITY

| | |
|---|---|
| **STABILITY:** | Stable |
| **CONDITIONS TO AVOID:** | Containers filled with this product should be kept closed when not in use. Keep container in a cool, well-ventilated area. Exposure of the solid xanthate to heat or moisture and heating or aging of xanthate solutions. Avoid prolonged exposure to heat; avoid strong acids, alkalies and oxidizing agents. Keep water and moist air out of container. |
| **POLYMERIZATION:** | Will not occur |
| **CONDITIONS TO AVOID:** | None known |
| **MATERIALS TO AVOID:** | Strong oxidizing agents, acidic material. High temperatures |
| **HAZARDOUS DECOMPOSITION PRODUCTS:** | Carbon disulfide, carbon monoxide, carbon dioxide, oxides of sulfur (includes sulfur di and tri oxides), hydrogen sulfide |

# 11. TOXICOLOGICAL INFORMATION

**Toxicological information for the product is found under SECTION 3: HAZARDS IDENTIFICATION**
Toxicological information on the regulated components of this product is as follows:

Sodium isopropyl xanthate has an acute oral (rat) and acute dermal (rabbit) LD50 values of >800 mg/kg and >1,000 mg/kg, respectively. Direct contact with this material may cause irritation to skin, eyes, mucous membrane and respiratory tract. It has been reported direct contact may cause moderate skin sensitation. Sodium isopropyl xanthate tested negative for Ames test.

Acute overexposure to sodium hydroxide mists or dusts causes severe respiratory irritation. A solution of sodium hydroxide can produce irreversible damage to eyes and skin.

Sodium sulfide has an acute oral (rat) LD50 value of 208 mg/kg. Sodium sulfide severely irritates the skin and eyes, as well as, mucous membranes. This material liberates hydrogen sulfide upon contact with acids

Sodium carbonate has acute oral (rat) LD50 value of > 4,000 mg/kg. Direct contact with this material may cause moderate eye and mild skin irritation.

Sodium isopropyl xanthate has an acute oral (rat) and acute dermal (rabbit) LD50 values of >800 mg/kg and >1,000 mg/kg, respectively. Direct contact with this material may cause irritation to skin, eyes, mucous membrane and respiratory tract. It has been reported direct contact may cause moderate skin sensitation. Sodium isopropyl xanthate tested negative for Ames test.

# 12. ECOLOGICAL INFORMATION

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
This material is not readily biodegradable.
All ecological information provided was conducted on a structurally similar product.

**ALGAE TEST RESULTS**

| Test | Duration | Procedure | Species | Results | |
|---|---|---|---|---|---|
| Growth Inhibition (OECD 201) | 96 hr. | - | Green Algae (Selenastrum capricornutum) | > 100 mg/l | EC50 |

**FISH TEST RESULTS**

| Test | Duration | Procedure | Species | Results | |
|---|---|---|---|---|---|
| Acute toxicity, freshwater (OECD 203) | 96 hr. | - | Rainbow Trout (Oncorhyncus mykiss) | > 595 mg/l | LC50 |

**INVERTEBRATE TEST RESULTS**

| Test | Duration | Procedure | Species | Results | |
|---|---|---|---|---|---|
| Acute Immobilization (OECD 202) | 48 hr. | Static | Water Flea (Daphnia magna) | >100 mg/l | EC50 |

**ACCUMULATION TEST RESULTS**

| Test | Duration | Procedure | Species | Results | |
|---|---|---|---|---|---|
| Bioaccumulation | - | - | - | 1.95 | BCF |

**DEGRADATION**

| Test | Duration | Procedure | Results |
|---|---|---|---|
| Closed Bottle (OECD 301D) | 28 day | Ready biodegradability | 1.9 % |
| COMMENTS: | | | |

## 13. DISPOSAL CONSIDERATIONS

| | |
|---|---|
| **RECOMMENDATIONS FOR THE PRODUCT:** | In accordance with regulations for special waste, product must be taken, after pretreatment, to an authorized special waste incineration plant. |
| **RECOMMENDATIONS FOR PACKAGING:** | Packaging that cannot be cleaned should be disposed of like the product. |
| **RECOMMENDED CLEANSING AGENT:** | Water |

## 14. Transportation Information

This section provides basic shipping classification information.
Refer to appropriate transportation regulations for specific requirements.

| **U.S. DOT** | | | | |
|---|---|---|---|---|
| PROPER SHIPPING NAME: | XANTHATES | | | |
| HAZARD CLASS | 4.2 | | | |
| PACKING GROUP: | II | | | |
| UN/ID NUMBER: | UN3342 | | | |
| TRANSPORT LABEL REQUIRED: | Spontaneously Combustible | | | |
| TECHNICAL NAME (N.O.S.): | Not applicable | | | |
| HAZARDOUS SUBSTANCE: | Not applicable | | | |
| COMMENTS: | - | | | |
| **TRANSPORT CANADA** | | | | |
| PROPER SHIPPING NAME: | XANTHATES | | | |
| HAZARD CLASS | 4.2 | | | |
| PACKING GROUP: | II | | | |
| UN/ID NUMBER: | 3342 | | | |
| TRANSPORT LABEL REQUIRED: | Spontaneously Combustible | | | |
| TECHNICAL NAME (N.O.S.): | Not applicable | | | |
| **ICAO/IATA** | | | | |
| PROPER SHIPPING NAME: | XANTHATES | | | |
| HAZARD CLASS: | 4.2 | | | |
| PACKING GROUP: | II | | | |
| UN NUMBER: | 3342 | | | |
| TRANSPORT LABEL REQUIRED: | Spontaneously Combustible | | | |
| PACKING INSTRUCTIONS/ MAXIMUM NET QUANTITY: | PASSENGER AIRCRAFT | 415 | 15 kg | |
| | CARGO AIRCRAFT | 417 | 50 kg | |
| TECHNICAL NAME (N.O.S.): | Not applicable | | | |
| **IMO** | | | | |
| PROPER SHIPPING NAME: | XANTHATES | | | |
| HAZARD CLASS: | 4.2 | | | |
| UN NUMBER: | 3342 | | | |
| PACKING GROUP: | II | | | |
| TRANSPORT LABEL REQUIRED: | Spontaneously Combustible | | | |
| TECHNICAL NAME (N.O.S.): | Not applicable | | | |

## 15. REGULATORY INFORMATION

### INVENTORY INFORMATION

| | |
|---|---|
| **United States (USA)** | All components of this product are included on the TSCA Inventory in compliance with the Toxic Substances Control Act, 15 U. S. C. 2601 et. seq. |
| **Canada** | Components of this product have been reported to Environment Canada in accordance with Sections 66 and/or 81 of the Canadian Environmental Protection Act (1999), and are included on the Domestic Substances List |
| **European Union (EU)** | All components of this product are included in the European Inventory of Existing Chemical Substances (EINECS) in compliance with Council Directive 67/548/EEC and its amendments. |
| **Australia** | All components of this product are included in the Australian Inventory of Chemical Substances (AICS) or are not required to be listed on AICS. |
| **China** | All components of this product are included on the Japanese (ENCS) inventory or are not required to be listed on the Japanese inventory. |
| **Japan** | All components of this product are included on the Japanese (ENCS) inventory or are not required to be listed on the Japanese inventory. |
| **Korea** | All components of this product are included on the Korean (ECL) inventory or are not required to be listed on the Korean inventory. |
| **Philippines** | All components of this product are included on the Philippine (PICCS) inventory or are not required to be listed on the Philippine inventory. |

### OTHER ENVIRONMENTAL INFORMATION

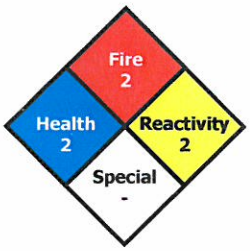
The following components of this product may be subject to reporting requirements pursuant to Section 313 of CERCLA (40 CFR 372), Section 12(b) of TSCA, or may be subject to release reporting requirements (40 CFR 307, 40 CFR 311, etc.) See Section 13 for information on waste classification and waste disposal of this product.

| Component | CAS NO. | % (w/w) | TPQ (lbs) | RQ (lbs) | S313 | TSCA 12B |
|---|---|---|---|---|---|---|
| This product does not contain any components regulated under these sections of the EPA | | | | | | |

### PRODUCT CLASSIFICATION UNDER SECTION 311 OF SARA

| ACUTE (Y) | CHRONIC (N) | FIRE (Y) | REACTIVE (Y) | PRESSURE (N) |
|---|---|---|---|---|

## 16. OTHER INFORMATION




### NFPA HAZARD RATING
### (National Fire Protection Association)

| | |
|---|---|
| **HEALTH - 2 -** | Materials that, under emergency conditions, can cause temporary incapacitation or residual injury. |
| **FIRE - 2 -** | Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. |
| **REACTIVITY - 2 -** | Materials that readily undergo violent chemical change at elevated temperatures and pressures. |

**REASON FOR REVISION:** New format; Revised all sections

**Prepared By:** F. Cappuccitti **Revised By:** R. Nix

**IMPORTANT:** The above information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warrant, expressed or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular uses.

Engineered Drilling Solutions Inc.

500, 630 – 8th Avenue SW
Calgary, Alberta T2P 1G6
p 403.233.2850
f 403.261.4018
w edsi.ca

# SECTION 1 – IDENTIFICATION OF PRODUCT

**Product Name: Magnafloc 10**
**Chemical Family:** Copolymer of acrylamide and sodium acrylate
**Product Use:** Drilling Mud Additive

| Work Place Hazardous Information Systems Data (WHMIS) | Transportation Of Dangerous Goods (TDG) |
|---|---|
| **WHMIS Classification:** Not a controlled product<br>**Work Place Hazard:** N/A | **TDG Classification:** Not a regulated product<br>**Package Group:** N/A<br>**UN Number (PIN):** N/A |

# SECTION 2 – HAZARDOUS INGREDIENTS

*No Hazardous Ingredients*

# SECTION 3 – PHYSICAL DATA

**Physical State:** White granular solid
**Odour And Appearance**: Little odour
**Odour Threshold:** N/A
**Vapour Pressure:** N/A
**Vapour Density:** N/A
**Evaporation Rate:** N/A
**Coefficient Of Water To Oil Distribution:** N/A
**Boiling Point:** N/A
**Freezing Point:** N/A
**Melting Point:** N/A
**pH:** N/A
**Solubility:** Soluble.
**Specific Gravity:** N/A
**Percent Volatile By Volume:** N/A

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f 403.261.4018
w edsi.ca

**Waste Disposal**

All waste should be disposed of according to Federal, Provincial, and Local regulations. Containers should NOT be reused. Containers should be disposed of in accordance with government regulations.

## SECTION 4 – FIRE AND EXPLOSION DATA

**Conditions Of Flammability:** Very low risk.

**Handling Procedures And Equipment**

Avoid inhalation of vapours or mist. Avoid prolonged skin contact. Use with appropriate ventilation.

**Flashpoint:** N/A

**Lower Flammable Limit:**

**Upper Flammable Limit:** N/A

**Auto Ignition Temperature:** N/A

## SECTION 8 – FIRST AID MEASURES / OTHER HAZARDOUS INFORMATION

**Means Of Extinction**

Dry Chemical, Carbon Dioxide, Foam.

**Hazardous Combustion Products**

None known

**Specific Measures**

N/A

**Sensitivity To Impact / Static Discharge**

As with most organic powders, flammable dust clouds may be formed; avoid generating dust. Avoid sources of ignition.

**Skin First Aid**

Wash with soap and water. If adverse symptoms develop, seek medical attention.

**Eye First Aid**

Flush eyes with running water for at least 15 minutes. If adverse symptoms develop, seek medical attention.

**Special Firefighting Procedures**

Firefighters must wear appropriate breathing apparatus and clothing. Use of water may cause extreme slipperiness.

**Inhalation First Aid**

Move victim to fresh air. If breathing has stopped, apply artificial respiration. If breathing is difficult, administer oxygen. Seek immediate medical attention.

## SECTION 5 – REACTIVITY DATA

**Ingestion First Aid**

Do not induce vomiting. Give large quantities of water, if conscious. Call a physician.

**Chemically Stable?:** Yes

**Conditions Of Chemical Instability**

**Incompatible Chemical Substances:** Yes

## SECTION 9 – PREPARATION INFORMATION

**Incompatible Substances**

**Prepared By:** Safety Department

Avoid strong oxidizing agents and caustic solutions.

**Phone:** (403) 233-2850 **Preparation Date:** October 01, 2009

**Conditions Of Reactivity**

None known

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**Hazardous Decomposition Products**

None known

**Hazardous Polymerization:** Will not occur

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500, 630 – 8th Avenue SW
Calgary, Alberta T2P 1G6
p 403.233.2850
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## SECTION 6 – TOXICOLOGICAL PROPERTIES

| | Skin | Skin Absorption | Eye Contact | Inhalation | Ingestion |
|---|---|---|---|---|---|
| **Routes Of Entry:** | Yes | No | Yes | Yes | Yes |
| **Irritation:** | Prolonged exposure may cause irritation, swelling, or dermatitis. | | Exposure may cause irritation to eyes or eye lids. | May cause slight irritation of the nose and throat. | May cause nausea and vomiting. |

**General Irritancy Of Product**
N/A

**Exposure Limits**
N/A

**Specific Measures**
N/A

**Effects Of Acute Exposure:** None known
**Effects Of Chronic Exposure:** None known
**Sensitization To Product:** N/A
**Carcinogenicity:** N/A
**Teratogenicity:** N/A
**Reproductive Toxicity:** N/A
**Mutagenicity:** N/A
**Synergistic Products:** N/A

## SECTION 4 – FIRE AND EXPLOSI

Waste Disposal
All waste should be disposed of in accordance with Federal, Provincial, and Local regulations. Containers should NOT be reused. Containers should be disposed of in accordance with government regulations.

**Handling Procedures And Equipment**
Avoid inhalation of vapours or mist. Avoid prolonged skin contact. Use with appropriate ventilation.

## SECTION 8 – FIRST AID MEASURES / OTHER HAZARDOUS INFORMATION

**Skin First Aid**
Wash with soap and water. If adverse symptoms develop, seek medical attention.

**Eye First Aid**
Flush eyes with running water for at least 15 minutes. If adverse symptoms develop, seek medical attention.

**Inhalation First Aid**

**Ingestion First Aid**
Do not induce vomiting. Give large quantities of water, if conscious. Call a physician.

## SECTION 7 – PREVENTIVE MEASURES

**Gloves:** See [Clothing]
**Respirator:** If using in a confined non-ventilated space, use of an approved dust mask is advised.
**Eye:** See [Clothing]
**Footwear:** See [Clothing]
**Clothing:** Chemical resistant clothing is recommended including gloves, apron and goggles.
**Other:**

## SECTION 9 – PREPARATION INFORMATION

**Prepared By:** Safety Department

**Engineering Controls**

**Phone:** (403) 233-2850 **Preparation Date:** October 01, 2009

**Storage Requirements**
Avoid high temperatures, ingestion, dusty conditions, and all sources of ignition.

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**Special Shipping Information**

**Leak And Spill Procedures**
Wear protective equipment. Recover material into approved containers. Do not allow into water ways. Wash spill site after cleanup.

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500, 630 – 8th Avenue SW
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p 403.233.2850
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w edsi.ca

**Waste Disposal**

All waste should be disposed of according to Federal, Provincial, and Local regulations. Containers should NOT be reused. Containers should be disposed of in accordance with government regulations.

**Handling Procedures And Equipment**

Avoid inhalation of vapours or mist. Avoid prolonged skin contact. Use with appropriate ventilation.

## SECTION 8 – FIRST AID MEASURES / OTHER HAZARDOUS INFORMATION

**Specific Measures**

N/A

**Skin First Aid**

Wash with soap and water. If adverse symptoms develop, seek medical attention.

**Eye First Aid**

Flush eyes with running water for at least 15 minutes. If adverse symptoms develop, seek medical attention.

**Inhalation First Aid**

**Ingestion First Aid**

Do not induce vomiting. Give large quantities of water, if conscious. Call a physician.

## SECTION 9 – PREPARATION INFORMATION

**Prepared By:** Safety Department

**Phone:** (403) 233-2850 **Preparation Date:** October 01, 2009

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# Safety Data Sheet

**According to Directive 91/155/EEC**
**May not comply with national legislation; shall be used only as a source of information.**

## MAGNAFLOC 155

Edition 29.05.2002
(dd.mm.yyyy)

### 1. Identification of the Substance/Preparation and the Company/Undertaking

| | |
|---|---|
| Chemical characterization | Anionic acrylamide copolymer |
| CAS Number | Preparation |
| Producer/Supplier | CIBA SPEZIALITÄTENCHEMIE AG<br>KLYBECKSTRASSE 141<br>POSTFACH<br>4002 BASEL<br>SWITZERLAND |
| Phone Number | +41 (61) 6361111 |
| Telefax | +41 (61) 6361212 |
| Information | Product Safety and Regulatory Affairs |
| Telefax | +41 (61) 6368601 |
| Emergency Phone Number (24h) | +41 (61) 6965151 |

### 2. Composition/Information on Ingredients

The product contains no substances classified as hazardous to health in concentrations which should be taken into account according to EC directive.

### 3. Hazards Identification

May cause slight skin irritation, especially with repeated or prolonged exposure.
May cause some eye irritation which should cease after removal of the product.
May cause some irritation to the respiratory system if dust is inhaled.
Low toxicity product.
Not classified as hazardous by physical / chemical properties.
This type of product has a tendency to create dust if roughly handled. It does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.
Avoid creating dust and keep away from sources of ignition.
Very slippery when wet.

### 4. First Aid Measures

**Skin contact**
Wash off with soap and plenty of water. Contaminated clothing should be washed before re-use.

**Eye contact**
Rinse immediately with plenty of water for at least 15 minutes. In case of eye irritation, seek medical attention.

**Inhalation**
Move to fresh air. Clear any blocked airways. If affected person feels unwell, seek medical advice.

**Ingestion**
Do not induce vomiting. Give nothing by mouth in cases of unconsciousness or convulsion. Check for breathing and pulse, if present, place in the recovery position and obtain medical attention. If conscious rinse out the mouth with water. Give 1 pint (600 ml) of water to drink immediately and repeated drinks of water at a rate of a cupful (1/3 pint/200 ml) every 10 minutes. Call a physician immediately.

### 5. Fire-Fighting Measures

**Suitable extinguishing media**
Foam, Dry powder, Carbon dioxide (CO2), in preference to water spray/ fog.

**Extinguishing media which must not be used for safety reasons**
None known

**Special protective equipment for firefighters**
As for all fires involving chemicals: chemical protection suit, suitable gloves, boots and self contained breathing apparatus.

**Hazardous decomposition products**
Combustion may result in the formation of, Oxides of carbon

**Further information**
Very slippery when wet.

### 6. Accidental Release Measures

**Personal precautions**
Avoid dust formation. Use suitable protective equipment. Effective dust mask.

**Environmental precautions**
Do not flush into surface water, sanitary sewer or ground water system.

**Methods for cleaning up**
Sweep up and shovel into suitable containers for disposal. Residues or small spillages should be hosed away completely with plenty of water. Spilled product which becomes wet or spilled aqueous solution create a hazard because of their slippery nature. The spillage should be contained with earth or sand and removed for disposal.

### 7. Handling and Storage

**Handling**
As with many organic powders flammable dust clouds may be formed. Avoid dust formation and ignition sources. Ensure good local exhaust ventilation. Do not eat, drink or smoke at the workplace. Remove contaminated clothing immediately and launder before re-use. Wash hands before breaks and immediately after handling the product.

**Storage**
Protect from wet and humid conditions. Keep in a dry, cool place. Avoid extremes of temperature.

Very slippery when wet.

### 8. Exposure Controls / Personal Protection

**Exposure limit(s)**
***CIEL-TWA Ciba internal exposure limit (8 hour time weighted average)***
not tested

**Technical measures/Precautions**
Ensure adequate ventilation, especially in confined spaces. Provide appropriate exhaust ventilation at places where dust is formed.

**Respiratory protection**
If dust is created. Effective dust mask. (Disposable, EN149 FFP2S). Half or full face mask with a particle filter type P2.(European standard)

**Hand protection**
PVC or other plastic material gloves. Rubber gloves.

**Eye protection**
Goggles.

**Skin and body protection**
Lightweight protective clothing.

### 9. Physical and Chemical Properties

| | | |
|---|---|---|
| **Form** | powder | |
| **Colour** | off-white | |
| **Odour** | odourless | |
| **Melting/freezing temperature** | not applicable | |
| **Softening point** | not applicable | |
| **Density** | not applicable | |
| **Bulk density** | 0.75 g/cm3 | Typical Value |
| **Flash point** | not applicable | |
| **Ignition Temperature** | not applicable | |
| **Assessment for ignitiontemperatur** | As with many organic powders flammable dust clouds may be formed. | |
| **Oxidising properties** | not applicable | |
| **Assessment for water solubility** | Soluble, forms a viscous solution in water. | |
| **Vapour pressure** | not tested | |
| **Partition coefficient; Log Pow** | not applicable | |
| **pH-value** | not tested | |
| **Explosive properties** | not applicable | |

### 10. Stability and Reactivity

| | |
|---|---|
| **Conditions to avoid** | No special precautions other than good housekeeping of chemicals. Avoid wet or humid conditions. Extremes of temperature. |
| **Materials to avoid** | Reactive chemicals. |
| **Hazardous decomposition products** | Combustion may result in the formation of, Oxides of carbon |

### 11. Toxicological Information

| | | | |
|---|---|---|---|
| **Acute oral toxicity**<br>*Rat* | LD50 | > 2000 mg/kg | By analogy to similar products |
| **Acute dermal irritation/corrosion**<br>*Rabbit* | | not irritant | By analogy to similar products |
| **Acute eye irritation/corrosion**<br>*Rabbit* | | not irritant | By analogy to similar products |
| **Acute skin sensitisation**<br>*Guinea pig* | | not tested | |

### 12. Ecological Information

| | | | |
|---|---|---|---|
| **Acute toxicity to fish**<br>*Zebra fish (Brachydanio rerio) 96 h* | LC50 | 357 mg/l<br><br>From tests on a product range. | OECD 203 / EEC C 1 |

| | | | |
|---|---|---|---|
| **Acute toxicity to daphnia**<br>*Daphnia magna 48 h* | EC50 | 212 mg/l<br><br>From tests on a product range. | OECD 202 / EEC C 2 |
| **Acute toxicity to bacteria**<br>*Pseudomonas putida 24 h* | EC50 | 892 mg/l<br><br>From tests on a product range. | |
| **Acute toxicity to algae**<br>*Chlorella vulgaris 72 h* | EC50 | > 1000 mg/l<br><br>From tests on a product range. | OECD 201 / EEC C 3 |

## 13. Disposal Considerations

**Waste from residues / unused products**
Local regulations must be observed.

**Contaminated packaging**
Contaminated packaging material should be treated equivalent to residual chemical. Clean packaging material should be subjected to waste management schemes (recovery recycling, reuse) according to local legislation.

## 14. Transport Information

| | |
|---|---|
| Flash point | not applicable |
| ADR/RID | Class: Free |
| IMO | Class: Free |
| ICAO | Class: Free |

## 15. Regulatory Information

| | |
|---|---|
| Classification | Classification not required |

## 16. Other Information

| | |
|---|---|
| Essential changes | This safety data sheet has been created using new software and replaces all earlier versions. There have been no significant change in safety information. |
| Further information | Intended use: -Flocculant |

MAGNAFLOC is a registered trademark.

## MAGNAFLOC 155

Edition 29.05.2002
(dd.mm.yyyy)

***Important***

THIS MATERIAL IS NOT INTENDED FOR USE IN PRODUCTS FOR WHICH PROLONGED CONTACT WITH MUCOUS MEMBRANES, BODY FLUIDS OR ABRADED SKIN, OR IMPLANTATION WITHIN THE HUMAN BODY, IS SPECIFICALLY INTENDED, UNLESS THE FINISHED PRODUCT HAS BEEN TESTED IN ACCORDANCE WITH NATIONALLY AND INTERNATIONALLY APPLICABLE SAFETY TESTING REQUIREMENTS. BECAUSE OF THE WIDE RANGE OF SUCH POTENTIAL USES, CIBA IS NOT ABLE TO RECOMMEND THIS MATERIAL AS SAFE AND EFFECTIVE FOR SUCH USES AND ASSUMES NO LIABILITY FOR SUCH USES.

This product should be stored, handled and used in accordance with good industrial hygiene practices and in conformity with any legal regulation. The information contained herein is based on the present state of our knowledge and is intended to describe our products from the point of view of safety requirements. It should not therefore be construed as guaranteeing specific properties.

# Material Safety Data Sheet




**SECTION 1 PRODUCT AND COMPANY IDENTIFICATION**

# ORFOM® MCO Flotation Oil

**Product Use:** Chemical Intermediate
**Product Number(s):** 0001016846, 0001016847, 0001086158
**Synonyms:** Flotation Oil
**Product Cas No.:** MIXTURE

**Company Identification:**
Chevron Phillips Chemical Company LP
Mining Chemicals
10001 Six Pines Drive
The WoodlandsTX 77380

**Product Information:**
MSDS Requests: (800) 852-5530
Technical Information: (800) 221-1956

**24-Hour Emergency Telephone Numbers**
HEALTH:Chevron Phillips Emergency Information Center 866.442.9628 (North America) and 1.832.813.4984 (International)
TRANSPORTATION: North America: CHEMTREC 800.424.9300 or 703.527.3887
ASIA: +1.703.527.3887
EUROPE: BIG .32.14.584545 (phone) or .32.14.583516 (telefax)
SOUTH AMERICA SOS-Cotec Inside Brazil: 0800.111.767
Outside Brazil: 55.19.3467.1600

| COMPONENT | CAS NUMBER | AMOUNT | EINECS | SYM | R-PHRASES |
|---|---|---|---|---|---|
| Decant (Clarified) Oils | 64741-62-4 | 40 - 55 % weight | 265-064-6 | T | R45 |
| Light Cycle Oil | 64741-59-9 | 28 - 35 % weight | 265-060-4 | T | R45 |
| Heavy Cycle Oil | 64741-60-2 | 28 - 33 % weight | 265-062-5 | T | R45 |
| Includes: Polynuclear Aromatics (PNAs) | Various | 35 - 49 % weight | NA | NA | NA |

**Occupational Exposure Limits:**

| Component | Limit | TWA | STEL | Ceiling / Peak | Notation |
|---|---|---|---|---|---|
| Decant (Clarified) Oils | CPCHEM | Not Established | NA | NA | NA |
| Heavy Cycle Oil | CPCHEM | Not Established | NA | NA | NA |
| Includes: Polynuclear Aromatics (PNAs) | CPCHEM | Not Established | NA | NA | NA |
| Light Cycle Oil | CPCHEM | Not Established | NA | NA | NA |

## SECTION 3 HAZARDS IDENTIFICATION

**********

### *EMERGENCY OVERVIEW*

Black liquid with mild odor.

- COMBUSTIBLE LIQUID AND VAPOR
- HARMFUL OR FATAL IF SWALLOWED - CAN ENTER LUNGS AND CAUSE DAMAGE
- CAUSES EYE IRRITATION
- CAUSES SKIN IRRITATION
- POSSIBLE CANCER HAZARD - MAY CAUSE CANCER BASED ON ANIMAL DATA

**********

**IMMEDIATE HEALTH EFFECTS:**

**Eye:** Contact with the eyes causes irritation. Symptoms may include pain, tearing, reddening, swelling and impaired vision. Not expected to cause prolonged or significant eye irritation.
**Skin:** Repeated contact with the skin may cause irritation. Contact with the skin causes irritation. Symptoms may include pain, itching, discoloration, swelling, and blistering. Not expected to be harmful to internal organs if absorbed through the skin.
**Ingestion:** This material can directly enter the lungs, if swallowed, or if subsequently vomited. Once in the lungs it is very difficult to remove and can cause severe injury or death.
**Inhalation:** Breathing this material at elevated concentrations causes central nervous system effects. Central nervous system effects may include headache, dizziness, nausea, vomiting, weakness, loss of coordination, blurred vision, drowsiness, confusion, or disorientation. At extreme exposures, central nervous system effects may include respiratory depression, tremors or convulsions, loss of consciousness, coma or death.

**DELAYED OR OTHER HEALTH EFFECTS:**

**Cancer:** Prolonged or repeated exposure to this material may cause cancer.
**Genetic Toxicity:** Contains material that may cause heritable genetic damage based on animal data.

See Section 11 for additional information. Risk depends on duration and level of exposure.

## SECTION 4 FIRST AID MEASURES

**Eye:** Flush eyes with running water immediately while holding the eyelids open. Remove contact lenses, if worn, after initial flushing, and continue flushing for at least 15 minutes. Get medical attention if irritation persists.
**Skin:** To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse. Get medical attention if any symptoms develop.
**Ingestion:** If swallowed, do not induce vomiting. Give the person a glass of water or milk to drink and get immediate medical attention. Never give anything by mouth to an unconscious person.
**Inhalation:** Move the exposed person to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if breathing difficulties continue.
**Note to Physicians:** Ingestion of this product or subsequent vomiting may result in aspiration of light hydrocarbon liquid, which may cause pneumonitis.

## SECTION 5 FIRE FIGHTING MEASURES

**See Section 7 for proper handling and storage.**
**FIRE CLASSIFICATION:**
OSHA Classification (29 CFR 1910.1200): Combustible liquid.
**NFPA RATINGS:** **Health:** 2 **Flammability:** 2 **Reactivity:** 0
**FLAMMABLE PROPERTIES:**
**Flashpoint:** > 66 °C (> 150.8°F) (Pensky-Martens Closed Cup)
**Autoignition:** NDA
**Flammability (Explosive) Limits (% by volume in air):** **Lower:** NDA **Upper:** NDA

**EXTINGUISHING MEDIA:** Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

**PROTECTION OF FIRE FIGHTERS:**
**Fire Fighting Instructions:** For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.
**Combustion Products:** Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be evolved when this material undergoes combustion. Combustion may form: Carbon Oxides, Sulfur Oxides

**Protective Measures:** Eliminate all sources of ignition in the vicinity of the spill or released vapor. If this material is released into the work area, evacuate the area immediately. Monitor area with combustible gas indicator. Eliminate potential sources of ignition. Handling equipment must be bonded and grounded to prevent sparking. Wear appropriate personal protective equipment when cleaning up spills. Refer to Section 8.
**Spill Management:** Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible sorbent materials or pumping. All equipment used when handling the product must be grounded. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.
**Reporting:** U.S.A. regulations require reporting spills of this material that could reach any surface waters. Report spills to local authorities and/or the National Response Center at (800) 424-8802 as appropriate or required.

**READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL . REFER TO PRODUCT LABEL OR MANUFACTURERS TECHNICAL BULLETINS FOR THE PROPER USE AND HANDLING OF THIS MATERIAL .**

**Precautionary Measures:** Do not breathe mist. Do not breathe vapor or fumes. Do not get in eyes.
**Static Hazard:** Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations, which have the potential of generating an accumulation

of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids, National Fire Protection Association (NFPA 77), Recommended Practice on Static Electricity' (liquids, powders and dusts), and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents' (liquids).
**General Storage Information:** DO NOT USE OR STORE near heat, sparks or open flames. USE AND STORE ONLY IN WELL VENTILATED AREA. Keep container closed when not in use. Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner, or disposed of properly.
**Container Warnings:** Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

## SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

**GENERAL CONSIDERATIONS:**
Consider the potential hazards of this material (see Section 3) applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

**ENGINEERING CONTROLS:**
If user operations generate airborne material, use process enclosures, local exhaust ventilation, or other engineering controls to control exposure.

**PERSONAL PROTECTIVE EQUIPMENT:**
**Eye/Face Protection:** Wear eye protection such as safety glasses, chemical goggles, or faceshields if engineering controls or work practices are not adequate to prevent eye contact.
**Skin Protection:** Wear impervious protective clothing to prevent skin contact. Selection of protective clothing may include gloves, apron, boots, and complete facial protection depending on operations conducted. Users should determine acceptable performance characteristics of protective clothing. Consider physical requirements and other substances present when selecting protective clothing. Suggested materials for protective gloves include: Neoprene, or Nitrile Rubber
**Respiratory Protection:** Wear a NIOSH approved respirator that provides protection when working with this material if exposure to harmful levels of airborne material may occur, such as: Air-Purifying Respirator for Organic Vapors, Dusts and Mists
Use a positive pressure, air-supplying respirator if there is potential for uncontrolled release, exposure levels are not known, or other circumstances where air-purifying respirators may not provide adequate protection.

**Occupational Exposure Limits:**

| Component | Limit | TWA | STEL | Ceiling / Peak | Notation |
|---|---|---|---|---|---|
| Decant (Clarified) Oils | CPCHEM | Not Established | NA | NA | NA |
| Heavy Cycle Oil | CPCHEM | Not Established | NA | NA | NA |
| Includes: Polynuclear Aromatics (PNAs) | CPCHEM | Not Established | NA | NA | NA |
| Light Cycle Oil | CPCHEM | Not Established | NA | NA | NA |

## SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

**APPEARANCE AND ODOR:** Black liquid with mild odor.
**pH:** NA
**VAPOR PRESSURE:** <1 mmHg Estimated @ 21 ºC
**VAPOR DENSITY (AIR=1):** >3
**BOILING POINT:** 165 °C (329°F) - 538°C (1000.4°F)
**SOLUBILITY (in water):** Negligible
**VISCOSITY:** 35 - 45 cSt @ 25 ºC (77°F)
**SPECIFIC GRAVITY:** 0.985 @ 15.6 ºC (60°F)
**EVAPORATION RATE:** <1

**Chemical Stability:** This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.
**Conditions to Avoid:** Introduction of oxygen
**Incompatibility With Other Materials:** Avoid contact with strong oxidizing agents.
**Hazardous Decomposition Products:** Carbon Oxides. Sulfur Oxides.
**Hazardous Polymerization:** Hazardous polymerization will not occur.

**IMMEDIATE HEALTH EFFECTS:**

**Acute Oral Toxicity:** LD50 / rat / > 2000 mg/kg
**Acute Dermal Toxicity:** LD50 / rabbit / > 2000 mg/kg
**Acute Inhalation Toxicity:** LC50 / rat / 4.7 mg/l

**Eye Irritation:** This material is irritating to the eyes.
**Skin Irritation:** This material is irritating to the skin.

**ADDITIONAL TOXICOLOGY INFORMATION:**
This material contains POLYNUCLEAR AROMATICS (PNA's):
Reproductive and Developmental Toxicity: GD7-16 / gavage / rat / Doses: 0, 10, 40, or 160mg/kg / LOAEL = 40mg/kg (reduced pup weight)
Carcinogenicity: lifetime / dermal / mouse / 0, 2 µg/kg / 1x/day, 2d/wk / LOAEL = 2µg (skin tumors); lifetime / oral / rat / 0, 0.15mg/kg / 5x/wk / LOAEL = 0.15mg/kg (forestomach tumors)

This product contains decant (clarified) oil:

Repeated Dose Toxicity: 13 weeks / dermal / rat / Doses: 0, 8, 125, or 500mg/kg / daily / LOAEL = 8mg/kg (bile duct abnormalities); 28 days/ dermal / rat / Doses: 0, 400, 1000, 2000 or 4000mg/kg / 5 times/wk / LOAEL = 400mg/kg (hepatomegaly)
Reproductive and Developmental Toxicity: GD 0-19 / dermal / rat / Doses: 0, 4, 8, 125 or 250mg/kg / daily / NOAELmaternal toxicity = 4mg/kg, NOAELteratogenicity = 4mg/kg
Genetic Toxicity: Ames test - positive; Mouse lymphoma assay - positive; Sister Chromatid Exchange assay - positive; Cytogenetic assay - positive; Unscheduled DNA synthesis - positive
Carcinogenicity: lifetime / dermal / mouse / Doses: 0, 20 µl / 3 times/wk / dermal carcinogen

This product contains LIGHT CYCLE OIL:
Repeated Dose Toxicity: 28 days / dermal / rabbit / Doses: 0, 1, 1000, or 2000 mg/kg / 3 times/wk / NOAEL = 200mg/kg; LOAEL = 1000mg/kg (body weight gain and skin irritation).
Reproductive and Developmental Toxicity: GD 0-19 / dermal / rat / Doses: 0, 25, 50, 125, 250, 500 or 1000mg/kg / daily / NOAELmaternal toxicity = 125 mg/kg
Genetic Toxicity: Ames test - positive; Mouse lymphoma assay - positive; Sister Chromatid Exchange assay - negative; Cytogenetic assay - negative
Carcinogenicity: 24 months / dermal / mouse / doses: 0, 50µl / 2times/wk / dermal carcinogen

## SECTION 12 ECOLOGICAL INFORMATION

**ECOTOXICITY:**
This material is not expected to be harmful to aquatic organisms.
Decant (Clarified) Oils - 96 hour(s) / EC50 / invertebrate (Unidentified species) / 5.1 mg/l
Decant (Clarified) Oils - 96 hour(s) / EC50 / Diatom (*Skeletonema costatum* ) / 160 mg/l
Decant (Clarified) Oils - 96 hour(s) / LC50 / Atlantic silverside (*Menidia menidia* ) / 130 mg/l

**ENVIRONMENTAL FATE:**
The environmental fate of this material is not available.

## SECTION 13 DISPOSAL CONSIDERATIONS

Use material for its intended purpose or recycle if possible. This material, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA under RCRA (40 CFR 261) or other State and local regulations. Measurement of certain physical properties and analysis for regulated components may be necessary to make a correct determination. If this material is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

## SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

**Shipping Descriptions per regulatory authority.**

**US DOT**

PETROLEUM PRODUCTS, N.O.S., COMBUSTIBLE LIQUID, UN1268, III

**ICAO / IATA**

PETROLEUM PRODUCTS, N.O.S., COMBUSTIBLE LIQUID, UN1268, III

**IMO / IMDG**

PETROLEUM PRODUCTS, N.O.S., COMBUSTIBLE LIQUID, UN1268, III, (66 °C )

**RID / ADR**

UN1268, PETROLEUM PRODUCTS, N.O.S., COMBUSTIBLE LIQUID, III, ADR

**SARA 311/312 CATEGORIES:**

1. Immediate (Acute) Health Effects: YES
2. Delayed (Chronic) Health Effects: YES
3. Fire Hazard: YES
4. Sudden Release of Pressure Hazard: NO
5. Reactivity Hazard: NO

**REGULATORY LISTS SEARCHED:**

| | | |
|---|---|---|
| 01= CA Prop 65 | 17 = FDA 178 | 33 = RCRA Waste Appendix VIII |
| 02 = LA RTK | 18 = FDA 179 | 34 = RCRA Waste D-List |
| 03 = MA RTK | 19 = FDA 180 | 35 = RCRA Waste P-List |
| 04 =MN Hazardous Substance | 20 = FDA 181 | 36 = RCRA Waste U-List |
| 05 =NJ RTK | 21 = FDA 182 | 37 = SARA Section 311/312 |
| 06 = PA RTK | 22 = FDA 184 | 38 = SARA Section 313 |
| 07 = CAA Section 112 HAPs | 23 = FDA 186 | 39 = TSCA 12 (b) |
| 08 = CWA Section 307 | 24 = FDA 189 | 40 = TSCA Section 4 |
| 09 = CWA Section 311 | 25 = IARC Group 1 | 41 = TSCA Section 5(a) |
| 10 =DOT Marine Pollutant | 26 = IARC Group 2A | 42 = TSCA Section 8(a) CAIR |
| 11 = FDA 172 | 27 = IARC Group 2B | 43 = TSCA Section 8(a) PAIR |
| 12 = FDA 173 | 28 = IARC Group 3 | 44 = TSCA Section 8(d) |
| 13 = FDA 174 | 29 = IARC Group 4 | 45 = WHIMS - IDL |
| 14 = FDA 175 | 30 = NTP Carcinogen | 46 = Germany D TAL |
| 15 = FDA 176 | 31 = OSHA Carcinogen | 47 = Germany WKG |
| 16 = FDA 177 | 32 = OSHA Highly Hazardous | 48 = DEA List 1 |
| | | 49 = DEA List 2 |

**The following components of this material were found on the regulatory lists above.**

Includes: Polynuclear Aromatics (PNAs) 38

**WHMIS CLASSIFICATION:**

Class B, Division 3: Combustible Liquids
Carcinogenicity
Class D, Division 2, Subdivision B: Toxic Material
Skin or Eye Irritation

**CHEMICAL INVENTORY LISTINGS:**

AUSTRALIA: All the components of this material are listed on the Australian Inventory of Chemical Substances (AICS).

CANADA: All the components of this material are on the Canadian Domestic Substances List (DSL).

EUROPEAN UNION: All the components of this material are in compliance with the EU Seventh Amendment Directive 92/32/EEC.

KOREA: All the components of this product are on the Existing Chemicals List (ECL) in Korea.

UNITED STATES: All of the components of this material are on the Toxic Substances Control Act (TSCA) Chemical Inventory.

PHILIPPINES: This material contains components that require notification before sale or importation into the Philippines.

JAPAN: All the components of this product are on the Existing & New Chemical Substances (ENCS) inventory in Japan, or have an exemption from listing.

PEOPLE'S REPUBLIC OF CHINA: This material contains components that require notification before sale or importation into China.

**EU RISK AND SAFETY PHRASES:**

R36: Irritating to eyes.
R38: Irritating to skin.
R45: May cause cancer.
R46: May cause heritable genetic damage.
R65: Harmful: may cause lung damage if swallowed.
S2: Keep out of the reach of children.
S24: Avoid contact with skin.
S25: Avoid contact with eyes.
S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S62: If swallowed do not induce vomiting: seek medical advice immediately and show this container or label.
S36/37: Wear suitable protective clothing and gloves.

**EU Symbols:** T

## SECTION 16 OTHER INFORMATION

**NFPA RATINGS:** Health: 2 Flammability: 2 Reactivity: 0 Special: NA

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA).

**REVISION STATEMENT:** This revision updates all sections of the MSDS please review.

**ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:**

| | | | | |
|---|---|---|---|---|
| TLV | - Threshold Limit Value | TWA | - | Time Weighted Average |
| STEL | - Short-term Exposure Limit | PEL | - | Permissible Exposure Limit |
| ACGIH | - American Conference of Government Industrial Hygienists | OSHA | - | Occupational Safety & Health |
| NIOSH | National Institute of Safety & Health | NFPA | - | National Fire Protection Agency |

| | | | | | |
|---|---|---|---|---|---|
| WHMIS | - | Workplace Hazardous Materials Information System | IARC | - | Intl. Agency for Research on Cancer |
| EINECS | - | European Inventory of existing Commercial Chemical Sales | RCRA | - | Resource Conservation Recovery Act |
| SARA | - | Superfund Amendments and Reauthorization Act. | TSCA | - | Toxic Substance Control Act |
| EC50 | - | Effective Dose | LC50 | - | Lethal Concentration |
| LD50 | - | Lethal Dose | CAS | - | Chemical Abstract Service Number |
| NDA | - | No Data Available | NA | - | Not Applicable |
| <= | - | Less Than or Equal To | >= | - | Greater Than or Equal To |
| CNS | - | Central Nervous System | MAK | - | Germany Maximum Concentration Values |

**This data sheet is prepared according to the latest adaptation of the EEC Guideline 67/548.**
**This data sheet is prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200).**
**This data sheet is prepared according to the ANSI MSDS Standard (Z400.1).**
**This data sheet was prepared by EHS Product Stewardship Group, Chevron Phillips Chemical Company LP, 10001 Six Pines Drive, The Woodlands, TX 77380.**

**The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.**

For more information and technical assistance contact:

Chevron Phillips Chemical Company LP
P.O. Box 4910
The Woodlands, TX 77387-4910
800.858.4327

# ORFOM® MCO Flotation Oil

**ORFOM® MCO flotation oil is a non-polar collector that is a highly effective collector for molybdenite. It is used as a primary collector in both primary and by-product molybdenite ores. It can be used with all conventional collectors and is stable over a wide pH range. Mill tests have indicated that ORFOM® MCO flotation oil can improve molybdenum recovery and is more selective than fuel oil, diesel, and other types of oil products. It should be added to the primary grinding stage for maximum effectiveness.**

**Application**

ORFOM® MCO flotation oil should be added to the primary ball mill or rod mill grinding stage. Recommended starting dosage rates:

For copper/molybdenum porphyry ores 0.01 - 0.04 lbs/ton of ore (5 - 20 g/metric ton).

For primary molybdenum ore 0.1 - 0.3 lbs/ton of ore (50 - 150 g/metric ton).

**Benefits**

ORFOM® MCO flotation oil improves recovery of molybdenite in copper/molybdenum porphyry ores and by primary molybdenite ores.

**Availability**

ORFOM® MCO flotation oil is currently available in drum, tank truck and tank car quantities.

**Material Handling**

Do not get in eyes, on skin or on clothing. Do not breathe vapor or mists. Do not swallow, may be aspirated into lungs. Wear personal protective equipment as described in the MSDS if exposure conditions warrant. Wash thoroughly after handling. Immediately remove and launder contaminated clothing before reuse. Use only with adequate ventilation. In case of skin contact, immediately wash thoroughly with soap and water. For eye contact, irrigate with running for at least 15 minutes. Seek medical attention if irritation or adverse symptoms develop. In case of inhalation, immediately remove from exposure. If breathing is difficult, give oxygen.

Provide means of controlling leaks and spills. Keep away from ignition sources. If spilled, protect from ignition. Use dry chemical, CO2, foam or water fog as fire extinguishing media. Keep out of water sources and sewers. Absorb in dry inert material (sand, clay, sawdust, etc.). Transfer to disposal drums using non-sparking equipment. Dispose of waste by incineration or place in a permitted waste management facility. Insure Conformity with all Applicable Disposal Regulations.

Refer to the Material Safety Data Sheet for complete safety and health information.

**Typical Properties**

| Property | Value |
|---|---|
| Density at 60°F (15.6°C) | 8.3 lbs/gal. (0.994 g/cc) |
| Flash Point, TCC | 195°F (91°C) |
| Pour Point | 25°F (-4°C) |
| Kinematic Viscosity, cst @ 70°F (21.1°C) | 34.4 |

MSDS #59730 Revision Date February, 2006

Another quality product from Chevron Phillips Chemical Company LP The Woodlands, Texas

Before using this product, the user is advised and cautioned to make its own determination and assessment of the safety and suitability of the product for the specific use in question and is further advised against relying on the information contained herein as it may relate to any specific use or application. It is the ultimate responsibility of the user to ensure that the product is suited and the information is applicable to the user's specific application. Chevron Phillips Chemical Company LP does not make, and expressly disclaims, all warranties, including warranties of merchantability or fitness for a particular purpose, regardless of whether oral or written, express or implied, or allegedly arising from any usage of any trade or from any course of dealing in connection with the use of the information contained herein or the product itself. The user expressly assumes all risk and liability, whether based in contract, tort or otherwise, in connection with the use of the information contained herein or the product itself. Further, information contained herein is given without reference to any intellectual property issues, as well as federal, state or local laws which may be encountered in the use thereof. Such questions should be investigated by the user.

| | |
|---|---|
| **Product name:** | Methyl isobutyl carbinol |
| **MSDS number:** | 63 |
| **Material number:** | 80063 |
| **Published date:** | 07/28/2005(V1) |

# MATERIAL SAFETY DATA SHEET

## 1. Product and Company Identification

**Product:** Methyl isobutyl carbinol
**MSDS number:** 63
**Material number:** 80063

**Manufacturer name and address:**

**Celanese Ltd.**
1601 W. LBJ Freeway
P.O. Box 819005
Dallas, TX 75381-9005
United States
Phone: 972 443 4000
Internet: www.celanesechemicals.us

**Transportation emergency phone numbers:**
In USA, call 800 424 9300
Outside USA, call 703 527 3887, collect calls accepted

**Product Use:** Intermediate for lube oil additives, especially zinc dialkyl dithiophosphates; frothing agent for ore flotation, especially copper.

## 2. Composition / Information on Ingredients

| Component | CAS Number | Percent % | OSHA hazard category: |
|---|---|---|---|
| METHYL ISOBUTYL CARBINOL | 108-11-2 | 99 | Hazardous |

## 3. Hazards Identification

### Emergency Overview:

WARNING!
•Flammable liquid and vapor.
•May cause respiratory tract and eye irritation.
•May cause skin irritation.
•Prolonged or repeated contact may dry skin and cause irritation.
•Material creates a special hazard because it floats on water.

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**Transportation emergency:** 800 424 9300 CHEMTREC, 24 hrs/day
703 527 3887 Outside USA, collect calls accepted, 24 hrs/day
**Product information:** 800 835 5235

| | |
|---|---|
| **Product name:** | Methyl isobutyl carbinol |
| **MSDS number:** | 63 |
| **Material number:** | 80063 |
| **Published date:** | 07/28/2005(V1) |

**Product Description**

| | |
|---|---|
| **Appearance:** | Clear, colorless mobile liquid. |
| **Odor:** | Slightly irritating, alcohol odor. |

## Potential health effects

***Routes of exposure:*** Skin, eyes, inhalation, ingestion.

***Immediate effects:***

**Skin:** May cause skin irritation. Prolonged or repeated contact may dry skin and cause irritation. May be harmful if absorbed through skin. Symptoms of exposure may include: Central nervous system depression with headache, stupor, uncoordinated or strange behavior or unconsciousness. Drying, cracking or inflammation of skin.

**Eyes:** Exposure to vapors and liquid Causes eye irritation. Symptoms of exposure may include: Eye irritation, burning sensation, pain, watering, and/or change of vision.

**Inhalation:** Causes respiratory tract irritation. Harmful if inhaled. Symptoms of exposure may include: Central nervous system depression with nausea, dizziness, headache, stupor, uncoordinated or strange behavior or unconsciousness. Nasal discharge, hoarseness, coughing, chest pain and breathing difficulty.

**Ingestion:** May be harmful if swallowed. Symptoms of exposure may include: Nausea, vomiting, loss of appetite, gastrointestinal irritation and/or diarrhea. Central nervous system depression with nausea, headache and mental sluggishness.

**Mutagenic:** Does not show mutatgenic potential in most in vitro tests.

**Target organ effects:**
•Overexposure (prolonged or repeated exposure) may cause:
Kidney damage
Central nervous system depression
Injury to the eyes
Irritation of the respiratory tract
Irritation of the digestive tract
Drying of the skin

**Medical conditions which may be aggravated by exposure:** Significant exposure to this chemical may adversely affect people with acute or chronic disease of the:
Respiratory Tract
Skin
Eyes
Kidneys
Central nervous system
Digestive tract

---

| | | |
|---|---|---|
| **Transportation emergency:** | 800 424 9300 | CHEMTREC, 24 hrs/day |
| | 703 527 3887 | Outside USA, collect calls accepted, 24 hrs/day |
| **Product information:** | 800 835 5235 | |

| | |
|---|---|
| **Product name:** | Methyl isobutyl carbinol |
| **MSDS number:** | 63 |
| **Material number:** | 80063 |
| **Published date:** | 07/28/2005(V1) |

**For further information, see:**

Section 4 - First Aid Measures
Section 5 - Fire Fighting Measures
Section 6 - Accidental Release Measures
Section 8 - Exposure Controls/Personal Protection
Section 9 - Physical and Chemical Properties
Section 10 - Stability and Reactivity

## 4. First Aid Measures

**Skin:** Immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Call a physician if irritation develops and persists. Wash clothing before reuse. Thoroughly clean shoes before reuse.

**Eyes:** Immediately flush eyes with plenty of water for at least 15 minutes. If easy to do, remove contact lenses, if worn. Get medical attention immediately.

**Inhalation:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

**Ingestion:** DO NOT induce vomiting. Get medical attention immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

## 5. Fire Fighting Measures

**NFPA:** Health: 2 Flammability: 2 Reactivity: 0

**Flammable properties**

**Flash point (test method):** 42.4 C (108 F)

**Flammable limits in air, % by volume:**

**Upper:** 5.5 %
**Lower:** 1 %

**Autoignition temperature:** 360.3 C (680 F)

**Products of combustion:** Carbon Monoxide.

**Extinguishing Media:** Use $CO_2$ or dry chemical for small fires. Use aqueous film forming foam for large fires.

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**Transportation emergency:** 800 424 9300 CHEMTREC, 24 hrs/day
703 527 3887 Outside USA, collect calls accepted, 24 hrs/day

**Product information:** 800 835 5235

| | |
|---|---|
| **Product name:** | Methyl isobutyl carbinol |
| **MSDS number:** | 63 |
| **Material number:** | 80063 |
| **Published date:** | 07/28/2005(V1) |

**Fire Fighting Instructions:** Water spray should be used to cool fire-exposed structures and vessels. Keep personnel removed from and upwind of fire. If potential for exposure to vapors or products of combustion exists, wear full fire fighting turnout gear and NIOSH approved self-contained breathing apparatus. Oxidizing chemicals may accelerate the burning rate in a fire situation.

**Fire Fighting Environmental Concerns:** Thoroughly decontaminate bunker gear and other fire-fighting equipment before re-use.

## 6. Accidental Release Measures

**Spill or Leak Instructions** Eliminate ignition sources. See Section 8 for appropriate personal protective equipment. Contain spill with dikes of soil or nonflammable absorbent to minimize contaminated area. If fire potential exists, blanket spill with alcohol type aqueous film-forming foam or use water fog stream to disperse vapors. Avoid run-off into storm sewers and ditches leading to waterways. If required, notify state and local authorities. Place leaking containers in well-ventilated area. Clean up small spills by using a nonflammable absorbent or flushing sparingly with water. Contain larger spills with nonflammable diking or absorbent. Clean up by vacuuming or sweeping.

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Isolate for 800 meters or 0.5 miles in all directions if tank, rail car, or tank truck in involved in fire. Material creates a special hazard because it floats on water. Assess the spill situation, as the spill may not evolve large amounts of hazardous airborne contaminants in many outdoor spill situations. It may be advisable in some cases to simply monitor the situation until spilled product is removed.

## 7. Handling and Storage

**Handling:** Use with adequate ventilation. Keep containers closed when not in use. Always open containers slowly to allow any excess pressure to vent. Avoid breathing vapor. Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Decontaminate soiled clothing thoroughly before re-use. Destroy contaminated leather clothing.

This product may generate a static charge. Ground/bond equipment when transferring material to prevent static accumulation. Electrical equipment and circuits in all storage and handling must conform to requirements of National Electric Code (Article 500 and 501) for hazardous location.

**Storage:** Keep all containers tightly closed when not in use. Store out of direct sunlight and on an impermeable floor.
Do not store with incompatible materials. See Section 10. Stability and Reactivity.

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## 8. Exposure Controls / Personal Protection

**Engineering Controls:** General or dilution ventilation is frequently insufficient as the sole means of controlling employee exposure. Local ventilation is usually preferred.

**Protective Equipment** A safety shower and eyebath should be readily available.

***Skin protection:*** Wear impervious clothing and gloves to prevent contact. Butyl rubber is recommended. Other protective material may be used, depending on the situation, if adequate degradation and permeation data is available. If other chemicals are used in conjunction with this chemical, material selection should be based on protection for all chemicals present.

***Eye/face protection:*** Wear chemical goggles when there is a reasonable chance of eye contact.

***Respiratory protection:*** Based on workplace contaminant level and working limits of the respirator, use a respirator approved by NIOSH. The following is the minimum recommended equipment for an occupational exposure level. To estimate an occupational exposure level see Section 3, Section 8 and Section 11.

For concentrations > 1 and < 10 times the occupational exposure level: Use air-purifying respirator with full facepiece and organic vapor cartridge(s) or air-purifying full facepiece respirator with an organic vapor canister or a full facepiece powered air-purifying respirator fitted with organic vapor cartridge(s). The air purifying element must have an end of service life indicator, or a documented change out schedule must be established. Otherwise, use supplied air.

For concentrations more than 10 times the occupational exposure level and less than the lower of either 100 times the occupational exposure level or the IDLH: Use Type C full facepiece supplied-air respirator operated in positive-pressure or continuous-flow mode.

For concentrations > 100 times the occupational exposure level or greater than the IDLH level or unknown concentrations (such as in emergencies): Use self-contained breathing apparatus with full facepiece in positive-pressure mode or Type C positive-pressure full facepiece supplied-air respirator with an auxiliary positive-pressure self-contained breathing apparatus escape system.

For escape: Use self-contained breathing apparatus with full facepiece or any respirator specifically approved for escape.

**Exposure guidelines**

---

| | |
|---|---|
| **Product name:** | Methyl isobutyl carbinol |
| **MSDS number:** | 63 |
| **Material number:** | 80063 |
| **Published date:** | 07/28/2005(V1) |

| Component | CAS Number | Percent % | ACGIH TWA | ACGIH STEL | ACGIH CEILING | OSHA TWA | OSHA STEL | OSHA CEILING | Celanese WEL * | Mexico TWA | Mexico STEL | Mexico CEILING |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| METHYL ISOBUTYL CARBINOL | 108-11-2 | 99 | 25 ppm | 40 ppm | - | 25 ppm | - | - | - | 25 ppm | 40 ppm | - |

| Component | CAS Number | Percent % | 1990 NIOSH IDLH (Recognized by OSHA) | 1994 NIOSH IDLH |
|---|---|---|---|---|
| METHYL ISOBUTYL CARBINOL | 108-11-2 | 99 | 2000 PPM | 400 ppm |

**Comments:** Celanese has adopted the ACGIH TLVs
* Workplace Exposure Limit

## 9. Physical and Chemical Properties

**Appearance:** Clear, colorless mobile liquid.

**Odor:** Slightly irritating, alcohol odor.

**Vapor Pressure:** 4.7 mm Hg at 20 deg C

**Vapor Density (Air=1 @ 20°C):** 3.53

**Boiling Point (760 mmHgA):** 132 C (269.6 F)

**Freezing Point:** < -50 C (< -58 F)

**Solubility in Water @ 20°C:** 1.82 grams per 100 grams H2O

**Specific Gravity:** 0.808 at 20 deg C

**Molecular Weight:** 102.2

**Evaporation Rate (n-Butyl acetate = 1):** 0.26

## 10. Stability and Reactivity

**Stability:** Stable.

**Conditions to Avoid:** Avoid heat , flames, sparks, and other sources of ignition.

**Incompatibility:** Keep away from sulfuric and other strong inorganic acids, aluminum or lead (including equipment made of these metals), and oxidizing agents such as peroxides, nitric acid, perchloric acid or chromium trioxide.

---

**Transportation emergency:** 800 424 9300 CHEMTREC, 24 hrs/day
703 527 3887 Outside USA, collect calls accepted, 24 hrs/day

**Product information:** 800 835 5235

| | |
|---|---|
| **Product name:** | Methyl isobutyl carbinol |
| **MSDS number:** | 63 |
| **Material number:** | 80063 |
| **Published date:** | 07/28/2005(V1) |

**Hazardous Combustion or Decomposition Products:** Thermal decomposition products may include oxides of carbon.

**Hazardous Polymerization:** Hazardous polymerization will not occur.

## *11. Toxicological Information*

**Component Toxicological Information**

| Component | METHYL ISOBUTYL CARBINOL |
|---|---|

**Acute Exposure:** Excessive exposure leads to depression of the central nervous system which is generally reversible and is shown by headache, dizziness, drowsiness, loss of coordination and unconsciousness.

**Oral LD50:** 2.6g-kg (rats); Slightly toxic to animals. Nausea, vomiting, gastrointestinal irritation and diarrhea may occur.

**Inhalation LC50:** >3776 ppm (rats; vapor; 4hrs.); Slightly toxic to animals. Vapors are irritating to the respiratory tract.

**Skin:** Repeated or prolonged contact may cause drying of the skin dermatitis. Moderately irritating to rabbit skin. Slightly toxic (dermal LD50, rabbit:2.9g/kg).

**Eyes:** Liquid causes moderate to severe irritation of rabbit eyes. Vapors are irritating to the eyes.

**Mutagenicity:** Not mutagenic in bacterial, yeast and rat liver cell in vitro assays, including the Ames Test.

**Carcinogenicity:** No information.

**Reproductive/Developmental Effects:** No information.

**Other:** Methyl isobutyl carbinol has potentiated the liver toxicity of halogenated solvents (e.g., chloroform and carbon tetrachloride) in experimental animals at oral doses of 570 mg/kg or higher.

**Repeated Exposure:** Male and female rates exposed for 6hr/day. 5 days/wk for 6 wks to 211. 825 or 3698 mg/m$^3$ showed no overt signs of toxicity, effects on blood parameters or compound-related effects based on gross and microscopic examination of tissues. Increased kidney weight was observed in the males at the high dose. Effects on urine parameters were noted at all dose levels except for the low dose males. There are several other studies of limited quality and with limited details. In a 90-day inhalation study, kidney effects were reported in rats at 0.425 mg/1, but not in monkeys or dogs. The effect in rats was reversible on cessation of exposure. In mice exposed 12 times for 4 hours to vapor saturated air (approximately 20 mg/1), an anesthetic effect was reported, but no mortality. In rabbits exposed dermally 5 times over a period of 15-21 days at 2.5 g/kg, no systemic effects were observed.

## *12. Ecological Information*

**Component Ecological Information**

| Component | METHYL ISOBUTYL CARBINOL |
|---|---|

**Ecotoxicity:** Methyl isobutyl carbinol exhibits low acute toxicity to aquatic species. The 96-hour LC50 for fish (Pimephales promelas) was greater than 92.4 ppm. There was no mortality at this level. The 24-hour LC50 value for fish (Carassius auratus) is 360 ppm. The 24-hour LC50 value for shrimp (Artemia salina) is 370 ppm. The 48-hour LC50 value for the clawed toad (Xenopus laevis) is 656 ppm. The 3-hour EC50 for inhibition of bacteria was greater than 100 ppm in the Activated Sludge Respiration Inhibition Test.

## 13. Disposal Considerations

Dispose of spilled material in accordance with state and local regulations for hazardous waste. Recommended methods are incineration or biological treatment at a federally or state-permitted disposal facility. Note that this information applies to the material as manufactured; processing, use, or contamination may make this information inappropriate, inaccurate, or incomplete.

Note that this handling and disposal information may also apply to empty containers, liners and rinsate. State or local regulations or restrictions are complex and may differ from federal regulations. This information is intended as an aid to proper handling and disposal; the final responsibility for handling and disposal is with the owner of the waste. See Section 9 - Physical and Chemical Properties.

EPA Hazardous Waste Code(s): D001

## 14. Transport Information

### US Department of Transportation:

| | |
|---|---|
| **UN/NA Number:** | UN 2053 |
| **Shipping name:** | METHYL ISOBUTYL CARBINOL |
| **Hazard class:** | 3 |
| **Packing Group:** | PG III |
| **Emergency Response Guide:** | 129 |

### ICAO/IATA:

| | |
|---|---|
| **IATA UN Number:** | UN 2053 |
| **Proper Shipping Name:** | METHYL ISOBUTYL CARBINOL |
| **Hazard Classification:** | 3 |
| **Packing group:** | III |
| **Label:** | (Flammable Liquid) |

### IMDG:

| | |
|---|---|
| **International Marine UN Number:** | UN 2053 |
| **Proper Shipping Name:** | METHYL ISOBUTYL CARBINOL |
| **Hazard Class:** | 3 |
| **Packing Group:** | III |
| **Flash point (test method):** | 42.4 C (108 F) |

---

| | | |
|---|---|---|
| **Transportation emergency:** | 800 424 9300 | CHEMTREC, 24 hrs/day |
| | 703 527 3887 | Outside USA, collect calls accepted, 24 hrs/day |
| **Product information:** | 800 835 5235 | |

| | |
|---|---|
| **Product name:** | Methyl isobutyl carbinol |
| **MSDS number:** | 63 |
| **Material number:** | 80063 |
| **Published date:** | 07/28/2005(V1) |

**Transport Canada**

**Trade Information**
**Schedule B Code (export):** 2905.19.0020

## *15. Regulatory Information*

**U.S. STATE REGULATIONS**
Chemicals associated with the product which are subject to the state right-to-know regulations are listed along with the applicable state(s):

METHYL ISOBUTYL CARBINOL 108-11-2

| | |
|---|---|
| **Pennsylvania** | Listed |
| **New Jersey** | Listed |
| **Illinois** | Listed |
| **Massachusetts** | Listed |

**U.S. FEDERAL REGULATIONS**

**TSCA Inventory:** We certify that all components are either on the TSCA inventory or qualify for an exemption.

**Environmental Regulations:**

**SARA 311:**

| | |
|---|---|
| **Acute health:** | Yes |
| **Chronic health:** | No |
| **Fire:** | Yes |
| **Sudden release of pressure:** | No |
| **Reactive:** | No |

**INTERNATIONAL REGULATIONS**

**International Chemical Inventory**
Listed on the chemical inventories of the following countries or qualifies for an exemption:

AUSTRALIA,CHINA,CANADA,EUROPE,KOREA,PHILIPPINES, JAPAN

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| | | |
|---|---|---|
| **Transportation emergency:** | 800 424 9300 | CHEMTREC, 24 hrs/day |
| | 703 527 3887 | Outside USA, collect calls accepted, 24 hrs/day |
| **Product information:** | 800 835 5235 | |

| | |
|---|---|
| **Product name:** | Methyl isobutyl carbinol |
| **MSDS number:** | 63 |
| **Material number:** | 80063 |
| **Published date:** | 07/28/2005(V1) |

## *16. Other Information*

**Prepared by:** Product Stewardship Department
Celanese Ltd.

**Hazard ratings** This information is intended solely for the use of individuals trained in the NFPA and/or HMIS systems.

**NFPA:** Health: 2 Flammability: 2 Reactivity: 0

**HMIS:** Health: 2 Flammability: 2 Reactivity: 0

**Revisions:** The following sections have been revised since the last issue of this MSDS.

Footer: Product Information number

**For industrial use only.** The information contained herein is accurate to the best of our knowledge. We do not suggest or guarantee that any hazards listed herein are the only ones which exist. Celanese makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other substances. Effects can be aggravated by other materials and/or this material may aggravate or add to the effects of other materials. This material may be released from gas, liquid, or solid materials made directly or indirectly from it. User has the sole responsibility to determine the suitability of the materials for any use and the manner of use contemplated. User must meet all applicable safety and health standards. Material safety data sheets are provided on the Internet by Celanese as a service to its customers. Possession of an Internet MSDS does not indicate that the possessor of the MSDS was a purchaser or user of the subject product.

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# Methyl Isobutyl Carbinol – CAS # 108-11-2

Methyl Isobutyl Carbinol (MIBC) is a liquid derivative of acetone with a pungent, alcohol odor. This flammable liquid has limited solubility in water, but is miscible with most organic solvents. MIBC is stable under recommended storage conditions.

Methyl Isobutyl Carbinol is available from Celanese Chemicals in the following packages:

- DOT 111A100W1 Tank Cars
- DOT MC 307 or DOT 407 Tank Trucks
- UN 1A1/X1.2/300 55-Gallon Carbon Steel Drums

## *Storage*

| | |
|---|---|
| Recommended Blanketing | Air[1,2] or Dry Nitrogen[1,2,3] |
| Recommended Temperature | Ambient |
| Recommended Pressure | Atmospheric |
| Bulk Quantities | Outside, detached tanks |
| Small Containers | Cool, dry, well ventilated area |

## *Handling*

- Thoroughly review Material Safety Data Sheet before handling product.
- Keep containers closed when not in use.
- Open containers slowly to allow any excess pressure to vent.
- Keep away from heat, sparks, flame, or other sources of ignition.
- Protect small containers from physical damage.
- Use proper electrical grounding and bonding procedures when loading, unloading, and transferring.[1]
- Refer to the Celanese Chemicals Material Safety Data Sheet for more information on materials to avoid.
- Use spark-resistant tools.
- Electrical equipment and circuits in all storage and handling areas must conform to requirements of national electrical code (Articles 500 and 501) for hazardous location.
- Methyl Isobutyl Carbinol floats on water and may create a special hazard.

See the National Fire Protection Agency (NFPA) #30 “Flammable and Combustible Liquids Code” and consult with qualified fire protection specialists to determine specific storage tank design requirements. Refer to the Celanese Chemicals Material Safety Data Sheet for more specific health and environmental information and refer to the Celanese Chemicals Product Descriptions for additional physical properties and general product information. Material Safety Data Sheet and Product Descriptions for Methyl Isobutyl Carbinol are available through your Celanese Chemicals sales representative.

1. Refer to NFPA #77 “Static Electricity” for proper electrical grounding procedures.
2. See the National Fire Protection Agency (NFPA) #30 “Flammable and Combustible Liquids Code” and consult with qualified fire protection specialists to determine specific storage tank design requirements.
3. Blanketing may be used to retain quality in long-term storage conditions.

# Methyl Isobutyl Carbinol

## Materials of Construction for Storage and Transportation

| Item | Recommended | Acceptable |
|---|---|---|
| Tank | Carbon Steel (rust free) | Stainless Steel[1], Lined Carbon Steel[2] |
| Piping | Carbon Steel | Stainless Steel[1] |
| Valves | Carbon Steel, Cast Iron | Stainless Steel[1] |
| Pumps | Carbon Steel | Stainless Steel[1] |
| Relief Valves | Carbon Steel | Stainless Steel[1] |
| Gaskets | Glass Filled PTFE[3] | PTFE[3] |
| Pump Seals | Single mechanical seal: Stainless steel /Hastelloy C-276 metallic components, Kalrez O-rings | |
| Valve Packing | PTFE[3] | Braided PTFE[3] |
| Pipe End Connections | Welded and flanged system | Threaded with PTFE[3] tape thread lubricant |
| Heat Exchanger | Product Side: Carbon Steel | Product Side: Stainless Steel[1] |
| Hoses | Stainless Steel[1] | Butyl Rubber, Aluminum |
| Tank Car | Carbon Steel | Aluminum, Stainless Steel[1] |
| Tank Truck | Stainless Steel[1] | Aluminum |

1. Type 304 or 316 Stainless Steel.
2. Lining refers to a high baked phenolic.
3. Polytetrafluoroethylene.

This information is based on our present state of knowledge and is intended to provide general notes on our products and their uses. It should therefore not be construed as guaranteeing specific properties of the products described or their suitability for a particular application. Any existing industrial property rights must be observed. The quality of our products is guaranteed under our General Conditions of Sale.

PH-161-8 04/03 9074

*Dallas:*
1601 West LBJ Freeway
Dallas, Texas 75234-6034
Tel.: 972 443-4000

*Frankfurt:*
Lurgialle 14
D-60439 Frankfurt am Main
Tel.: 0049/69-305-13300

# Sodium Hydrosulfide (NaHS)

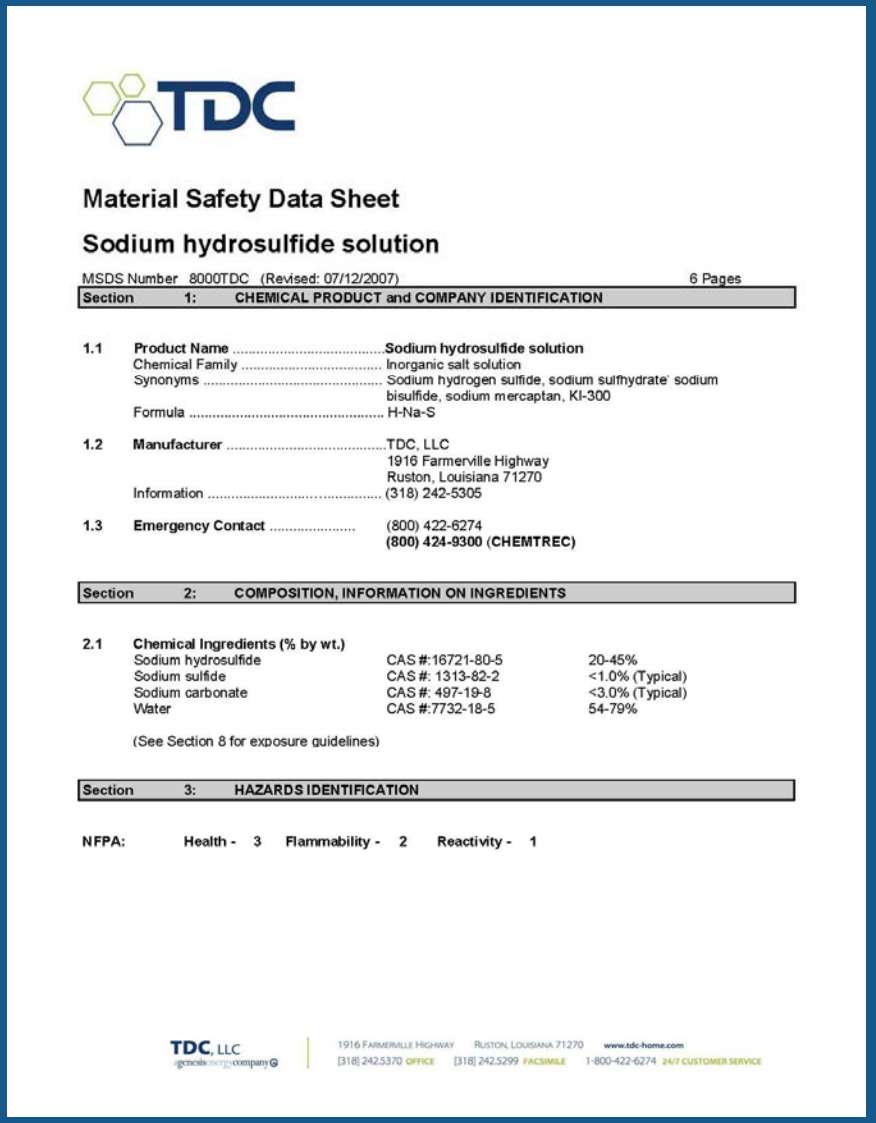
# Material Safety Data Sheet (MSDS)

TDC, LLC

1916 Farmerville Hwy, Ruston LA  71270

# KNOW THE PRODUCT!

# READ THE MSDS



TDC

## Material Safety Data Sheet

## Sodium hydrosulfide solution

MSDS Number 8000TDC (Revised: 07/12/2007) 6 Pages

**Section 1: CHEMICAL PRODUCT and COMPANY IDENTIFICATION**

| | | |
|---|---|---|
| 1.1 | **Product Name** | **Sodium hydrosulfide solution** |
| | Chemical Family | Inorganic salt solution |
| | Synonyms | Sodium hydrogen sulfide, sodium sulfhydrate' sodium bisulfide, sodium mercaptan, KI-300 |
| | Formula | H-Na-S |
| 1.2 | **Manufacturer** | TDC, LLC<br>1916 Farmerville Highway<br>Ruston, Louisiana 71270 |
| | Information | (318) 242-5305 |
| 1.3 | **Emergency Contact** | (800) 422-6274<br>**(800) 424-9300 (CHEMTREC)** |

**Section 2: COMPOSITION, INFORMATION ON INGREDIENTS**

2.1 **Chemical Ingredients (% by wt.)**

| | | |
|---|---|---|
| Sodium hydrosulfide | CAS #:16721-80-5 | 20-45% |
| Sodium sulfide | CAS #: 1313-82-2 | <1.0% (Typical) |
| Sodium carbonate | CAS #: 497-19-8 | <3.0% (Typical) |
| Water | CAS #:7732-18-5 | 54-79% |

(See Section 8 for exposure guidelines)

**Section 3: HAZARDS IDENTIFICATION**

**NFPA: Health - 3 Flammability - 2 Reactivity - 1**

# Material Safety Data Sheets

**MSDS's provide important information to the employee on the following:**

- **Physical hazards, such as fire and explosion**
- **Health hazards and signs of exposure**
- **Routes of exposure**
- **Precautions for safe handling and use**
- **Emergency and first-aid procedures**
- **Control measures**

# Material Safety Data Sheets

- Must be in English and include information regarding the specific chemical identity and common names
- Must provide information about the:
  - Physical and chemical characteristics
  - Health effects
  - Exposure limits
  - Carcinogenicity (cancer-causing)
  - Identification (name, address, and telephone number) of the organization responsible for preparing the sheet
- Must be readily accessible to employees in their work area

TDC's material safety data sheet (MSDS) for Sodium Hydrosulfide (NaHS) Solution is included in the following slides. Areas of interest for those personnel unloading NaHS railcars or trucks are highlighted in **red** and **yellow**.

# Material Safety Data Sheet

## Sodium Hydrosulfide Solution

MSDS Number 8000TDC (Revised: 7/21/04) 6 Pages

**Section 1: CHEMICAL PRODUCT and COMPANY IDENTIFICATION**

**1.1** **Product Name** .....**Sodium Hydrosulfide Solution**
Chemical Family ..... Inorganic salt solution
Synonyms ..... KI-300, sodium hydrogen sulfide, sodium sulfhydrate' sodium bisulfide, sodium mercaptan
**Formula** .....**NaHS**

**1.2** **Manufacturer** .....**TDC, LLC.**
1916 Farmerville Highway
Ruston, Louisiana 71270
Information ..... (318) 242-5305

**1.3** **Emergency Contact** ..... **(800) 422-6274 (TDC)**
**(800) 424-9300 (CHEMTREC)**

**International** .....**(703)527-3887**

**Section 2: COMPOSITION, INFORMATION ON INGREDIENTS**

**2.1** **Chemical Ingredients (% by wt.)**

| | | |
|---|---|---|
| Sodium hydrosulfide | CAS #:16721-80-5 | 20-45% |
| Sodium sulfide | CAS #:1313-82-2 | <1.0% (Typical) |
| Sodium Carbonate | CAS #: 497-19-8 | <3.0% (Typical) |
| Water | CAS #:7732-18-5 | 55-80% |

# Material Safety Data Sheet

## Section 3: HAZARDS IDENTIFICATION

**NFPA:** **Health - 3** **Flammability - 2** **Reactivity - 1**

**EMERGENCY OVERVIEW**

**Warning: Solution is highly alkaline**
**Contains hydrogen sulfide , a highly toxic gas.**

Eye contact will cause marked eye irritation and possibly severe corneal damage. Skin contact will result in irritation and possible corrosion of the skin. Ingestion will irritate/burn mouth, throat and gastrointestinal tract. Contact with stomach acid will cause hydrogen sulfide vapors to be released. Heating or acid will cause hydrogen sulfide gas to evolve. Dilution of NaHS with water will also cause increased evolution of hydrogen sulfide.

**3.1 POTENTIAL HEALTH EFFECTS**

**EYE: Contact with the eyes will cause marked eye irritation and possibly severe corneal damage.**

**SKIN CONTACT: Contact with the skin will cause skin irritation or burning sensation. Prolonged contact will result in corrosion of the skin.**

**SKIN ABSORPTION: Absorption is unlikely to occur.**

**INGESTION: Ingestion will result in severe burning and corrosion of mouth, throat and the gastrointestinal tract. If the ingested material contacts stomach acid, highly toxic hydrogen sulfide gas will be evolved.**

**INHALATION: Product solution and vapors contain highly toxic hydrogen sulfide gas. Exposure to this gas causes, headaches, nausea, dizziness and vomiting. Continued exposure can lead to loss of consciousness and death.**

**CHRONIC EFFECTS/CARCINOGENICITY:** Not listed as a carcinogen by NTP, IARC or OSHA.

# Material Safety Data Sheet

## Section 4: FIRST AID MEASURES

**4.1 EYES: Immediately flush with large quantities of water for 15 minutes. Hold eyelids apart during irrigation to insure thorough flushing of the entire area of the eye. Obtain immediate medical attention.**

**4.2 SKIN: Immediately flush with large quantities of water. Remove contaminated clothing under a safety shower. Obtain immediate medical attention.**

**4.3 INGESTION: DO NOT INDUCE VOMITING. If victim is conscious, immediately give 2 to 4 glasses of water. If vomiting does occur, repeat fluid administration. Obtain immediate medical attention.**

**4.4 INHALATION: Remove victim from contaminated atmosphere. If breathing is labored, administer oxygen. If breathing has ceased, clear airway and start mouth to mouth resuscitation. If heart has stopped beating, external heart massage should be applied. Obtain immediate medical attention.**

## Section 5: FIRE FIGHTING MEASURES

**5.1 FLAMMABLE PROPERTIES**

**FLASH POINT: Not flammable** **METHOD USED:** NA

**5.2 FLAMMABLE LIMITS** **Hydrogen sulfide** **LFL: 4%** **UFL: 44%**

**5.3 EXTINGUISHING MEDIA:** Water spray or foam or as appropriate for combustibles involved in fire.

**5.4 FIRE & EXPLOSIVE HAZARDS:** Solution is non-flammable. However if these solutions are exposed to heat or acids, hydrogen sulfide will be released and may form explosive mixtures with air (see above).

**Keep containers/storage vessels in fire area cooled with water spray. Heating may cause the release of hydrogen sulfide vapors.**

# Material Safety Data Sheet

## Section 5: FIRE FIGHTING MEASURES (Cont.)

**5.5 FIRE FIGHTING EQUIPMENT:** Because of the possible presence of toxic gases and the corrosive nature of the product, wear self-contained breathing apparatus, pressure demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

## Section 6: ACCIDENTAL RELEASE MEASURES

**6.1 Small releases:** Isolate for 100 feet. Confine area to qualified personnel. Wear proper Personal Protective equipment (See section 8). Confine release material by berming or diverting its path. Absorb on sand, earth or other inert dry absorbent. Do not allow into sewer, storm drains or any waterway. Oxidize residual reactive sulfides with a weak (3-5%) hydrogen peroxide solution to stop the release of toxic hydrogen sulfide. Remove contaminated soil and dispose of in accordance with all governmental regulations.

**6.2 Large releases:** Activate Emergency Response Plan procedures. Isolate release area for 700 feet. Confine area to qualified personnel. Wear proper protective equipment. Shut off release if safe to do so. Dike spill area to prevent runoff into sewers, drains (potential explosive mixtures of hydrogen sulfide in confined spaces) or surface waterways (potential aquatic toxicity). Recover as much of the solution as possible. Treat remaining material as a small release (above).

## Section 7: HANDLING and STORAGE

**7.1 Handling:** Wear proper protective equipment (See Section 8). Avoid breathing product vapors. Avoid contact with skin and eyes. Use only in a well ventilated area. Dilute product only in enclosed containers. Wash thoroughly after handling.

**7.2 Storage:** Store in well ventilated areas. Do not store combustibles in the area of storage vessels. Keep away from any sources of heat or flame. Store tote and smaller containers out of direct sunlight at moderate temperatures [<80º F (27º C)]. (See Section 10.4 for materials of construction)

# Material Safety Data Sheet

**Section 8: EXPOSURE CONTROLS, PERSONAL PROTECTION**

**8.1 RESPIRATORY PROTECTION: If working near open container or storage vessel opening or open tank truck dome cover, wear self-contained breathing apparatus, pressure demand, MSHA/NIOSH (approved or equivalent).**

**8.2 SKIN PROTECTION: Neoprene rubber gloves, chemical suit and boots should be worn to prevent contact with the liquid. Wash contaminated clothing prior to reuse. Contaminated leather shoes cannot be cleaned and should be discarded.**

**8.3 EYE PROTECTION: Chemical goggles and a full face shield.**

**8.4 EXPOSURE GUIDELINES:**

| | OSHA | | ACGIH | |
|---|---|---|---|---|
| | TWA | STEL | TLV | STEL |
| Hydrogen Sulfide | 20 ppm (ceiling) | | 10 ppm (ceiling) | |

**8.5 ENGINEERING CONTROLS: Use adequate exhaust ventilation to prevent inhalation of product vapors. Where feasible scrub process or storage vessel vapors with caustic solution.**

**Maintain eyewash/safety shower in areas where chemical is handled.**

# Material Safety Data Sheet

## Section 9: PHYSICAL and CHEMICAL PROPERTIES

| | |
|---|---|
| **9.1 APPEARANCE:** | **May be yellow to red, to dark green to black liquid.** |
| **9.2 ODOR:** | **Strong hydrogen sulfide (rotten egg) odor, hydrocarbon (mercaptan) odor.** |
| **9.3 BOILING POINT:** | 253 °F(122.8 °C) - 269 °F (131.7 °C) |
| **9.4 VAPOR PRESSURE:** | 17 mm Hg @ 68 °F (20 °C) |
| **9.5 VAPOR DENSITY: (Air = 1.0)** | **1.17** |
| **9.6 SOLUBILITY IN WATER:** | Complete |
| **9.7 SPECIFIC GRAVITY:** | 1.152 - 1.303 (9.6 - 10.9 lbs/gal) |
| **9.8 FREEZING POINT:** | 0° F (-17.8° C) - 20%<br>56º F (13.3º C) - 45% |
| **9.9 pH:** | **11.5 - 12.5** |
| **9.10 VOLATILE:** | Not applicable |

## Section 10: STABILITY and REACTIVITY

**10.1 STABILITY:** This is a stable material

**10.2 HAZARDOUS POLYMERIZATION:** Will not occur.

**10.3 HAZARDOUS DECOMPOSITION PRODUCTS: Heating this product will evolve hydrogen sulfide. Fire conditions will also cause the production of sulfur dioxide. Hydrogen sulfide (4-44%) may form flammable mixtures with air. Heating to decomposition emits toxic fumes of sulfoxides and Na2O**

**10.4 INCOMPATIBILITY: Acids will cause the release of highly toxic hydrogen sulfide. Sodium hydrosulfide solution is not compatible with copper, zinc, aluminum or their alloys (i.e. bronze, brass, galvanized metals, etc.). Corrosive to steel above 150º F (65.5º C). These materials of construction should not be used in handling systems or storage containers for this product. (SEE Section 7.2, Storage) Dilution of NaHS should be done in an enclosed container.**

# Material Safety Data Sheet

## Section 11: TOXICOLOGICAL INFORMATION

**11.1 ORAL:** Data not available

**11.2 DERMAL:** Data not available

**11.3 INHALATION:** INH-RAT $LC_{50}$: 444 ppm (hydrogen sulfide)
INH-MOUSE $LC_{50}$: 1,500 $mg/m^3$ 18 minutes
INH-RAT $LC_{50}$: 1,500 $mg/m^3$ 14 minutes

**11.4 CHRONIC/CARCINOGENICITY:** No evidence available

**11.5 TERATOLOGY:** Data not available

**11.6 REPRODUCTION:** Data not available

**11.7 MUTAGENICITY:** Data not available

# Material Safety Data Sheet

## Section 12: ECOLOGICAL INFORMATION

Static acute 96 hour-$LC_{50}$ for mosquito fish is 206 mg/L. ($TI_m$ - fresh water)
$LC_{50}$ fly inhalation 1,500 mg/$m^3$, 7 minutes
$TL_m$ Gammarus 0.84 mg/L, 96 hours (hydrogen sulfide)
$TL_m$ Ephemera 0.316 mg/L, 96 hours (hydrogen sulfide)
$TL_m$ Flathead minnow 0.071 – 0.55 mg/L @ 6-24ºC, 96 hour flow through bioassay (hydrogen sulfide)
$TL_m$ Bluegill 0.0090 – 0.0140 mg/L @ 20-22ºC, 96 hour flow through bioassay (hydrogen sulfide)
$TL_m$ Brook trout 0.0216 – 0.0308 mg/L @ 8-12.5ºC, 96 hour flow through bioassay (hydrogen sulfide)

## Section 13: DISPOSAL CONSIDERATIONS

**If released to the environment for other than its intended purpose, this product contains some reactive sulfides which may be in sufficient quantity to meet the definition of a D003, hazardous waste.**

## Section 14: TRANSPORT INFORMATION

| | |
|---|---|
| **14.1 DOT Shipping Name:** | **Corrosive liquids, toxic, n.o.s.** |
| **14.2 DOT Hazard Class:** | **8** |
| **14.3 UN/NA Number:** | **UN2922** |
| | **UN2949 (IMDG - over water)** |
| **14.4 Packing Group:** | **II** |
| **14.5 DOT Placard:** | **Corrosive** |
| **14.6 DOT Label(s):** | **Corrosive** |
| | **Toxic** |
| **14.7 IMO Shipping Name:** | **Sodium hydrosulphide solution** |
| **14.8 RQ (Reportable Quantity):** | **5,000 lbs (2268 Kg) 100% basis** |
| | **2,604 gal (20%) 1,019 gal (45%)]** |
| **14.9 RR STCC Number:** | **28-123-33/49-352-04** |

**14.10 USCG Codes: Bulk-SHR (Sodium Hydrosulfide Solution), Barge-SSI (Sodium Sulfide, hydrosulfide solutions, H2S greater than 15 ppm but less than 200 ppm)**

# Material Safety Data Sheet

## Section 15: REGULATORY INFORMATION

| | | | | |
|---|---|---|---|---|
| **15.1 OSHA:** | **This product is listed as a hazardous material under criteria of the Federal OSHA Hazard Communication Standard, 29 CFR 1910.1200.** | | | |
| **15.2 SARA TITLE III:** | a. | **EHS** (Extremely Hazardous Substance) List: | | No |
| | b. | Section 311/312, (Tier I,II) Categories: | Immediate (acute) | Yes |
| | | | Fire | Yes |
| | | | Sudden release | No |
| | | | Reactivity | Yes |
| | | | Delayed (chronic) | No |
| | c. | Section 313 (Toxic Release Report-Form R): | | No |
| | d. | **TPQ** (Threshold Planning Quantity): | | No |
| **15.3 CERCLA/SUPERFUND:** | | **RQ (Reportable Quantity)** | | **5,000 lbs (2270 Kg)** |
| **15.4 TSCA** (Toxic Substance Control Act) Inventory List: | | | | Yes |
| **15.5 RCRA** (Resource Conservation and Recovery Act) Status: | | | | D003 (See Section 13) |
| 15.6 WHMIS (Canada) Hazard Classification: | | | | E, D1 |
| **15.7 DOT Hazardous Material: (See Section 14)** | | | | **Yes** |
| **15.8 CAA** Hazardous Air Pollutant (HAP) | | | | No |

# Material Safety Data Sheet

## Section 16: OTHER INFORMATION

**REVISIONS:** The entire MSDS was reformatted to comply to ANSI Standard Z400.1-1993.

Revised Sections 1.1, 8.3, 11, 12, 5/7/02
Revised pH range in Section 8, 6/19/02
Revised shipping info & RQ data, 1/15/03
Revised Section 3, Emergency overview and Section 10.4 to include dilution caution. 1/23/04
Revised Section 2.1, Ingredients and Section 15, added USCG Codes. 5/3/04
Revised Section 14.10 (added), 15.9 (deleted), USCG Shipping Codes. 7/21/04.

THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN COMPILED FROM OUR EXPERIENCE AND OSHA, ANSI, NFPA, DOT, ERG, AND CHRIS**.** IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATION FOR THE ADOPTION OF NECESSARY SAFETY PRECAUTIONS. WE RESERVE THE RIGHT TO REVISE MATERIAL SAFETY DATA SHEETS PERIODICALLY AS NEW INFORMATION BECOMES AVAILABLE.

# MSDS Review

- **Sodium Hydrosulfide (NaHS) is very alkaline (pH 11.5-12.5) and very corrosive to the skin.**
- **Solution is typically yellow to dark green with a strong hydrogen sulfide (rotten egg) odor.**
- **Solutions are 20% to 45% strength and weigh 9.6 – 10.9 ppg.**
- **Vapor space over NaHS solutions contains highly toxic hydrogen sulfide ($H_2S$). This gas is colorless and heavier than air. The level of $H_2S$ above the solution is increased by solution contact with acidic materials, heating the solution and dilution, which lowers the pH of the solution.**

**When handling, transporting, storing or distributing any hazardous chemical, please consult the manufacturer's Material Safety Data Sheet (MSDS).**

**Should you have any questions regarding this presentation or would like additional information on Sodium Hydrosulfide related issues, please contact TDC, LLC. at (318) 242-5305.**

# Material Safety Data Sheet

# Sodium hydrosulfide solution

MSDS Number 8000TDC (Revised: 1/15/03) 6 Pages

**1.1 Product Name** .....**Sodium hydrosulfide solution**
Chemical Family ..... Inorganic salt solution
Synonyms ..... KI-300 depressant, NaHS, sodium hydrogen sulfide
Formula ..... NaHS

**1.2 Manufacturer** .....Tessenderlo Davison Chemicals
1916 Farmerville Highway
Ruston, Louisiana 71270
Information ..... (318) 242-5305

**1.3 Emergency Contact** ..... (800) 877-1737 (Tessenderlo Kerley)
**(800) 424-9300 (CHEMTREC)**

**2.1 Chemical Ingredients (% by wt.)**

| | | |
|---|---|---|
| Sodium hydrosulfide | CAS #:16721-80-5 | 20-45% |
| Water | CAS #:7732-18-5 | 55-80% |

(See Section 8 for exposure guidelines)

**NFPA:** **Health - 3** **Flammability - 2** **Reactivity - 1**

**EMERGENCY OVERVIEW**

**Warning:** Solution is highly alkaline
Contains hydrogen sulfide , a highly toxic gas.
Eye contact will cause marked eye irritation and possibly severe corneal damage.
Skin contact will result in irritation and possible corrosion of the skin.
Ingestion will irritate/burn mouth, throat and gastrointestinal tract. Contact with stomach acid will cause hydrogen sulfide vapors to be released.
Heating or acid will cause hydrogen sulfide gas to evolve.

### 3.1 POTENTIAL HEALTH EFFECTS

**EYE:** Contact with the eyes will cause marked eye irritation and possibly severe corneal damage.

**SKIN CONTACT:** Contact with the skin will cause skin irritation or burning sensation. Prolonged contact will result in corrosion of the skin.

**SKIN ABSORPTION:** Absorption is unlikely to occur.

**INGESTION:** Ingestion will result in severe burning and corrosion of mouth, throat and the gastrointestinal tract. If the ingested material contacts stomach acid, highly toxic hydrogen sulfide gas will be evolved.

**INHALATION:** Product solution and vapors contain highly toxic hydrogen sulfide gas. Exposure to this gas causes, headaches, nausea, dizziness and vomiting. Continued exposure can lead to loss of consciousness and death..

**CHRONIC EFFECTS/CARCINOGENICITY:** Not listed as a carcinogen by NTP, IARC or OSHA.

**4.1 EYES:** Immediately flush with large quantities of water for 15 minutes. Hold eyelids apart during irrigation to insure thorough flushing of the entire area of the eye. Obtain immediate medical attention.

**4.2 SKIN:** Immediately flush with large quantities of water. Remove contaminated clothing under a safety shower. Obtain immediate medical attention

**4.3 INGESTION:** DO NOT INDUCE VOMITING. If victim is conscious, immediately give 2 to 4 glasses of water. If vomiting does occur, repeat fluid administration. Obtain immediate medical attention.

**4.4 INHALATION:** Remove victim from contaminated atmosphere. If breathing is labored, administer oxygen. If breathing has ceased, clear airway and start mouth to mouth resuscitation. If heart has stopped beating, external heart massage should be applied. Obtain immediate medical attention.

### 5.1 FLAMMABLE PROPERTIES

**FLASH POINT:** Not flammable **METHOD USED:** NA

**5.2 FLAMMABLE LIMITS** **Hydrogen sulfide** **LFL**: 4% **UFL**: 44%

**5.3 EXTINGUISHING MEDIA:** Water spray or foam or as appropriate for combustibles involved in fire.

**5.4 FIRE & EXPLOSIVE HAZARDS:** Solution is non-flammable. However if these solutions are exposed to heat or acids, hydrogen sulfide will be released and may form explosive mixtures with air (see above).

Keep containers/storage vessels in fire area cooled with water spray. Heating may cause the release of hydrogen sulfide vapors.

## Section 5: FIRE FIGHTING MEASURES (Cont.)

**5.5 FIRE FIGHTING EQUIPMENT:** Because of the possible presence of toxic gases and the corrosive nature of the product, wear self-contained breathing apparatus, pressure demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

## Section 6: ACCIDENTAL RELEASE MEASURES

**6.1 Small releases:** Confine and absorb small releases on sand earth or other inert absorbent. Oxidize residual reactive sulfides with a weak (3-5%) hydrogen peroxide solution.

**6.2 Large releases:** Wear proper protective equipment. Confine area to qualified personnel. Shut off release if safe to do so. Dike spill area to prevent runoff into sewers, drains (potential explosive mixtures of hydrogen sulfide in confined spaces) or surface waterways (potential aquatic toxicity). Recover as much of the solution as possible. Treat remaining material as a small release (above).

## Section 7: HANDLING and STORAGE

**7.1 Handling:** Wear proper protective equipment (See Section 8). Avoid breathing product vapors. Avoid contact with skin and eyes. Use only in a well ventilated area. Dilute product only in enclosed containers. Wash thoroughly after handling.

**7.2 Storage:** Store in well ventilated areas. Do not store combustibles in the area of storage vessels. Keep away from any sources of heat or flame. Store tote and smaller containers out of direct sunlight at moderate temperatures [<80º F (27º C)]. (See Section 10.4 for materials of construction)

## Section 8: EXPOSURE CONTROLS, PERSONAL PROTECTION

**8.1 RESPIRATORY PROTECTION:** If working near open container or storage vessel opening or open tank truck dome cover, wear self-contained breathing apparatus, pressure demand, MSHA/NIOSH (approved or equivalent).

**8.2 SKIN PROTECTION:** Neoprene rubber gloves, chemical suit and boots should be worn to prevent contact with the liquid. Wash contaminated clothing prior to reuse. Contaminated leather shoes cannot be cleaned and should be discarded.

**8.3 EYE PROTECTION:** Chemical goggles and a full face shield.

**8.4 EXPOSURE GUIDELINES:**

| | OSHA | | ACGIH | |
|---|---|---|---|---|
| | TWA | STEL | TLV | STEL |
| Hydrogen sulfide | 20 ppm (ceiling) | | 10 ppm (ceiling) | |

**8.5 ENGINEERING CONTROLS:** Use adequate exhaust ventilation to prevent inhalation of product vapors. Where feasible scrub process or storage vessel vapors with caustic solution.
Maintain eyewash/safety shower in areas where chemical is handled.

## Section 9: PHYSICAL and CHEMICAL PROPERTIES

| | |
|---|---|
| **9.1 APPEARANCE:** | Yellow to dark green liquid. |
| **9.2 ODOR:** | Strong hydrogen sulfide (rotten egg) odor. |
| **9.3 BOILING POINT:** | 253 °F(122.8 °C) - 269 °F (131.7 °C) |
| **9.4 VAPOR PRESSURE:** | 17 mm Hg @ 68 °F (20 °C) |
| **9.5 VAPOR DENSITY:** (Air = 1.0) | 1.17 |
| **9.6 SOLUBILITY IN WATER:** | Complete |
| **9.7 SPECIFIC GRAVITY:** | 1.152 - 1.303 (9.6 - 10.9 lbs/gal) |
| **9.8 FREEZING POINT:** | 0° F (-17.8° C) - 20%<br>56º F (13.3º C) - 45% |
| **9.9 pH:** | 11.5 - 12.5 |
| **9.10 VOLATILE:** | Not applicable |

## Section 10: STABILITY and REACTIVITY

**10.1 STABILITY:** This is a stable material

**10.2 HAZARDOUS POLYMERIZATION:** Will not occur.

**10.3 HAZARDOUS DECOMPOSITION PRODUCTS:** Heating this product will evolve hydrogen sulfide. Fire conditions will also cause the production of sulfur dioxide. Hydrogen sulfide (4-44%) may form flammable mixtures with air.

**10.4 INCOMPATIBILITY:** Acids will cause the release of highly toxic hydrogen sulfide. Sodium hydrosulfide solution is not compatible with copper, zinc, aluminum or their alloys (i.e. bronze, brass, galvanized metals, etc.). Corrosive to steel above 150º F (65.5º C). These materials of construction should not be used in handling systems or storage containers for this product. (SEE Section 7.2, Storage)

## Section 11: TOXICOLOGICAL INFORMATION

**11.1 ORAL:** Data not available

**11.2 DERMAL:** Data not available

**11.3 INHALATION:** INH-RAT $LC_{50}$: 444 ppm (hydrogen sulfide)
INH-MOUSE $LC_{50}$: 1,500 mg/$m^3$ 18 minutes
INH-RAT $LC_{50}$: 1,500 mg/$m^3$ 14 minutes

**11.4 CHRONIC/CARCINOGENICITY:** No evidence available

**11.5 TERATOLOGY:** Data not available

**11.6 REPRODUCTION:** Data not available

**11.7 MUTAGENICITY:** Data not available

## Section 12: ECOLOGICAL INFORMATION

Static acute 96 hour-$LC_{50}$ for mosquito fish is 206 mg/L. ($Tl_m$ - fresh water)
$LC_{50}$ fly inhalation 1,500 mg/$m^3$, 7 minutes
$TL_m$ Gammarus 0.84 mg/L, 96 hours (hydrogen sulfide)
$TL_m$ Ephemera 0.316 mg/L, 96 hours (hydrogen sulfide)
$TL_m$ Flathead minnow 0.071 – 0.55 mg/L @ 6-24ºC, 96 hour flow through bioassay (hydrogen sulfide)
$TL_m$ Bluegill 0.0090 – 0.0140 mg/L @ 20-22ºC, 96 hour flow through bioassay (hydrogen sulfide)
$TL_m$ Brook trout 0.0216 – 0.0308 mg/L @ 8-12.5ºC, 96 hour flow through bioassay (hydrogen sulfide)

## Section 13: DISPOSAL CONSIDERATIONS

If released to the environment for other than its intended purpose, this product contains some reactive sulfides which may be in sufficient quantity to meet the definition of a D003, hazardous waste.

## Section 14: TRANSPORT INFORMATION

**14.1 DOT Shipping Name:** Corrosive liquids, toxic, n.o.s.

**14.2 DOT Hazard Class:** 8

**14.3 UN/NA Number:** UN2922
UN2949 (IMDG - over water)

**14.4 Packing Group:** II

**14.5 DOT Placard:** Corrosive

**14.6 DOT Label(s):** Corrosive
Toxic

**14.7 IMO Shipping Name:** Sodium hydrosulphide solution

**14.8 RQ (Reportable Quantity):** 5,000 lbs (2268 Kg) 100% basis
[2,604 gal (20%) 1,019 gal (45%)]

**14.9 RR STCC Number:** 28-123-33/49-352-04 (international)

## Section 15: REGULATORY INFORMATION

**15.1 OSHA:** This product is listed as a hazardous material under criteria of the Federal OSHA Hazard Communication Standard, 29 CFR 1910.1200.

**15.2 SARA TITLE III:** a. **EHS** (Extremely Hazardous Substance) List: No

## Section 15: REGULATORY INFORMATION (Cont.)

| | | | |
|---|---|---|---|
| b. | Section 311/312, (Tier I,II) Categories: | Immediate (acute) | Yes |
| | | Fire | Yes |
| | | Sudden release | No |
| | | Reactivity | Yes |
| | | Delayed (chronic) | No |
| c. | Section 313 (Toxic Release Report-Form R): | | No |
| d. | **TPQ** (Threshold Planning Quantity): | | No |

**15.3 CERCLA/SUPERFUND:** RQ (Reportable Quantity) 5,000 lbs (2270 Kg)

**15.4 TSCA** (Toxic Substance Control Act) Inventory List: Yes

**15.5 RCRA** (Resource Conservation and Recovery Act) Status: D003 (See Section 13)

**15.6 WHMIS** (Canada) Hazard Classification: E, D1

**15.7 DOT** Hazardous Material: (See Section 14) Yes

**15.8 CAA** Hazardous Air Pollutant (HAP) No

## Section 16: OTHER INFORMATION

**REVISIONS:** The entire MSDS was reformatted to comply to ANSI Standard Z400.1-1993.

Revised Sections 1.1, 8.3, 11, 12, 5/7/02
Revised pH range in Section 8, 6/19/02
Revised shipping info & RQ data, 1/15/03

THE INFORMATION PUBLISHED IN THIS MATERIAL SAFETY DATA SHEET HAS BEEN COMPILED FROM OUR EXPERIENCE AND OSHA, ANSI, NFPA, DOT, ERG, AND CHRIS**.** IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE SUITABILITY OF THIS INFORMATION FOR THE ADOPTION OF NECESSARY SAFETY PRECAUTIONS. WE RESERVE THE RIGHT TO REVISE MATERIAL SAFETY DATA SHEETS PERIODICALLY AS NEW INFORMATION BECOMES AVAILABLE.

| MATERIAL SAFETY DATA SHEET | October 20, 2004 | MSDS NUMBER W-5000 |
|---|---|---|

| EMERGENCY TELEPHONE NUMBERS | COMPANY | CHEMTREC |
|---|---|---|
| | 405-665-6565 | 800/424-9300 |

## I. PRODUCT IDENTIFICATION

| PRODUCT | CHEMICAL NAME AND SYNONYMS |
|---|---|
| **Sodium Hydrosulfide Solution** | Sodium Hydrogen Sulfide, Sodium Bisulfide, Sodium Sulfhydrate, Spent Caustic |
| CHEMICAL FAMILY | FORMULA |
| Sodium Salt of Hydrogen Sulfide | NaHS in Water |

| National Fire Protection Association Hazard Rating Codes | HEALTH CODE | FIRE CODE | REACTIVITY CODE |
|---|---|---|---|
| Least - 0 Slight - 1 Moderate - 2 High - 3 Extreme - 4 | 3 | 1 | 0 |

## II. SUMMARY OF HAZARDS

DANGER ! CONTAINS HYDROGEN SULFIDE -- MAY BE FATAL IF INHALED. CAUSES SEVERE BURNS
Contact with acid generates hydrogen sulfide. Avoid breathing hydrogen sulfide gas. Use ventilation adequate to keep gas below recommended exposure limits. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

| DOT Hazardous Material | DOT SHIPPING NAME AND NUMBER | DOT HAZARD CLASS |
|---|---|---|
| YES | Corrosive Liquid, Toxic, N.O.S., 8, UN2922, II, RQ | 8 (Corrosive material) |

## III. HAZARDOUS COMPONENTS

| INGREDIENT | % RANGE | PEL/TLV | HAZARD |
|---|---|---|---|
| Sodium Hydrosulfide Solution (CAS # 16721-80-5) | 100 | N/A | Corrosive Acute Health |
| Hydrogen Sulfide (CAS # 7783-06-4) | less than 1 | TWA - 10 ppm STEL - 15 ppm | |
| Sodium Hydroxide (CAS # 1310-73-2) | 5 | Ceiling - 2 mg/m3 | |

## IV. HEALTH INFORMATION

| EXPOSURE BY ROUTE OF ENTRY | EXPOSURE CHARACTERISTICS AND FIRST AID | |
|---|---|---|
| INHALATION | EFFECTS | Acute: Headache, nasal and respiratory irritation, nausea, dizziness, loss of consciousness, or death due to respiratory paralysis. Hydrogen sulfide may cause loss of sense of smell; immediately dangerous to life concentration - 700 ppm. |
| | FIRST AID | Move exposed person to fresh air. If breathing has stopped, perform artificial respiration. Get medical attention as soon as possible. |
| SKIN | EFFECTS | Acute: Corrosive, chemical burn |
| | FIRST AID | If clothing soaked, immediately remove clothing and wash skin with soap and water. Launder clothing before wearing. For burn: flush with water, wrap with sterile dressing and apply cold pack. Get medical attention promptly. |
| EYES | EFFECTS | Acute: Corrosive, chemical burn |
| | FIRST AID | Immediately flush eyes with water for a minimum of 15 minutes, occasionally lifting the lower and upper lids. Get medical attention as soon as possible. |
| SWALLOWING INGESTION | EFFECTS | Acute: Corrosive, and toxic |
| | FIRST AID | If conscious, induce vomiting by giving large amounts of water. Get medical attention as soon as possible. |

Medical conditions Generally Agravated by Exposure: N/AV

| LISTED AS POTENTIAL CARCINOGEN OR CARCINOGEN | | |
|---|---|---|
| | NOT LISTED X | NATIONAL TOXICOLOGY PROGRAM____ |
| | INTERNATIONAL Agency for Research on Cancer _____ | OSHA _____ |

## V. EMPLOYEE PROTECTION

RESPIRATORY PROTECTION (NIOSH APPROVED RESPIRATORS SEE OSHA STD. 1910.134)

Up to 100 mg/m3 sodium hydroxide, full-face high efficiency dust & mist respirator or supplied air respirator. Greater than 100 mg/m3 sodium hydroxide, 15 ppm hydrogen sulfide, fire fighting, or unknown concentration, self-contained breathing apparatus with positive pressure.

| | |
|---|---|
| EYE | Chemical goggles, face shield. |
| SKIN | Gloves - rubber or neoprene. Rubber boots. Rubber or neoprene jacket and pants or apron as appropriate. |

VENTILATION

Maintain local or dilution ventilation to keep hydrogen sulfide concentration below 10 ppm and sodium hydroxide below 2 mg/m3. Loading, unloading, tank gauging, etc., remain upwind. Request assistance of safety and industrial hygiene personnel in determining air concentrations.

## VI. FIRE PROTECTION INFORMATION

| FLASH POINT AND METHOD | AUTOIGNITION TEMPERATUR | FLAMMABLE LIMITS % VOLUME IN AIR | LOWER | UPPER |
|---|---|---|---|---|
| N/A | ESTIMATED N/A | ESTIMATED N/A | | |

EXTINGUISHING MEDIA

Water, carbon dioxide.

HAZARDOUS DECOMPOSITION PRODUCTS Equilibrium reaction for sodium hydrosulfide (NaHS) and hydrogen sulfide (H2S) in aqueous solution:NaHS+ H+(acid)==H2S+Na+Increase in acid (H+) concentration, such as mineral or organic acids promotes evolution of H2S.

FIRE AND EXPLOSION HAZARDS

Release of hydrogen sulfide in a confined space could create a fire or explosion hazard.

STORAGE

Do not store with acids.

| HAZARDOUS POLYMERIZATION | | | STABILITY | | |
|---|---|---|---|---|---|
| WILL NOT OCCUR | X | MAY OCCUI _____ | STABLE | X | UNSTABLE _____ |

## VII. PHYSICAL AND CHEMICAL PROPERTIES

| BOILING POINT | VAPOR PRESSURE at 100 'F | EVAPORATION (ETHYL ETHER = 1) |
|---|---|---|
| 212 'F | ESTIMATED < 50 mm Hg | ESTIMATED Equal to water |
| PERCENT VOLATILE BY VOLUME | AVG. MOLECULAR WEIGHT | APPEARANCE |
| (%) 70 (water) | N/A | Greenish to brown Solution |
| ODOR | DROP POINT | ESTIMATED VAPOR DENSITY (AIR = 1) |
| Hydrogen sulfide | N/A | N/A |
| SPECIFIC GRAVITY | VISCOSITY | SOLUBILITY (G/100g WATER AT 20° C) |
| 1.18 | Similar to Water | Infinitely Soluble |

## VIII. ENVIRONMENTAL PROTECTION

| | |
|---|---|
| SPILLS | DANGER. Spill may liberate Hydrogen Sulfide Gas (H2S). Notify emergency response personnel. Evacuate area, remove ignition sources and monitor for hydrogen sulfide. Build dike to contain flow. Remove free liquid, do not flush to sewer or open water. Pick up with inert absorbent and place in closed container for disposal. Reportable quantity - 5000 pounds |
| WASTE DISPOSAL | Utilize licensed waste disposal company. Consider recycling or incineration. Utilize permitted hazardous waste disposal site or industrial waste disposal site as appropriate. |

ADDITIONAL INFORMATION

| PREPARED BY | DATE PREPARED |
|---|---|
| Johnnie L. Ray | October 20, 2004 |

DISCLAIMER

The information and recommendations contained in this publication have been compiled from sources beleived to be reliable and to represent the best current opinion on the subject at the time of publication. Since we cannot anticipate or control the many different conditions under which this information or our products may be used, we make no gurantee that the recommendations will be adequate for all individuals or situations. Each user of the product described herein should determine the suitability of the described product for his particular purpose and should comply with all federal and state rules and regulations concerning the described product.

ABBREVIATIONS

| | |
|---|---|
| CAS # | Chemical Abstracts Service Number |
| N/A | Not Applicable |
| N/AV | Not Available |
| ppm | Parts per million |
| PEL | Permissible Exposure Limit |
| TLV | Threshold Limit Value<br>Both the OSHA PEL and the American Conference of Governmental Industrial Hygienists TLV were reviewed. Where a difference existed, the more restrictive of the two was selected. |
| STEL | Short Term Exposure Limit |
| TWA | Time-Weighted Average |

# APPENDIX U

Hydrocarbon Management Plan

# RESOLUTION COPPER MINING, LLC

## HYDROCARBON MANAGEMENT PLAN

*Prepared by:*

102 Magma Heights
Superior, Arizona 85273
(520) 689-9374

**February 19, 2013**

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## 1. PURPOSE

The purpose of this plan is to provide Resolution Copper Mining (RCM) employees and contractors with RCM's hydrocarbon management requirements to ensure hydrocarbons are appropriately stored, dispensed, used and disposed of. The benefits of properly managing hydrocarbon resources results in environmental protection, properly maintained equipment and reduced fuel, coolant and lubricant use and as such is critical to the way RCM conducts its business.

## 2. SCOPE

This plan applies to all individuals working for or on behalf of RCM on any RCM controlled site. It addresses the storage, handling, use, disposal and spill response aspects of hydrocarbon management on site. This plan is to be used in conjunction with any site Spill Prevention Control and Countermeasures Plan (SPCC), Storm Water Pollution Prevention Plan (SWPPP) and site emergency response plans.

## 3. HAZARDOUS SUBSTANCES REGISTER AND SAFETY DATA SHEETS

It is the responsibility of an individual using a substance to be familiar with its associated safety data sheet (SDS) and to comply with information provided in the SDS. In order to facilitate easy and centralized access to the SDS's for all chemical products RCM has on site, an internet based repository, Maxcom GHS, is utilized by RCM for the storage and retrieval of current SDS's. All employees and contractors employed by RCM are provided access to Maxcom GHS via centralized computers located at each site. If a printed copy of a SDS is to be used it must be checked against the SDS in Maxcom GHS to ensure currency.

## 4. APPROVAL TO BRING SUBSTANCES ONSITE

Permission to bring new substances onto RCM controlled property is required prior to the substance's arrival onsite. Approved substances can be located by logging into Maxcom GHS (login information is provided during the site induction training). The individual requesting to bring a new substance onto RCM property must submit a Chemical Product Approval request form (*RCML HSEMS E07 Form – Chemical Product Approval Request*) to designated RCM HSE personnel for internal review and approval. The requestor will be notified of the substance's approval or denial for use onsite, and if approved, a copy of the substance's SDS will be loaded into Maxcom GHS.

# 5. SPILL PREVENTION

## 5.1. Hydrocarbon Delivery

All hydrocarbons must be delivered and/or removed from site by a transport carrier, driver and vehicle with the appropriate licensing, permits and vehicle placarding for the substances/goods involved.

Transport carriers must complete RCM's site induction or be escorted by a site inducted person when accessing the East or West Plant sites.

All deliveries must promptly be brought to their storage locations and unloaded in an area with appropriate secondary containment.

RCM or contractor personnel responsible for receiving/accepting bulk petroleum product containers (e.g. drums and totes) will be trained in visual inspection procedures. Drums and totes containing petroleum products which will be delivered to the project by outside vendors will be visually inspected for signs of leaks and corrosion prior to acceptance. Petroleum products in damaged containers will not be accepted.

## 5.2. Fuel Loading/Unloading Bulk Storage Containers

When refueling or emptying tanks which contain hydrocarbons the following actions must be taken by the individuals performing the refueling/unloading task **prior** to fueling or draining tanks:

- If a spill containment apron is present, park the transport vehicle within the containment area.
- Set the transport vehicle's parking brake.
- Secure the transport vehicle with wheel chocks and interlocks.
- Turn off any cellular devices.
- Verify that adequate spill containment materials are within a reasonable distance of the work area. If a spill kit is present, verify its contents.
- Visually check all hoses for leaks and wet spots.
- Verify that there is sufficient volume in the storage tank for the delivery contents.

- Lock, in the closed position, any drainage valves that may be present for any secondary containment structure.
- Verify the proper alignment of valves and proper functioning of the pumping system.
- Establish adequate bonding/grounding prior to connecting to the fuel transfer point.

**During** the refueling/unloading process the following requirements apply:

- The transport driver must stay with the transport vehicle at all times.
- All systems, hoses and connections must be periodically inspected.
- Continually check for leaks through visual observation, sounds or smell during the refueling/unloading process.
- When loading, keep internal and external valves on the receiving tank open along with the pressure relief valves.
- When making a connection, shut off the engine of the transport vehicle. When transferring Class 3 materials, shut off the vehicle engine unless it must be used to operate a pump. Class 3 materials delivered to site will also require that a Permit to Unload (*20110000 RCML HSEMS E10 Permit Unload*) be completed and approved by RCM personnel before the transfer can begin.
- Monitor the liquid level in the receiving tank to prevent overflow.
- Monitor flow meters to determine rate of flow.
- When topping off the tank, reduce the flow rate to prevent overflow.

Upon **completion** of the transfer, the following steps should be taken:

- Make sure the transfer is complete.
- Close all tank and loading valves before disconnecting.
- Securely close all vehicle internal, external and dome cover valves before disconnecting.
- Secure all hatches.

- Disconnect grounding/bonding wires.
- Make sure the hoses are drained to remove the remaining fuel before moving them away from the connection. Use a drip pan.
- Cap the end of the hose and other connecting devices before moving them to prevent uncontrolled leakage.
- Remove wheel chocks and interlocks.
- Inspect the lowermost drain and all outlets on the tank prior to departure. If necessary, tighten, adjust or replace caps, valves or other equipment to prevent fuel leakage while in transit.

All bulk storage containers without liquid level sensing devices will not be filled or refilled unless they have secondary containment sufficient to contain the capacity of the largest container in the containment and all filling or refilling will be supervised by trained personnel to ensure that any spills or overflows from filling or refilling are promptly cleaned up and disposed of in accordance with the RCM's spill response procedures. In the event that a spill occurs during the fueling/unloading process, please refer to Section 6 (Spill Response) of this plan.

### 5.3. Hydrocarbon Storage

Hydrocarbons stored onsite at any RCM owned or managed location must be stored in aboveground containers constructed to be compatible with the material being stored and must be labeled for identification. The materials must be stored in a manner that will prevent contact by unauthorized personnel, birds and other animals, and will not pose a risk for discharge to streams, drainages or the environment.

Storage containers for hydrocarbons must be engineered to have a means of secondary containment and be placed in areas with adequate secondary containment which meets the following criteria:

- Containment drainage valves remain closed and locked except for draining rainwater. Signage must be provided that indicates proper valve position and requirements for locks.
- Containment systems must be free from product spillage. Rainwater or snow must be removed to maintain adequate capacity.
- Measures must be in place to prevent a release from secondary containment from reaching sewer systems, bodies of water or soil.

Methods of secondary containment include a combination of control structures, land-based spill response equipment and backup containment areas to prevent pollution from reaching navigable waters.

Typical secondary containment structures found at RCM property include double walled tanks, earthen berms and engineered secondary containment structures. Secondary containment at RCM is typically designed with sufficient freeboard to contain rainfall from a 25-year, 24-hour storm event.

### 5.4. Inspections

Storage areas for hydrocarbons are to be inspected on a routine basis to monitor for leaks and the structural integrity of the storage containers.

RCM or contractor employees will perform daily inspections of their work area and equipment on each shift. This daily visual inspection includes:

- Tank/piping integrity (ensure there are no leaks/damage)
- Soil (ensure there is on staining or discoloration of soils)
- Containment areas (ensure there is no accumulation of water or solution that would impact the containment's performance in the event of a spill)
- Equipment checks (ensure no equipment is leaking)

In addition to daily inspections documented quarterly inspections are performed on bulk storage containers located within secondary containment structures.

Annual inspections are performed for operational-use containers, which include oil-filled transformers. In addition, any out-of-service containers will require annual inspections until they are "permanently closed" or removed from site. "Permanently closed" is defined by federal regulations as a container for which:

- All liquid and sludge has been removed from the container and connecting lines;
- All connecting lines and piping have been disconnected and blanked off;
- All valves (except ventilation valves) have been closed and locked; and
- Conspicuous signs have been posted on each container stating that it is a permanently closed container and noting the date of closure.

## 6. SPILL RESPONSE

Small, incidental releases that may result from transfer operations will be handled by trained RCM or contractor employees using an appropriate absorbent. Spill kits, absorbent materials, empty drums and shovels will be located throughout the project site for this purpose.

No employee will be required to respond to any type of release if conditions are unsafe.

Response procedures are as follows:

1. Identify the character, source, amount and extent of the release. ***Do not enter*** a hazardous area until hazards have been assessed and controlled. ***Stay upwind/uphill*** of any release.

2. Evaluate the situation from a distance and assess whether a fire or explosion is possible. If there is a risk of fire or explosion, move a safe distance away from the area and evacuate personnel in the area. Turn off nearby sources of ignition (***if this can be done safely***).

3. **Immediately notify the front desk at 520-689-9374 or security at 520-689-0115 for any of the following discharges:**

    - Discharge of any quantity that poses an imminent danger or involves injured personnel;

    - Discharge of any quantity that reaches a wash, creek or stream; or

    - Discharge of any quantity that is not contained by a secondary containment basin or diversionary structures.

4. If you have not been trained to respond to releases, take no further action and wait for trained personnel to arrive.

5. If you have been trained to respond to releases, take active measures to contain the release ***without undue risk of personal injury.*** Make sure that proper personal protective equipment (PPE) is worn to provide skin and respiratory protection from the hazards involved with spill containment, cleanup and disposal. PPE may include a hardhat, boots, safety glasses, gloves and/or respirators.

    - Attempt to extinguish any incipient stage fires.

- Shut off pumps, close valves, etc. if material is still being released.
- For releases in a diked area, make sure any valves in the containment wall are closed.
- For small releases in undiked areas, place absorbent materials directly on the spilled oil.
- For large releases in undiked areas, develop a security perimeter around the impacted area; construct makeshift dikes of absorbent materials, booms, or other available materials around the release.

## 7. SPILL REPORTING AND INCIDENT TERMINATION

Once a release has been contained and cleaned-up, and any required verbal notifications have been made, the Emergency Response Coordinator (ERC)/work area supervisor is responsible for ensuring that all emergency/spill response equipment is clean and is fit for immediate use in the event of another spill. If emergency response equipment is not usable or disposable equipment is not replaced immediately, work is temporarily suspended until replacement of equipment is completed.

The responsible organization should complete and submit a Spill Information form (*20120530 RCML HSEMS E-14 Spill Information*), which will be routed to RCM's Environmental Department. This form is available via RCM's intranet site. If access to a computer is not available, a hand completed form may be used and submitted to RCM's Environmental Department.

The Environmental Department will review incident/spill report forms to evaluate if any follow up actions are required and to verify that no reportable quantities were met or exceeded and that there were no discharges to surface or ground water. For non-minor emergencies, the ERC will conduct an incident critique to identify any improvements that may be required to RCM's spill response procedures or to equipment design/use.

RCM's Environmental Manager is responsible for contacting outside regulatory agencies in the event of a release. For more information on spill reporting procedures, please refer to RCM's Emergency Response and Contingency Plan (*20120000 RCML HSEMS E12 Emergency Response and Contingency Plan*).

## 8. DISPOSAL

Used absorbent material and contained hydrocarbons from releases will be placed in 55-gallon metal drums or other appropriate containers and stored in an appropriate containment area. Drums will be appropriately labeled and kept closed except when

adding waste. If necessary, RCM may also contract a disposal company to assist with waste recovery and removal. The Environmental Department will coordinate all waste disposal and ensure that a shipping receipt or manifest is received from the disposal contractor and properly completed.

Used oil is transported off site for recycling through an authorized transporter. No RCM or contractor employee will be permitted to transport used oil off the project area or on public roads.

## 9. TRAINING

All employees and contractors who will handle hydrocarbons on RCM property are required to attend general hydrocarbon management training, which covers release prevention and response procedures, prior to working in areas where hydrocarbon products are stored or handled.

In addition to general hydrocarbon management training (typically provided in Employee/Contractor Induction Training) Spill Prevention, Control and Countermeasures (SPCC) training is required for new employees and/or existing employees assigned to oil-handling duties.

Transport carriers must complete RCM's site induction or be escorted by a site inducted person when accessing the East or West Plant sites.

Before refueling any tank on RCM property delivery drivers are required to:

- Know where the nearest spill kit is located and must visually inspect all drains, outlets and valves for leaks prior to filling and departing the fuel loading/unloading areas.
- Understand RCM's procedures for unloading the product.

All training records are kept with RCM's Training Coordinator.

## 10. ACCOUNTABILITY

**All Employees/Contractors** – All employees and contractors are responsible for reviewing and understanding this Plan, and for complying with this Plan and other Site Procedures relating to hydrocarbon management, hazardous substances and/or contamination control. All employees and contractors are also responsible for utilizing the management of change process to correct and deficiencies with this plan.

**Health & Safety/Environmental Manager** – The Health & Safety Manager and the Environmental Manager are responsible for ensuring that all personnel required to approve requests to bring new substances onsite have been trained in assessing hazardous substances.

**IT Manager** – The IT Manager is responsible for ensuring that all computers connected to RCM's network have access to Maxcom GHS.

**Training Coordinator**–The Training Coordinator is responsible for ensuring that all personnel/contractors who may potentially purchase hydrocarbons and/or other hazardous substances have been trained on how to check Maxcom GHS to determine which substances have been approved for site use and therefore authorized for purchase.

**Supervisors** – Supervisors are responsible for ensuring that all personnel working with hydrocarbons and/or other hazardous substances have been trained.

## 11. RELATED DOCUMENTS

| Document Number: | Document Name: | Document Type: |
|---|---|---|
| 20120000 RCML HSEMS E10 | Spill Prevention, Controls & Countermeasures Plan – West Plant | Plan |
| 20120000 RCML HSEMS E10 | Spill Prevention, Controls & Countermeasures Plan – East Plant | Plan |
| 20120112 RCML HSEMS E10 | SWPPP – East Plant | Plan |
| 20120109RCML HSEMS E10 | SWPPP – West Plant | Plan |
| 20121201 RCML HSEMS E10 | SWPPP – Drilling | Plan |
| 20120000 RCML HSEMS E05 | Environmental Materials Management Plan | Plan |
| 20120000 RCML HSEMS E12 | Emergency Response and Contingency Plan | Plan |
| 20120507 RCML HSEMS HSB04 | Hazardous Substances | Procedure |

| | | |
|---|---|---|
| 20120506 RCML HSEMS E10 HSB04 | Entering Chemicals Into Maxcom | Procedure |
| 20120530 RCML HSEMS E-14 | Spill Information | Form |
| 20110000 RCML HSEMS E07 | Chemical Product Approval Request | Form |
| 20110000 RCML HSEMS E10 | Permit to Unload | Form |

## 12. REVISIONS

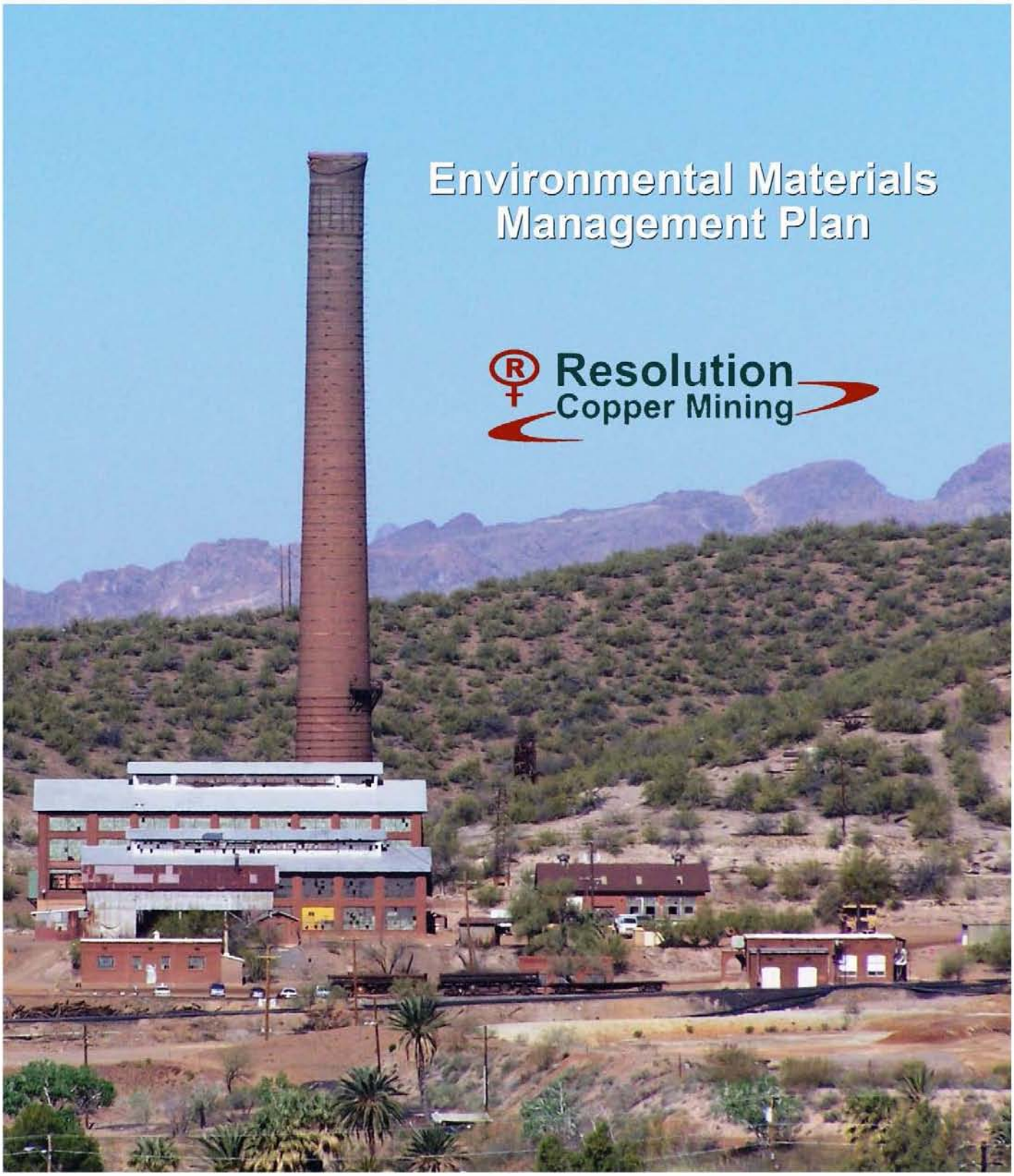
| Version: | Date: | Prepared by: | Approved by: | Reason for Change: |
|---|---|---|---|---|
| 1 | 2/20/2012 | M. Morissette | V. Peacey | NA |

# APPENDIX V

Environmental Materials Management Plan

# Environmental Materials Management Plan

Resolution Copper Mining



# RESOLUTION COPPER MINING

# ENVIRONMENTAL MATERIALS MANAGEMENT PLAN

*September 2014*

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# *Acronyms, Definitions and Regulations*

**1A1 (49 CFR 178.502)** – Steel drum with a non-removable head.

**1A2 (49 CFR 178.502)** – Steel drum with a removable head.

**A.A.C.** – Arizona Administrative Code

**Accumulation End Date** – In satellite accumulation areas, the date at which the container is filled (used interchangeably with Accumulation Start Date).

**Accumulation Start Date (40 CFR 262.34)** – The date at which hazardous waste was first placed in the hazardous waste storage container (**for satellite accumulation containers, the accumulation start date is the date the container is filled**).

**ACM** – Asbestos containing material

**Acutely Hazardous** – A hazardous waste where a small amount can cause severe health effects. Wastes designated in 40 CFR 261.33 and A.A.C. R18-8-261.A ("P" listed wastes and "F" listed dioxins).

**ADEQ** – Arizona Department of Environmental Quality

**ADHS** – Arizona Department of Health Services

**ADOT** – Arizona Department of Transportation

**AHERA** – Asbestos Hazard Emergency Response Act

**A.R.S** – Arizona Revised Statutes

**Asbestos (40 CFR 61.141)** – Naturally occurring fibers used in thermal insulation, building materials, equipment, tank liners, and transite materials that may be harmful if inhaled. Asbestos means, the asbestos form varieties of serpentinite (chrysotile) reibecktite (crodidolite) cummingtonite-grunerite, anthophyllite, and actinolite-tremolite.

**AST** – Aboveground storage tank

**AZSERC –** Arizona Emergency Response Commission

**BTEX** - Benzene, Toluene, Ethylbenzene, Xylenes

**CFR** – Code of Federal Regulations

a. 29 CFR contains regulations pertaining to the safety and health of workers;
b. 30 CRF contains regulations pertaining to the safety and health of miners;
c. 40 CFR contains regulations pertaining to the protection of the environment; and
d. 49 CFR contains regulations pertaining to the transportation of hazardous materials.

**Caustic** – A corrosive material that is alkaline as opposed to acid (pH equal to or great than 12.5 for RCRA regulations).

**CERCLA** - Comprehensive Environmental Response, Compensation, and Liability Act

**Characteristics of Hazardous Waste (40 CFR 261 Subpart C)** – Any waste that possesses the following characteristics:

a. *Ignitability (40 CFR 261.21)*
   (1) A liquid having a flash point at or below 140°F (60°C).
   (2) It is not a liquid and is capable of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.
   (3) It is an ignitable compressed gas as defined in 49 CFR 173.115(a)
   (4) It is an oxidizer as defined in 49 CFR 173.127(a).

b. *Corrosivity (40 CFR 261.22)*
   (1) It is aqueous and has a pH ≤ 2 or ≥ 12.5.
   (2) It is a liquid and corrodes steel at a rate greater than 0.250" (6.35 mm) per year, at a test temperature of 130°F (54°C).

c. *Reactivity (40 CFR 261.23)*
   (1) It is normally unstable and readily undergoes violent change without detonating.
   (2) It reacts violently with water.
   (3) It forms potentially explosive mixtures with water.
   (4) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
   (5) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5 can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.
   (6) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.
   (7) It is readily capable of detonation or explosive reaction at standard temperature and pressure.
   (8) It is a forbidden explosive as defined in 49 CFR 173.54, or a Class A (Division 1.1 or 1.2) explosive or a Class B (Division 1.2 or 1.3) explosive as defined in 49 CFR 173.50 and 173.53.

d. *Toxicity (40 CFR 261.24)*
   (1) A solid waste exhibits the characteristic of toxicity if a representative sample contains any contaminants equal to or greater than the respective values listed in Table 1*. The following table lists maximum concentrations of contaminants of concern for the toxicity characteristic for RCM Operations.

| EPA Waste Code | Contaminant | Regulatory Level (mg/L) |
|---|---|---|
| D004 | Arsenic | 5.0 |
| D005 | Barium | 100.0 |
| D018 | Benzene | 0.5 |
| D006 | Cadmium | 1.0 |
| D007 | Chromium | 5.0 |
| D008 | Lead | 5.0 |
| D009 | Mercury | 0.2 |
| D035 | Methyl Ethyl Ketone | 200.00 |
| D010 | Selenium | 1.0 |
| D040 | Trichloroethylene | 0.5 |

* This is not a complete list. There are many other contaminants with listed regulatory levels.

**Combustible Liquid (40 CFR 173.120(b))** – Any liquid with a flash point above 140°F (60°C) and below 200°F (93°C).

**Conditionally Exempt Small Quantity Generator (CESQG) (40 CFR 261.5(g)(2))** – A generator that generates less than 100 kg (220 lbs) of a hazardous waste or less than one kg (220 lbs)of acutely hazardous wastes in a calendar month. CESQG's must not accumulate more than 1,000 kg (2,200 lbs.) of hazardous waste onsite at any time.

**CWA** - Clean Water Act

**Declaration of Environmental Use Restriction (DEUR) (A.A.C. R18-7-208)** – An environmental document that has been completed in which the property owner elects to leave contamination on a property that exceeds the applicable residential standard for the property or elects to use an institutional control or an engineering control to meet requirements.

**Disposal Facility (40 CFR 260.10)** – A permitted facility for final disposal of hazardous wastes.

**DOT** – Department of Transportation.

**DOT Approved** – Drums and containers available for shipment must be in good condition to comply with DOT regulations. Drums/Containers not approved for transport may contain any one of the following conditions:

a. Interior of the drum is badly rusted.
b. Badly bulged head of bottom.
c. Stripped bung threads.
d. Broken or missing flange.
e. Pipe flange or gate valve welded or rusted in bung.
f. Any hole in the drum.
g. Top or bottom chimes with sharp dents.
h. Any significant dents on drum especially on the rolling hoops.

**Empty Container (40 CFR 261.7) – A container, the contents of which have the following characteristics:**

a. No more than 2.5 cm (one inch) of residue remain on the bottom of the container or inner liner, or
b. No more than 3 percent by weight of the total capacity of the container remains in the container or inner liner if the container is less than or equal to 119 gallons in size, or
c. No more than 0.3 percent by weight of the total capacity of the container remains in the container or inner liner if the container is greater than 119 gallons in size.
d. A container that has held a hazardous waste that is a compressed gas is empty when the pressure in the container approaches atmospheric pressure.

**EPA** – Environmental Protection Agency.

**EPA Identification Number (40 CFR 260.10; 40 CFR 262.12)** – Number assigned by the EPA to a generator, transporter, or a treatment, storage, or disposal facility (TSDF). As of 1996, EPA identifications numbers were changed to be RCRA Identification Numbers.

**EPCRA** – Emergency Planning and Community Right-to-Know Act

**Flammable Liquid (49 CFR 173.120(a))** – A liquid having a flash point below 140°F (60.5°C), or any material in a liquid phase with a flash point at or above 100°F (37.8°C)that is intentionally heated and offered for transportation or transported at or below its flash point in a bulk packaging.

**Flash Point (49CFR 173.120(c))** – The minimum temperature at which a liquid gives off vapor in a sufficient concentration to form an ignitable mixture with air near the surface of the liquid.

**FAR** – Facility Annual Report

**Generator (40 CFR 260.10)** – Any person whose act or process produces hazardous waste identified or listed in Part 261 or whose act first causes a hazardous waste to become subject to regulation.

**Generator Knowledge (40 CFR 262.11(c)(2))** – A Generator may apply knowledge of the hazard characteristic(s) of the waste in light of testing the materials and processes used.

**Hazardous Material (40 CFR 171.8)** – A substance or material capable of posing an unreasonable risk to health, safety, and property.

**HMTA** - Hazardous Materials Transportation Act

**Hazmat Employee (40 CFR 171.8)** – A person who in the course of employment directly affects hazardous materials transportation safety. This term includes an individual who:

a. Loads, unloads, or handles hazardous materials;
b. Tests, reconditions, repairs, modified, marks or otherwise represents containers, drums, or packaging as qualified for use in the transportation of hazardous materials;
c. Prepares hazardous materials for transportation;
d. Is responsible for safety of transporting hazardous materials; or
e. Operates a vehicle used to transport hazardous materials.

**Hazardous Waste (40 CFR 261.3)** – A solid waste is a hazardous waste when it meets any of the following criteria:

a. The waste is a listed hazardous waste.
b. The waste is a mixture of a solid waste and one or more listed hazardous wastes.
c. When the waste exhibits any of the characteristics of a hazardous waste.

**HazWoper** – Hazardous Waste Operations and Emergency Response

**HSE** – Health Safety and Environmental

**kg** – Kilogram – A kilogram is roughly equivalent to 2.2 lbs.

**Large Quantity Generator (LQG) (40 CFR 262.34(b))** – A generator that generates greater than 1,000 kg (2,200 lbs.) of hazardous waste or 2.2 lbs. of acute hazardous waste in a calendar month. A LQG may accumulate hazardous waste onsite for 90 days or less (once the waste is in a central accumulation area – timing requirements do not apply to satellite accumulation areas) without a permit.

**LDR** - Land Disposal Restriction

**LEPC** – Local Emergency Planning Committee

**LQHUW** – Large Quantity Handler of Universal Wastes

**Manifest (40 CFR 260.10))** – The shipping document EPA form 8700-22 for hazardous and PCB wastes, and if necessary form 8700-22A, originated and signed by the generator in accordance with the instruction included in the appendix to Part 262.

**MSHA** – Mine Safety and Health Administration.

**NESHAP** – National Emission Standards for Hazardous Air Pollutants

**Non-fuel, non-solvent petroleum product (A.A.C. R18-8-1601(6))** – Petroleum-based substance refined from virgin crude oil that is not used as a solvent or fuel including minerals oils and hydraulic oils.

**OSHA (29 CFR)** – Occupational Safety and Health Administration.

**PAH -** Polynuclear aromatic hydrocarbons

**PCB (40 CFR 761)** – Polychlorinated biphenyl

**PCS** – Petroleum Contaminated Soil

**PPE** – Personal Protective Equipment

**ppm** – parts per million

**RCM** – Resolution Copper Mining, LLC

**RCRA (40 CFR 260-299)** – Resource Conservation and Recovery Act; also known as the "cradle to grave" regulation which tracks hazardous waste to final disposal.

**RCRA Identification Number** – Formerly known as EPA Identification Numbers. Number assigned by the EPA to a generator, transporter, or a treatment, storage, or disposal facility (TSDF). As of 1996, EPA identifications numbers were changed to be RCRA Identification Numbers.

**Rebuttable Presumption (40 CFR 261.3; 40 CFR 279.10(b)(1)(ii))** – For used oil with halogen content greater than 1,000 ppm, a generator may rebut the presumption that hazardous waste was mixed with used oil.

**Reportable Quantity** (RQ) – Identifies this material has a hazardous substance which is reportable to EPA and DOT in the event of a spill exceeding the reportable quantity identified in Appendix A to 49 CFR §172.101. Also, CERCLA lists additional RQs.

**Satellite Accumulation Area (40 CFR 262.34(c))** – Designated area to accumulate up to 55 gallons of hazardous waste or one quart of acutely hazardous waste in containers at or near the point of generation and under the control of the operator. Arizona regulations allow a site to accumulate up to 55 gallons per waste stream or one quart of acutely hazardous waste in a satellite accumulation area.

**SDS** –Safety Data Sheet

**SDWA** – Safe Drinking Water Act

**Small Quantity Generator (SQG) (40 CFR 262.34(d))** – A generator who generates greater than 100 kg (220 lbs.) but less than 1000 kg (2,200 lbs.) of hazardous waste in a calendar month (and the quantity of waste accumulated onsite never exceeds 6,000 kg [13,200 lbs.]). A SQG may accumulate hazardous waste onsite for 180 days or less without a permit.

**SQHUW** - Small Quantity Handler of Universal Wastes

**Solid Waste (40 CFR 261.2)** – Any discarded material that is abandoned, recycled, or inherently waste-like that is not listed in the exclusions. A solid waste may be solid, liquid, or semi-solid or may be a material which contained gaseous materials that can no longer be used for its intended purpose.

**SPCC - Spill Prevention, Control and Countermeasures (40 CFR 112)** – A plan to avoid oil spills and minimize impacts of spills to public health and the environment

**SWPPP -** Storm Water Pollution Prevention Plan - a plan required for an industrial facility that discharges stormwater

**TCLP** – Toxicity Characteristics Leaching Procedure

**TOC** – Total Organic Content

**TPH** – Total Petroleum Hydrocarbons

**TRI -** Toxic Chemical Release Inventory

**TSCA** – Toxic Substance Control Act

**TSD** – Transfer, Storage and Disposal

**TSDF** – Transfer, Storage and Disposal Facility

**VOC** – Volatile Organic Compounds

# *List of Applicable Federal and State Regulations*

| Section | Citation | Description |
|---|---|---|
| Training | 29 CFR 1910-120 | OSHA HazWoper regulations |
| Chemical contaminated soils and spills information | 40 CFR 110 | Discharge of oil |
| Waste Identification | 40 CFR 261.2 through 261.6 | Hazardous wastes and solid waste definitions and exemptions |
| Waste Management | 40 CFR 261.7 | Residuals of hazardous wastes in empty containers |
| Waste Identification | 40 CFR 261 Subpart C | Hazardous waste characterization definitions (ignitability, corrosivity, reactivity, toxicity [TCLP]) |
| Waste Identification | 40 CFR 261 Subpart D | Lists of hazardous wastes |
| Waste Identification | 40 CFR 261 Appendices | Hazardous waste test methods and basis for listing hazardous wastes |
| Waste Identification | 40 CFR 262 Subpart A | Hazardous waste determination |

| Section | Citation | Description |
|---|---|---|
| Waste Management | 40 CFR 262 Subpart C | Pre-transportation requirements for hazardous wastes including labeling, packaging, marking, and accumulation |
| Recordkeeping and Reporting | 40 CFR 262 Subpart D | Hazardous waste generator recordkeeping and reporting requirements |
| Training | 40 CFR 265 Subpart B | General facility standards for hazardous waste treatment, storage and disposal facilities. |
| Waste Management | 40 CFR 265 Subpart I | Use and management of containers |
| Training | 40 CFR 265.19 | RCRA regulations |
| Specific Waste Stream Management | 40 CFR 266 Subpart G | Spent acid batteries requirements |
| Specific Waste Stream Management | 40 CFR 268 | Land disposal restrictions |
| Waste Management | 40 CFR 273 | Universal waste management standards |
| Specific Waste Stream Management | 40 CFR 279 | Used oil management standards |
| Recordkeeping and Reporting | 40 CFR 761 | PCB information |
| Chemical contaminated soils and spills information | 40 CFR 302 | Superfund, emergency planning and community right to know programs: designation, RQ, and notification |
| Chemical contaminated soils and spills information | 40 CFR 355 | Emergency planning and notification |
| Training | 49 CFR 172 | DOT HazMat regulations |
| Waste Management | 49 CFR 172 Subpart C | DOT HazMat regulations – shipping papers |
| Waste Management | 49 CFR 172 Subpart D | DOT HazMat regulations - marking |
| Waste Management | 49 CFR 173 Subpart D | Definitions, classification , and packing group assignments for hazardous wastes (except for Class I and Class 7, explosives and radioactive material) |
| Specific Waste Stream Management | A.R.S. Title 44 Chapter 9, Article 8 | Arizona’s waste tire disposal requirements |
| Waste Management | A.R.S. Title 49 Chapter 1, Article 3 | Arizona’s environmental nuisances |
| Landfills | A.R.S. Title 49 Chapter 4, Article 4 | Arizona’s regulations of solid wastes |
| Waste Management | A.R.S. Title 49 Chapter 4, Article 7 | Arizona used oil management standards |
| Specific Waste Stream Management | A.R.S. Title 44 Chapter 9, Article 9 | Arizona’s sale and disposal of batteries requirements |
| Pollution Prevention and Waste Minimization | A.R.S. Title 49 Chapter 5, Article 4 | Arizona’s pollution prevention requirements |

| Section | Citation | Description |
|---|---|---|
| Waste Management | A.R.S. Title 49 Chapter 5, Article 2 | Arizona's hazardous waste management |
| Specific Waste Stream Management | A.A.C. R11-1-1501 though 1521 | Arizona's mine acid plant and leaching requirements |
| Waste Identification | A.A.C. R18-7 -203 | Arizona's soil remediation standards |
| Waste Management | A.A.C. R18-8-262 | Arizona's standards applicable to generators of hazardous waste |
| Waste Management | A.A.C. R18-8-273 | Arizona's universal waste standards |
| Waste Management | A.A.C. R18-8-280 | Arizona's hazardous waste program compliance requirements |
| Specific Waste Stream Management | A.A.C. R18-13-1201 through 1210 | Arizona's waste tire standards |

# *Quick Reference Guide*

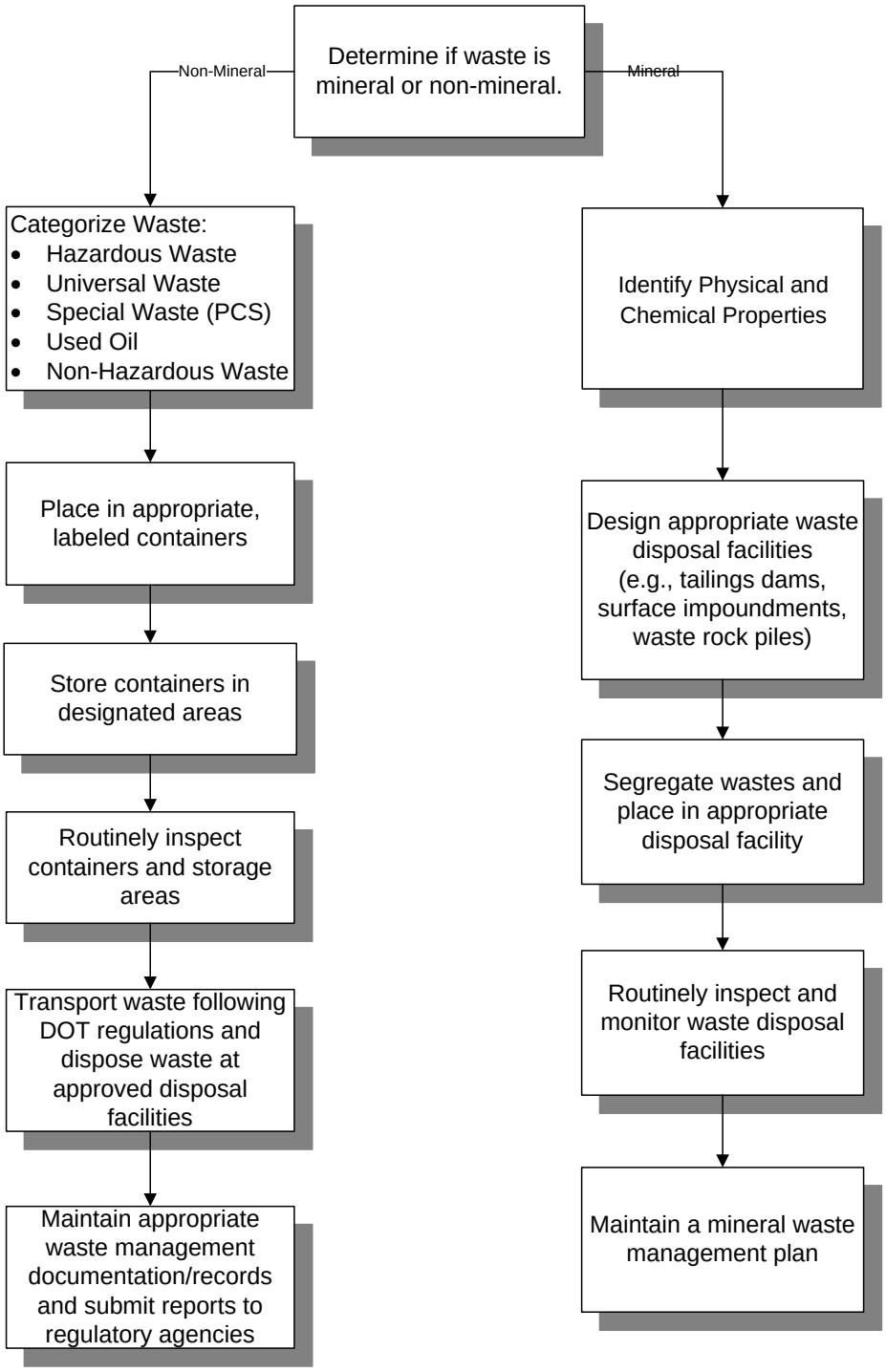
## Roles & Responsibilities

The following table provides a general summary of roles and responsibilities for Resolution Copper Mining, LLC (RCM) employees and contractors with regards to environmental materials management at RCM managed facilities.

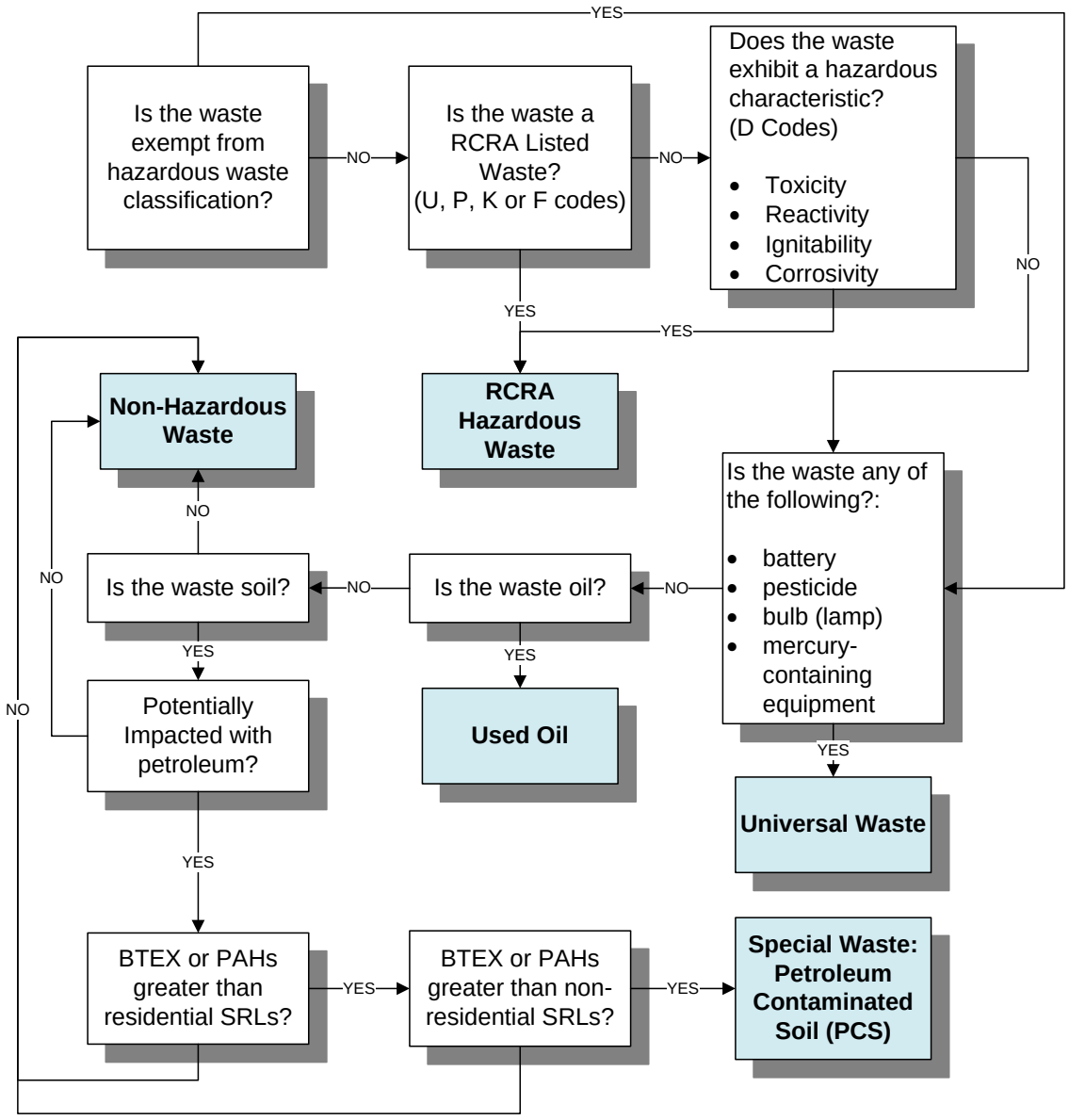
| Role | Responsibilities |
|---|---|
| RCM Environmental Manager | Program approval, guidance, and oversight |
| RCM HSE | Chemical review and approval through MaxCom |
| RCM Environmental Staff | Plan implementation and enforcement and employee and contractor support |
| RCM Employees and Contractors | Compliance with MaxCom and Plan guidelines |

**Flow Chart Operational Procedures**

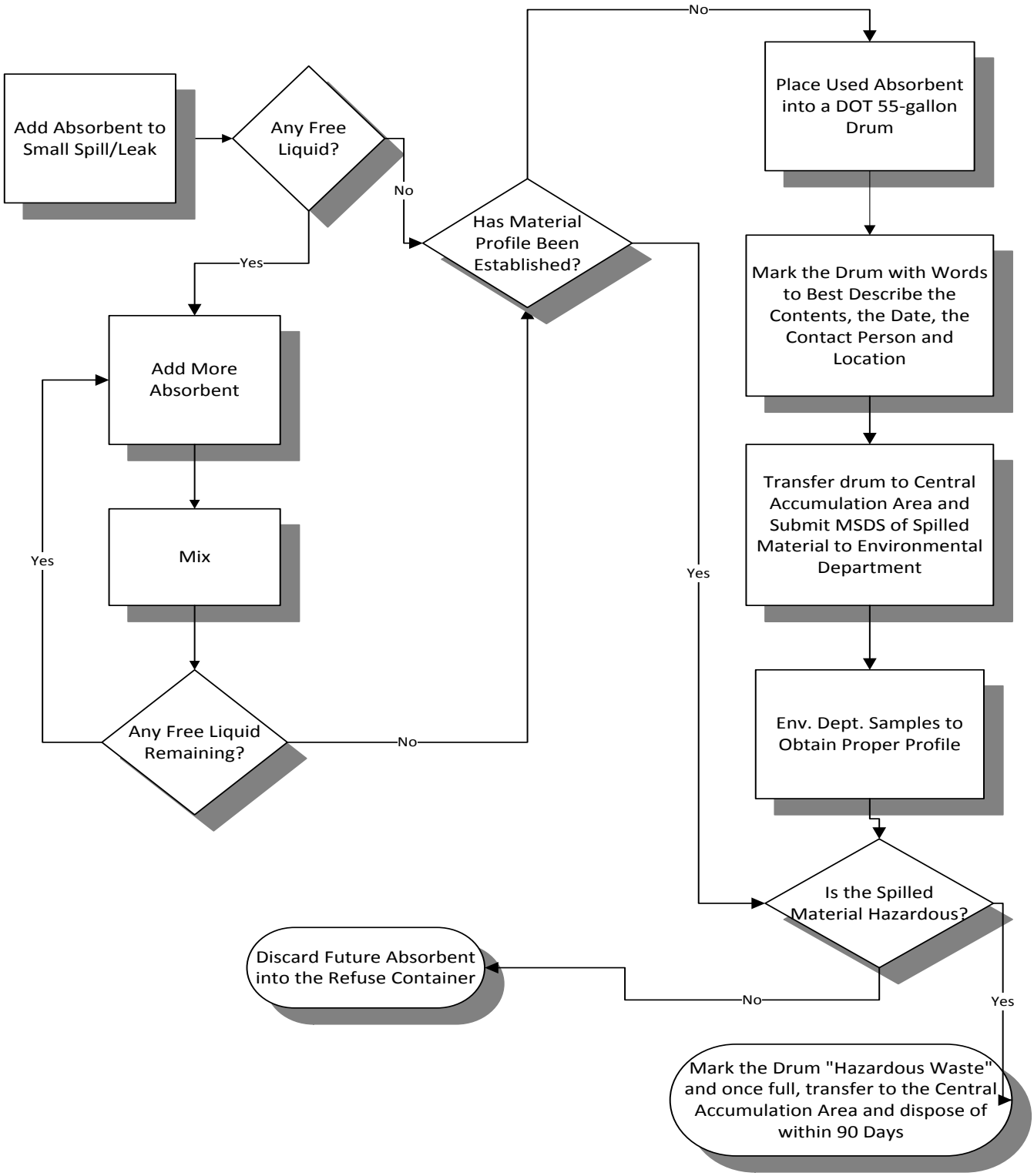
- Waste Management Overview
- Non-mineral Waste Identification Overview
- Specific Waste Stream Procedures
  - Used Absorbent Handling Procedures for Operators
  - Waste Aerosol Can Handling Procedures for Operators
  - Used / Waste Antifreeze Handling Procedures for Operators
  - Asbestos Handling Procedures for Operators
  - Spent Batteries Handling Procedures for Operators
  - CFC - Freon™ Handling Procedures for Operators
  - Chemical Contaminated Soils and Spill handling Procedures for Operators
  - New Cleaning and Solvent Product Approval Handling Procedures for Operators
  - Compressed Gas Cylinder Handling Procedures for Operators
  - Used/Waste Diesel Handling Procedures for Operators
  - Empty Determination and Disposal Procedures for Non-Aerosol Containers for Operators
  - Used Grease Handling Procedures for Operators
  - Used Gasoline Handling Procedures for Operators
  - Landfill Procedures for Operators
  - Oil-Filled Electrical Devices / PCB Ballasts / Capacitors (not Transformers)Handling Procedures for Operators
  - Oil-Filled Electrical Devices Transformers Handling Procedures for Operators
  - Used Oil Filter Handling Procedures for Operators
  - Intact Used Mercury Lamp (Universal Waste) Handling Procedures for Operators
  - Broken Mercury Lamp (Hazardous Waste) Handling Procedures for Operators
  - Spent Mercury Thermostat Handling Procedures for Operators
  - Used Paint (Latex/Non-Hazardous) Handling Procedures for Operators
  - Waste Paint Materials Handling Procedures for Operators
  - Shop Rags Handling Procedures for Operators
  - Scrap Metal Handling Procedures for Operators



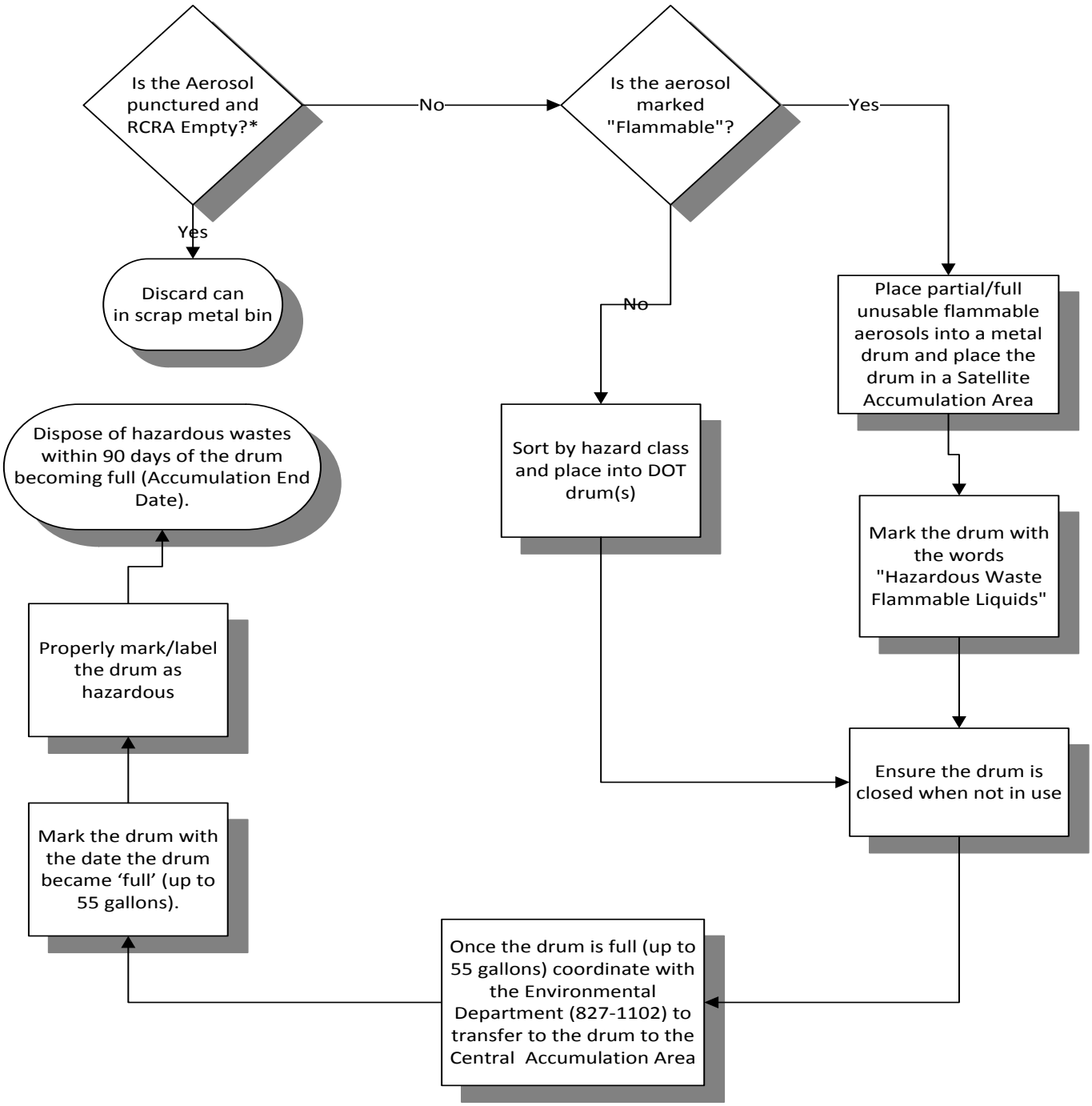

**WASTE MANAGEMENT OVERVIEW**




**NON-MINERAL WASTE IDENTIFICATION OVERVIEW**

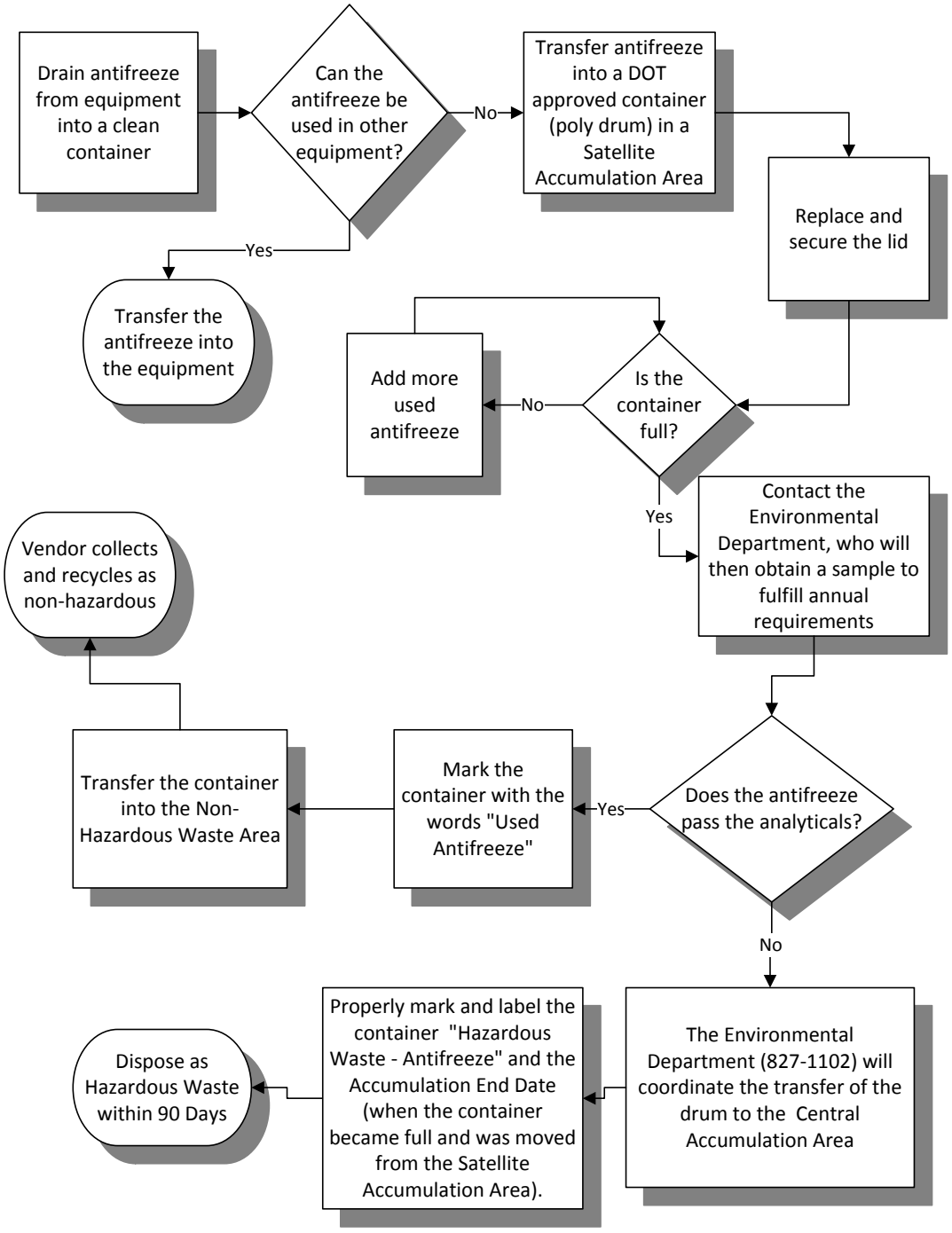



**USED ABSORBENT HANDLING PROCEDURES FOR OPERATORS**

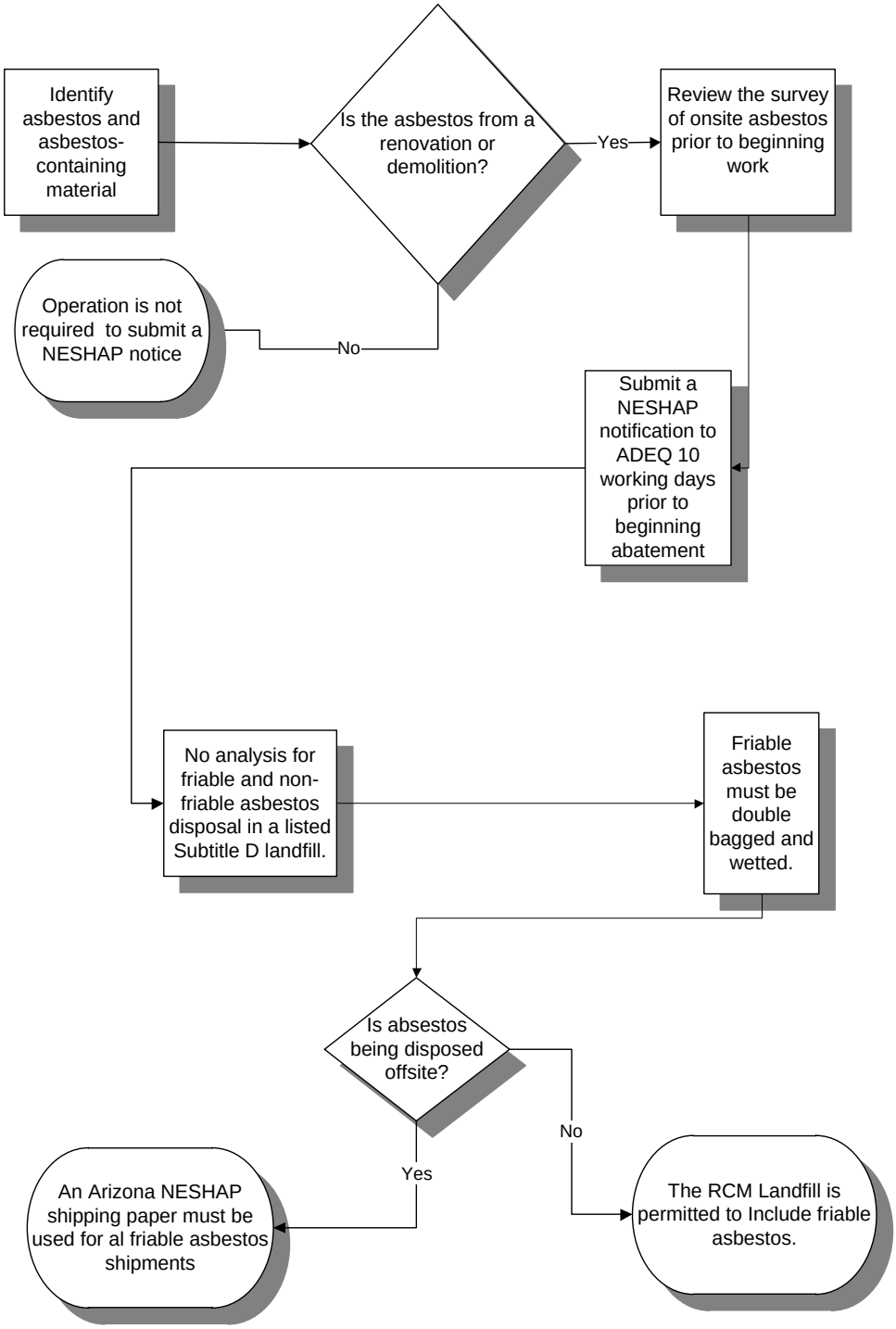



**WASTE AEROSOL CAN HANDLING PROCEDURES FOR OPERATORS**

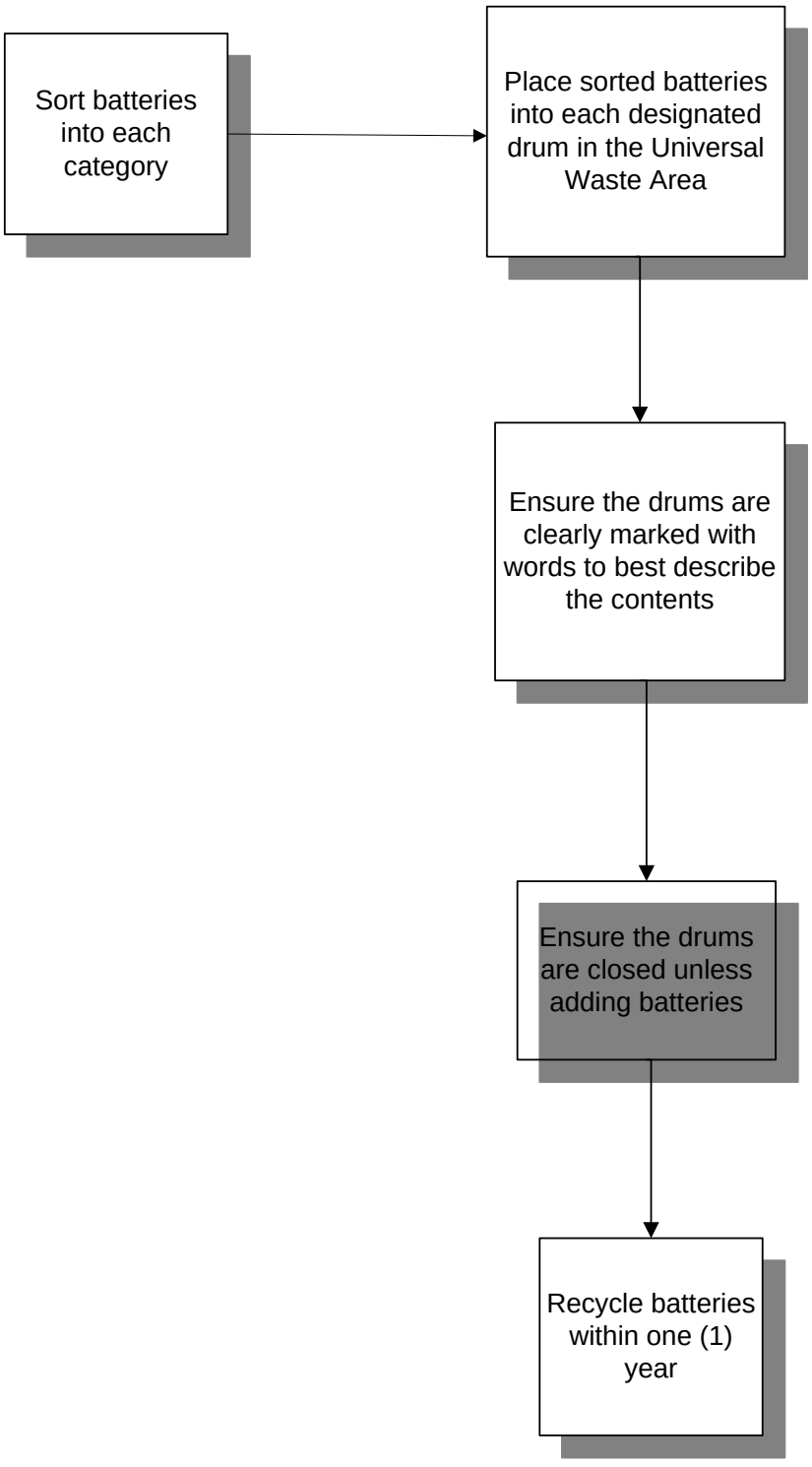
* Refer to Sections 1.13 and 2.14



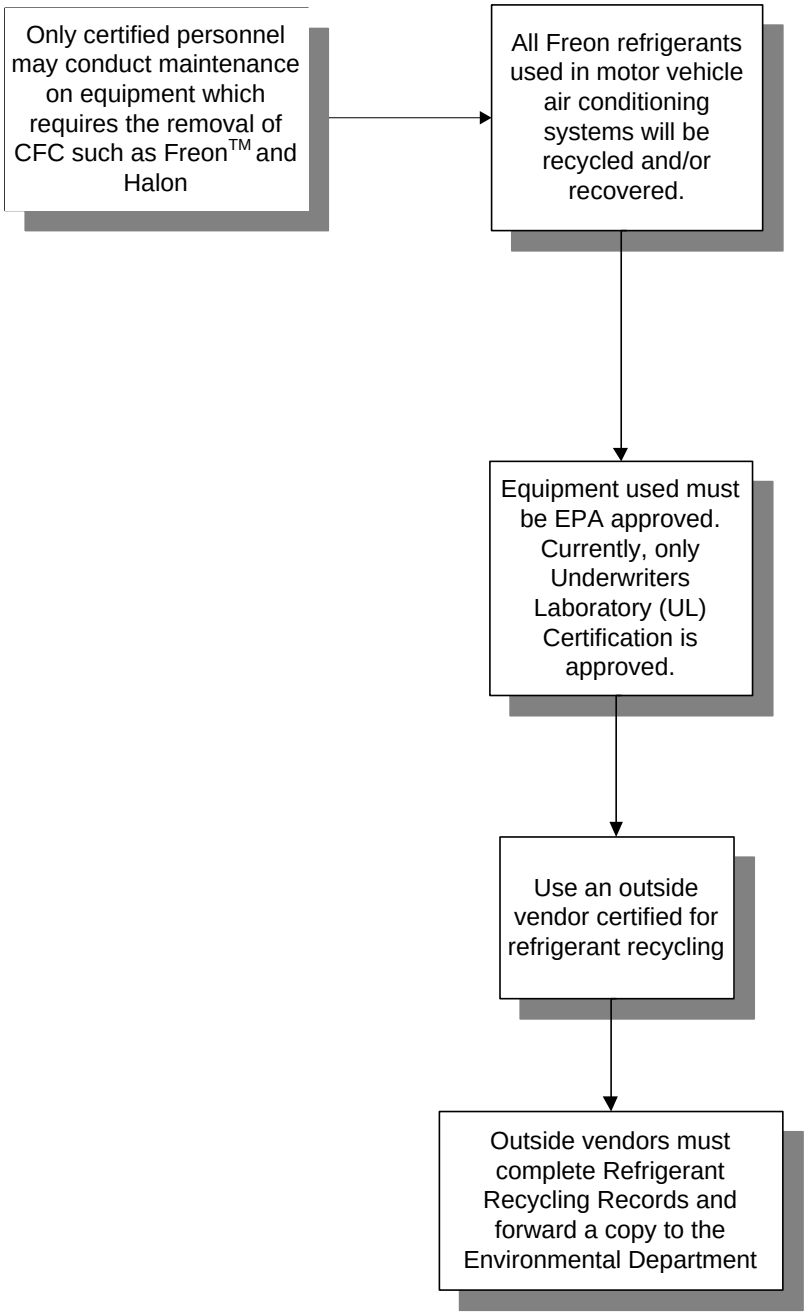

**USED / WASTE ANTIFREEZE HANDLING PROCEDURES FOR OPERATORS**



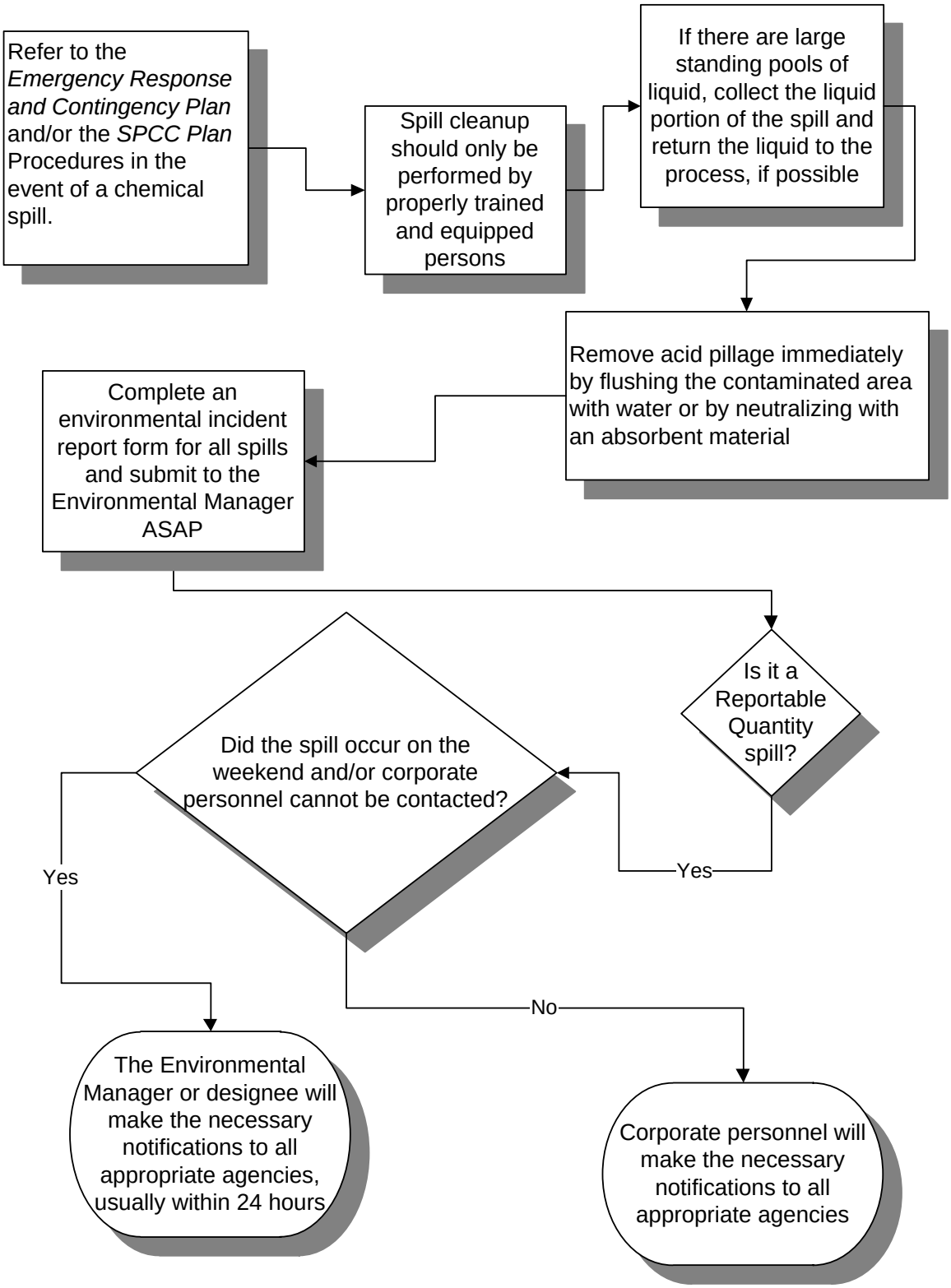

**ABESTOS HANDLING PROCEDURES FOR TRAINED OPERATORS**



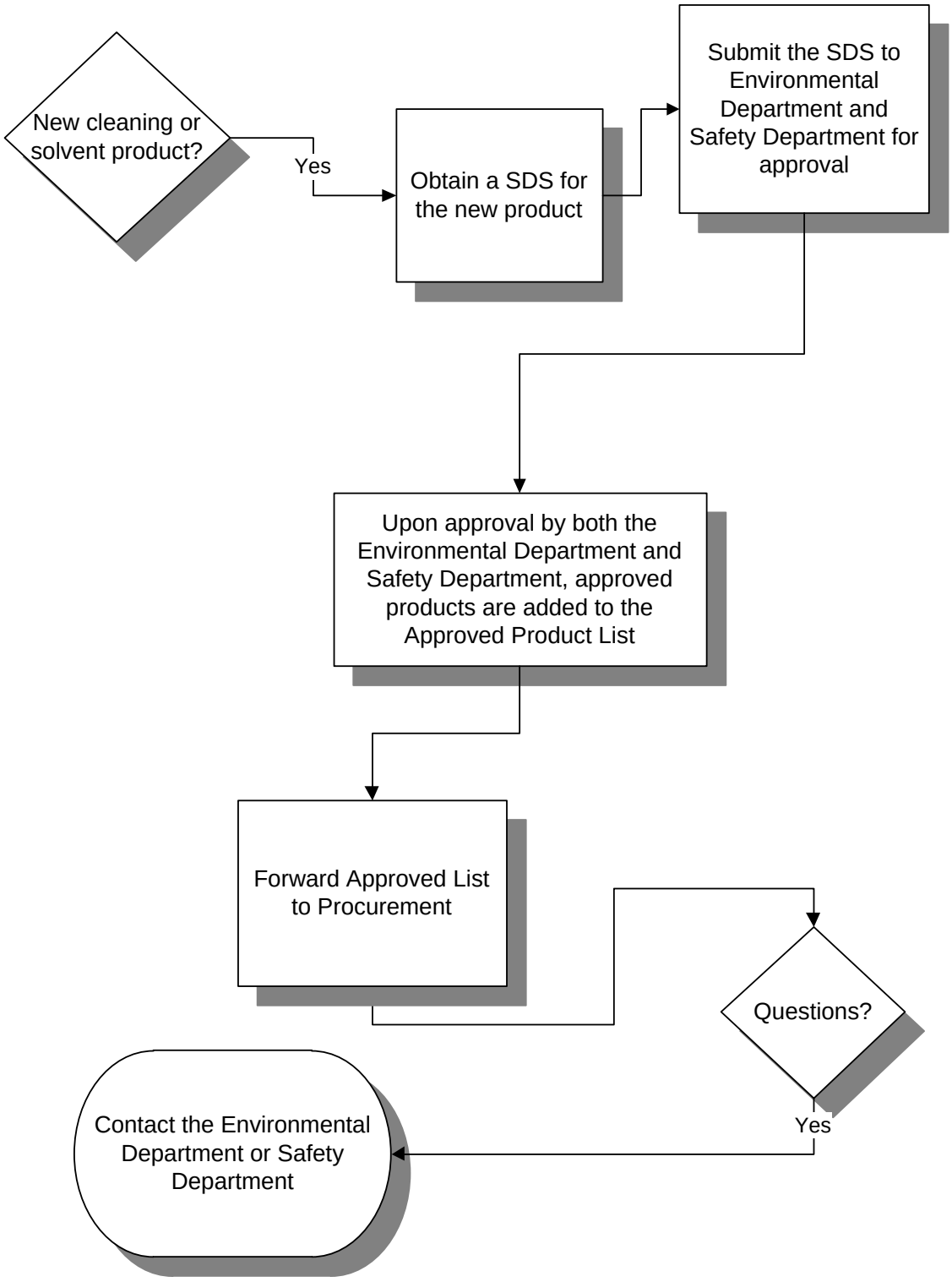

**SPENT BATTERIES HANDLING PROCEDURES FOR OPERATORS**



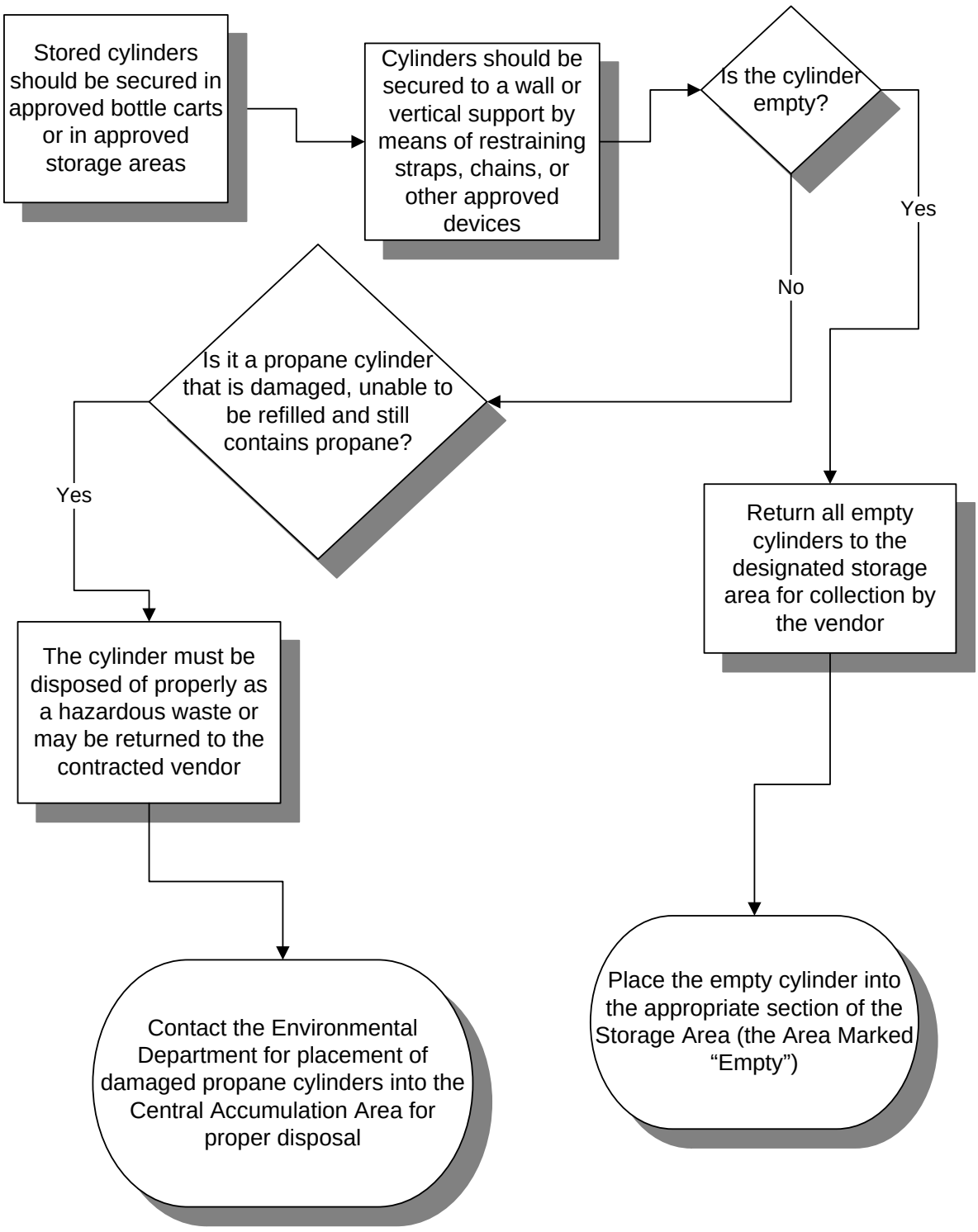

**CFC – Freon™ HANDLING PROCEDURES FOR OPERATORS**



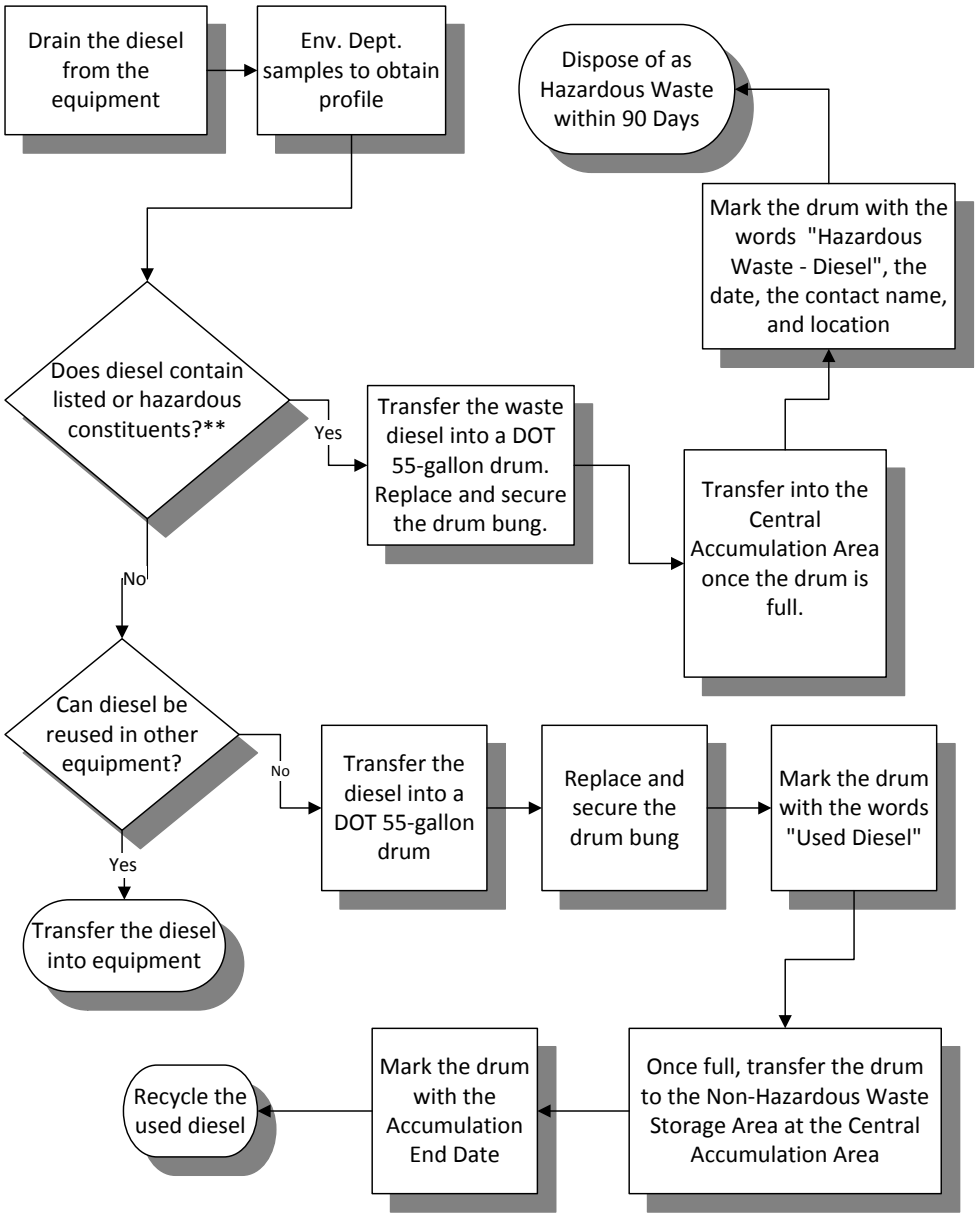

**CHEMICAL CONTAMINATED SOILS AND SPILL HANDLING PROCEDURES FOR OPERATORS**




**NEW CLEANING AND SOLVENT PRODUCT APPROVAL HANDLING PROCEDURES FOR OPERATORS**

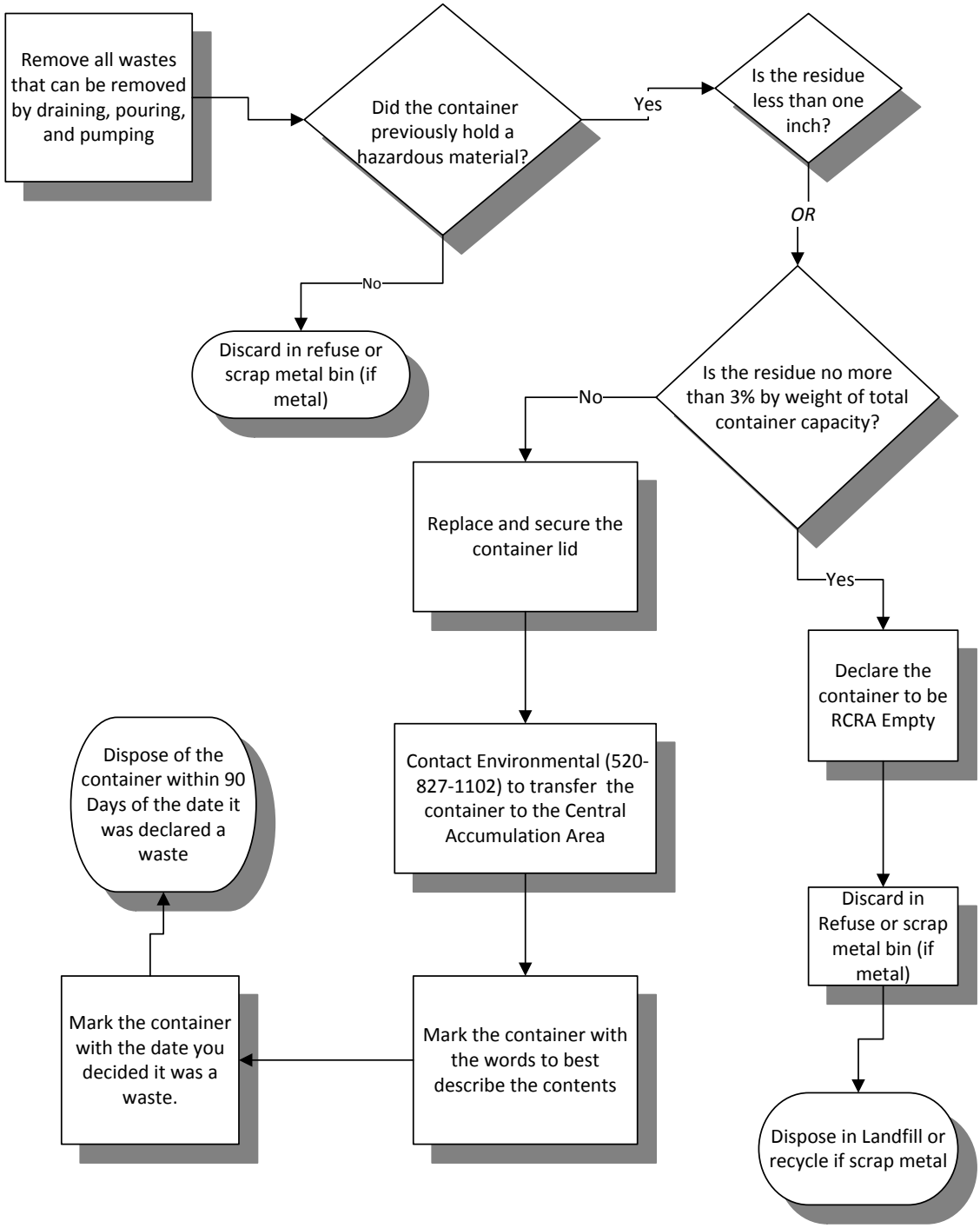



**COMPRESSED GAS CYCLINDER HANDLING PROCEDURES FOR OPERATORS**

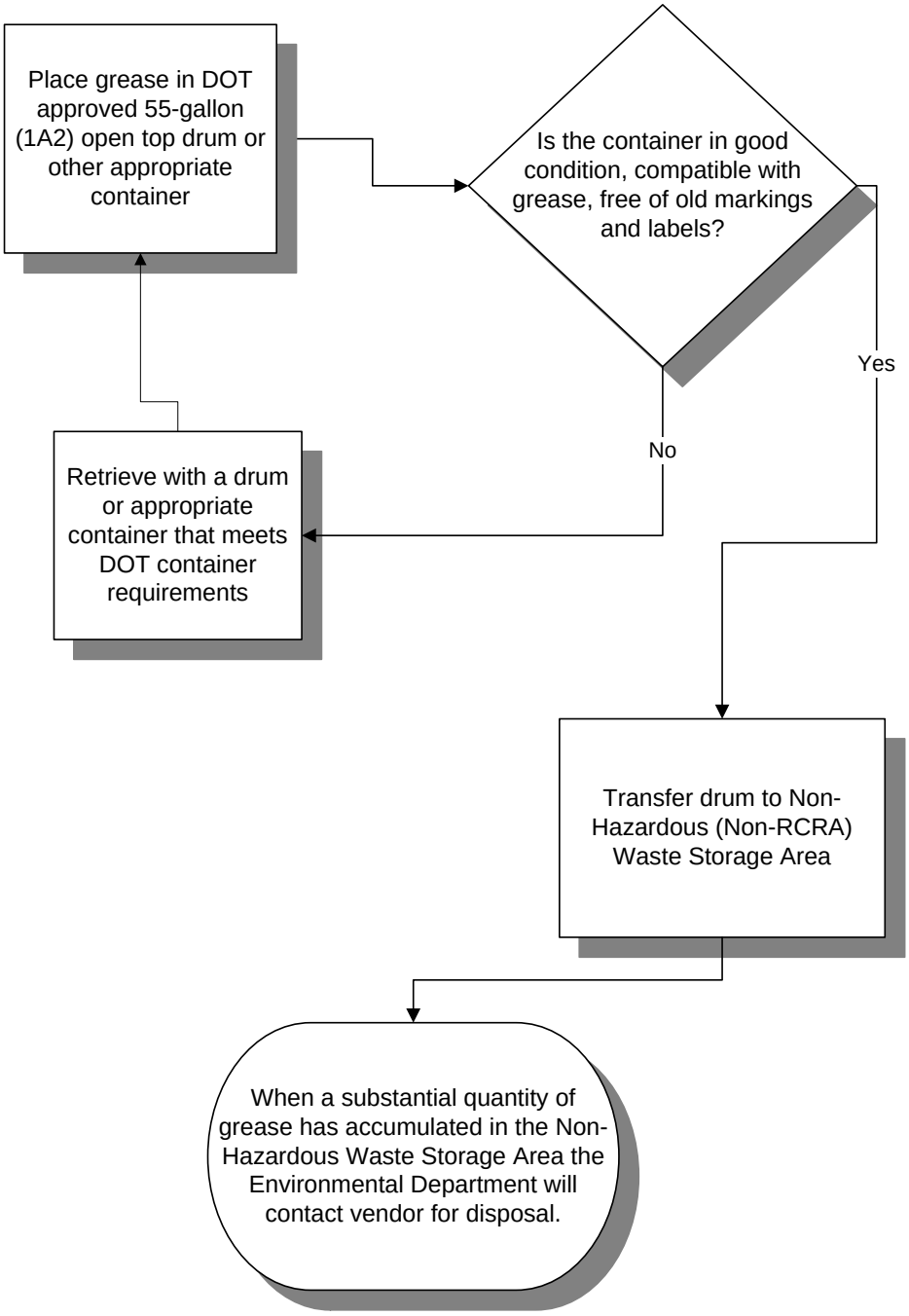



**USED / WASTE DIESEL HANDLING PROCEDURES FOR OPERATORS**

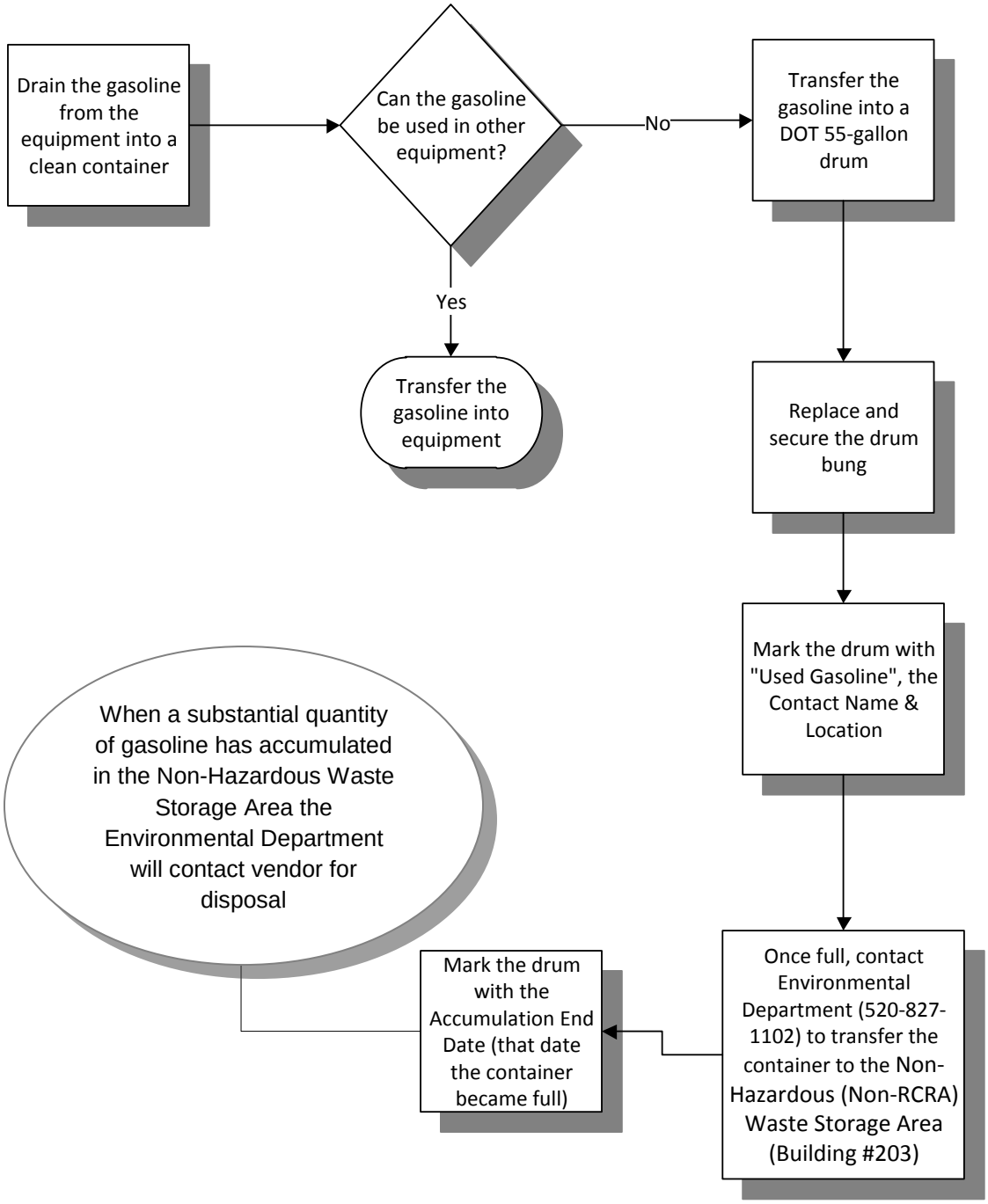
** Contact Environmental Department for guidance



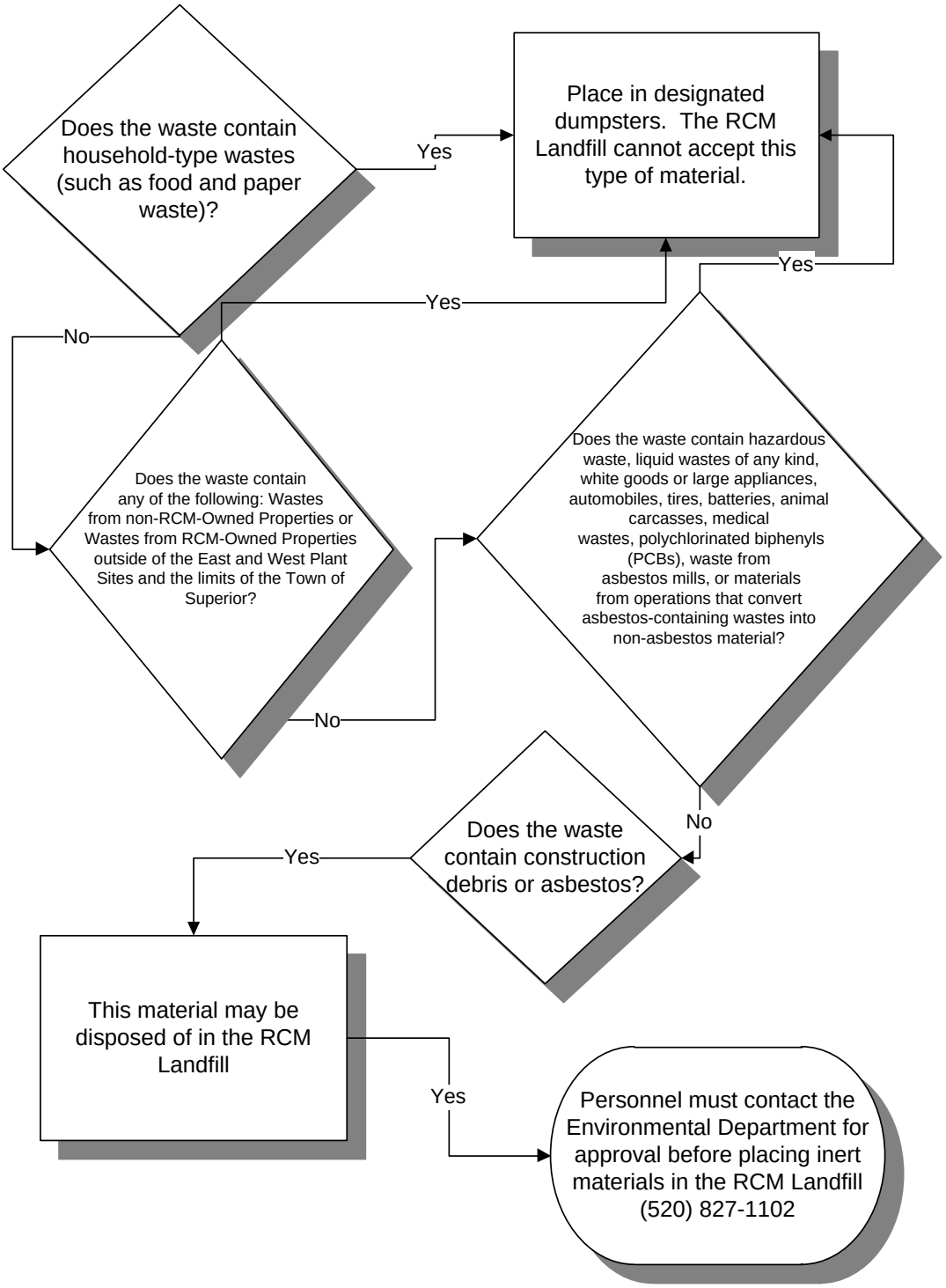

**EMPTY DETERMINATION AND DISPOSAL PROCEDURES FOR NON-AEROSOL CONTAINERS FOR OPERATORS**



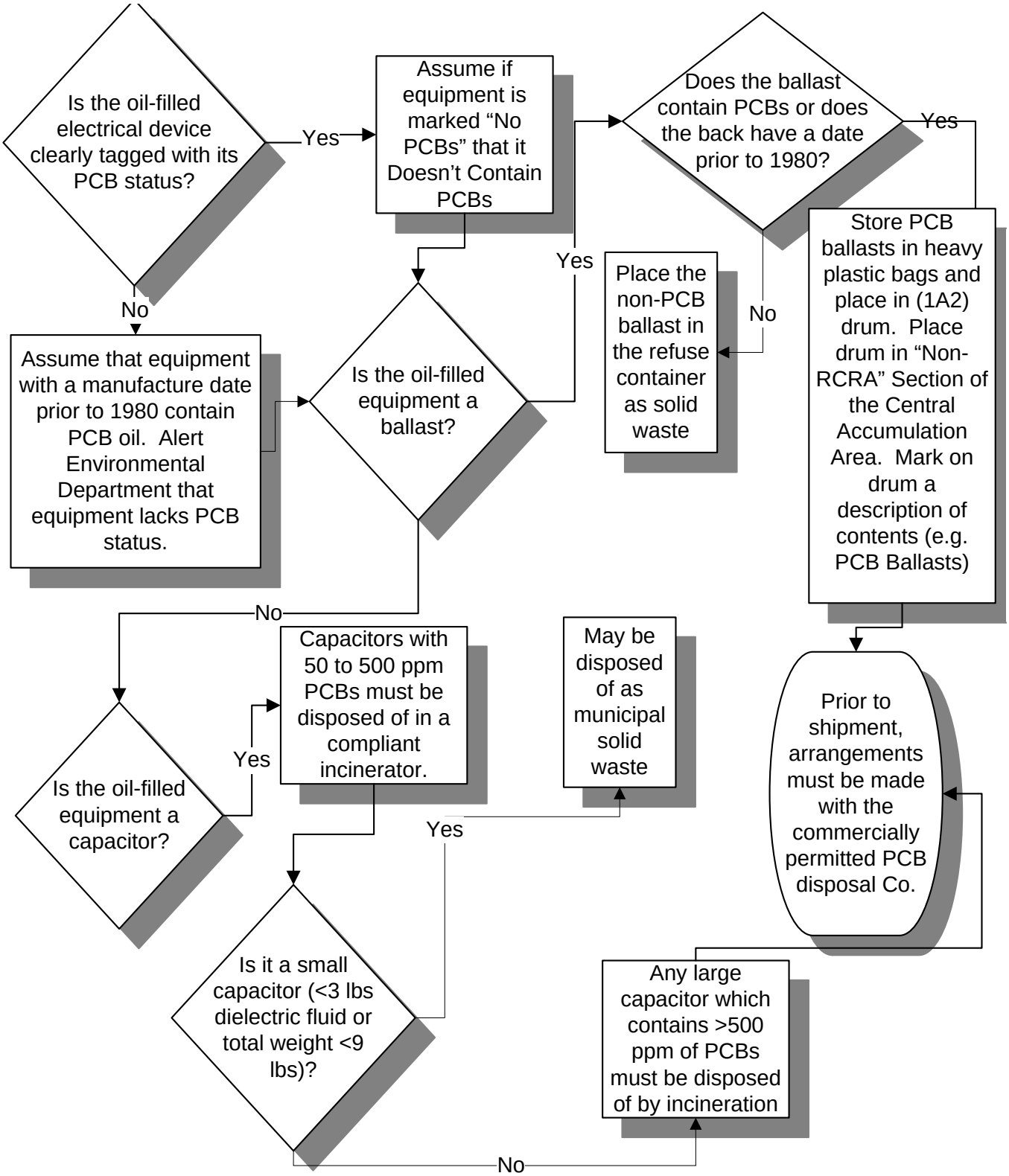

**USED GREASE HANDLING PROCEDURES FOR OPERATORS**



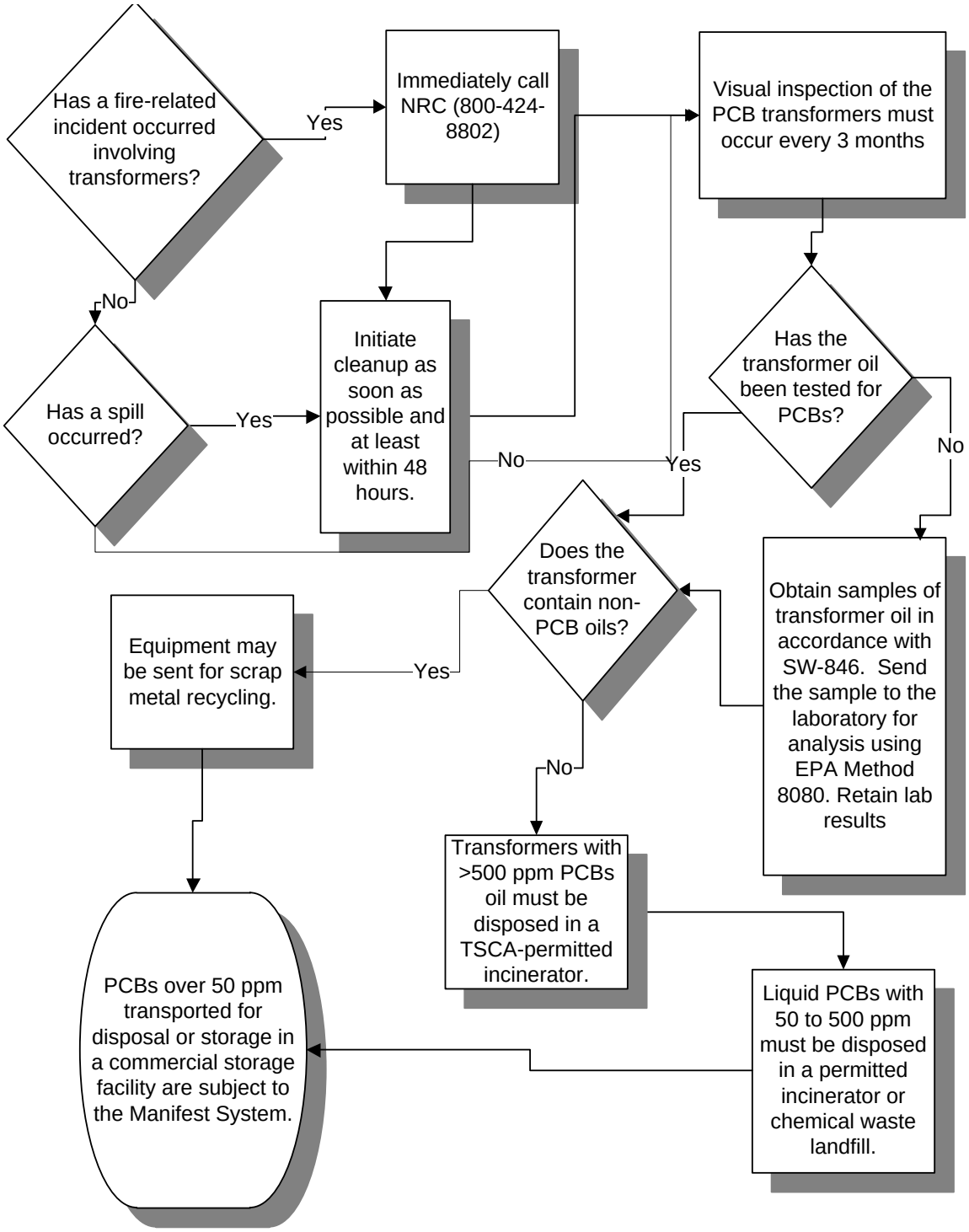

**USED GASOLINE HANDLING PROCEDURES FOR OPERATORS**



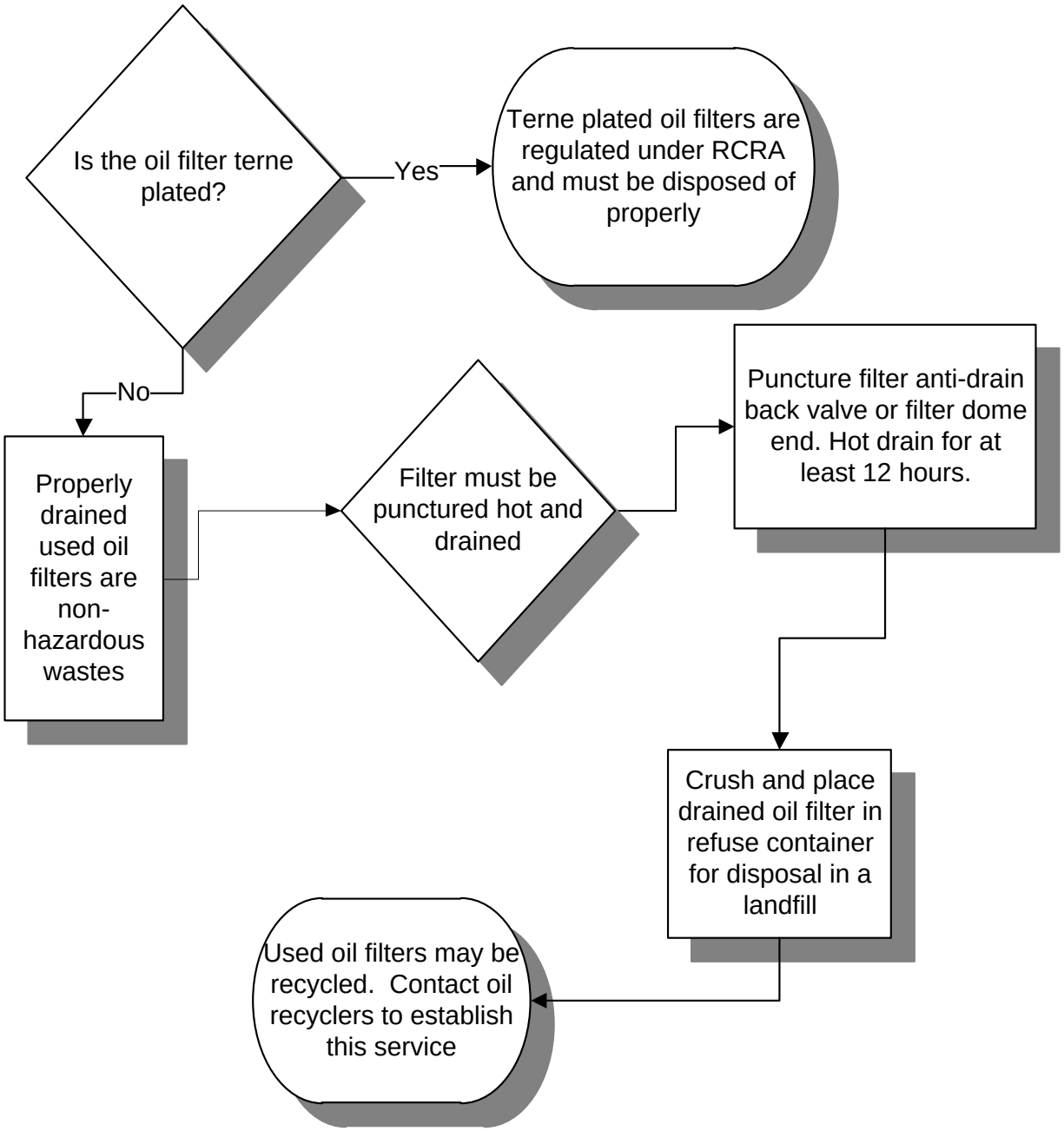

**LANDFILL PROCEDURES FOR OPERATORS**



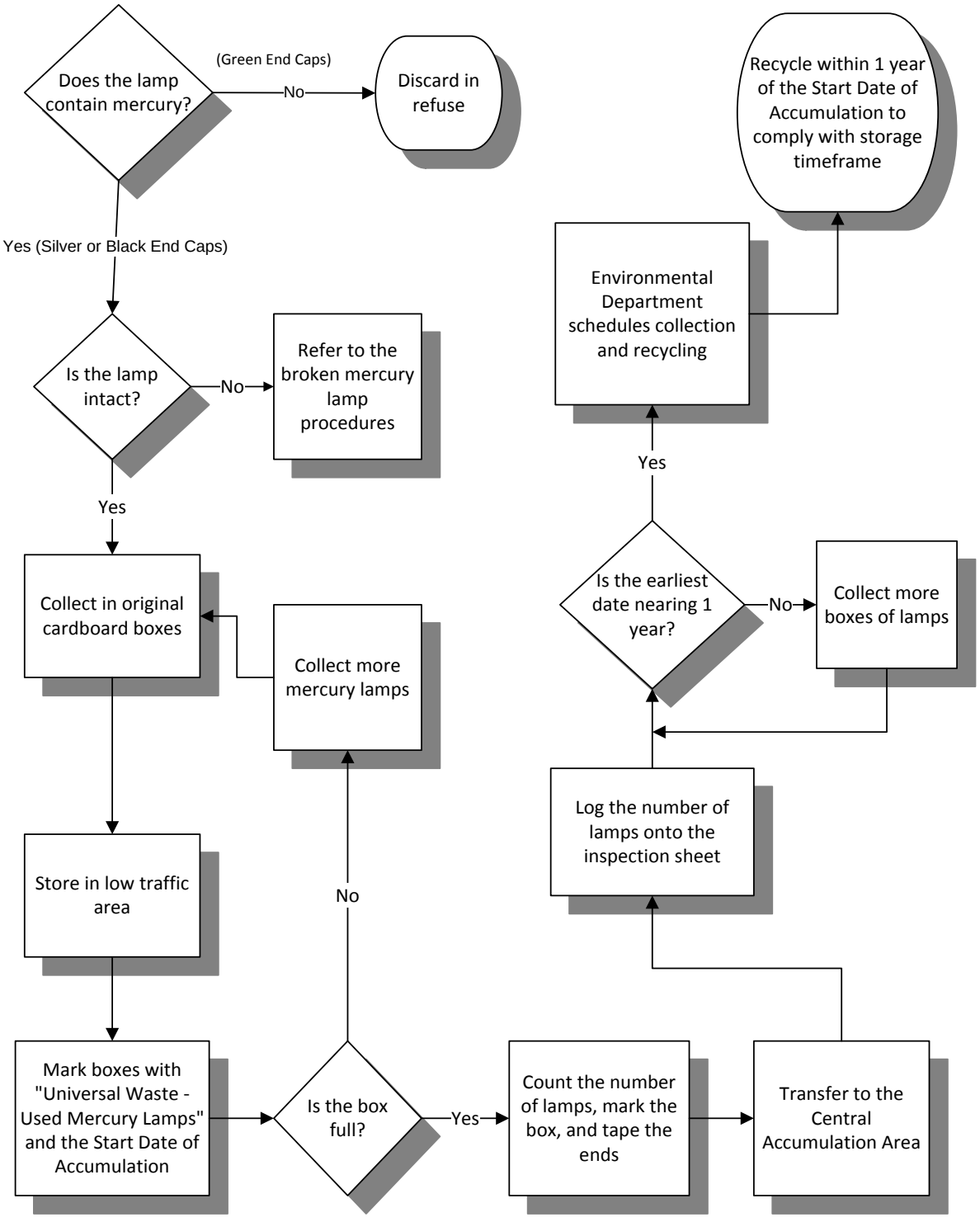

**OIL-FILLED ELECTRICAL DEVICE/PCB BALLAST/CAPACITOR (NOT TRANSFORMERS) HANDLING PROCEDURES FOR OPERATORS**



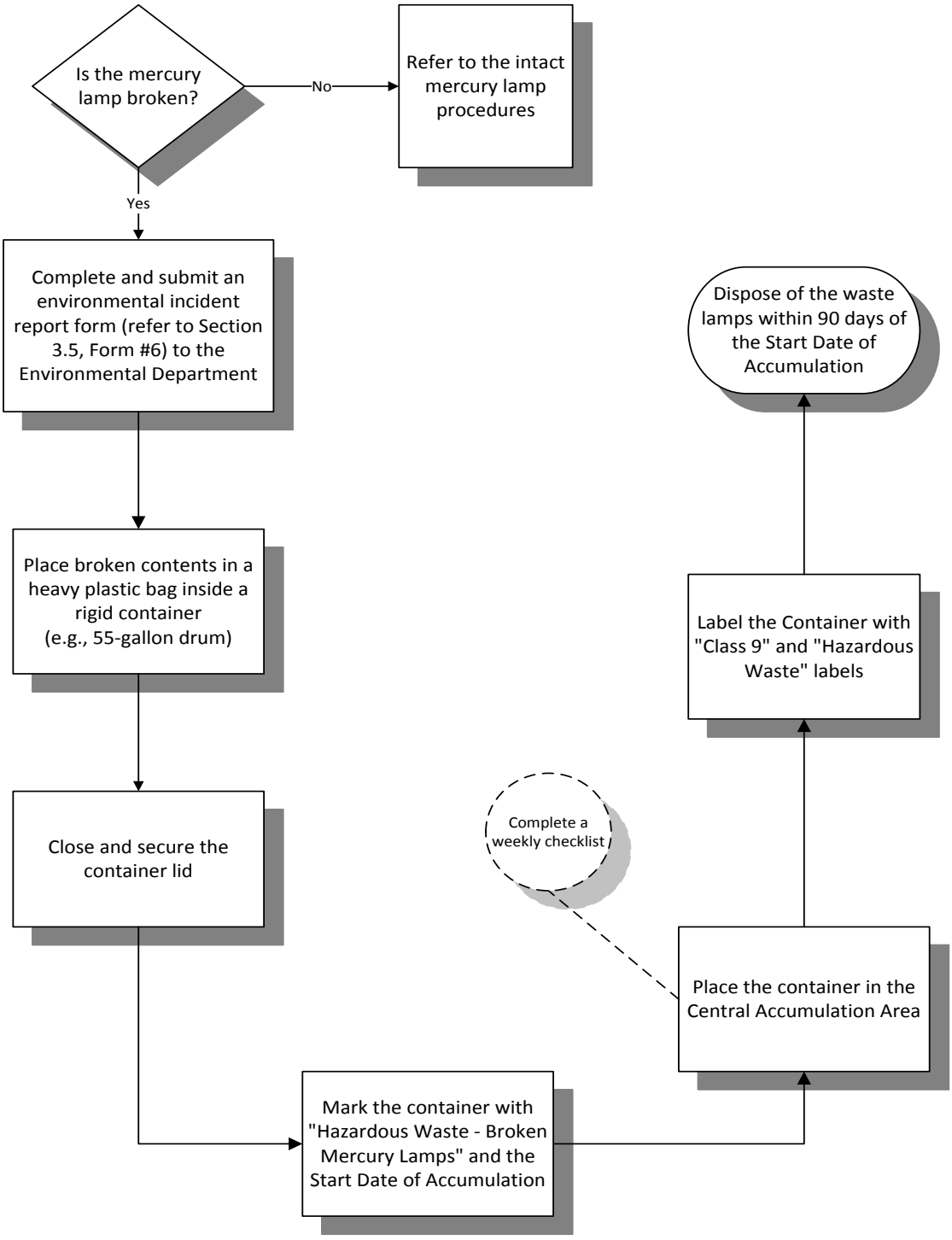

**OIL-FILLED ELECTRICAL DEVICES**
**TRANSFORMERS HANDLING PROCEDURES**
**FOR OPERATORS**



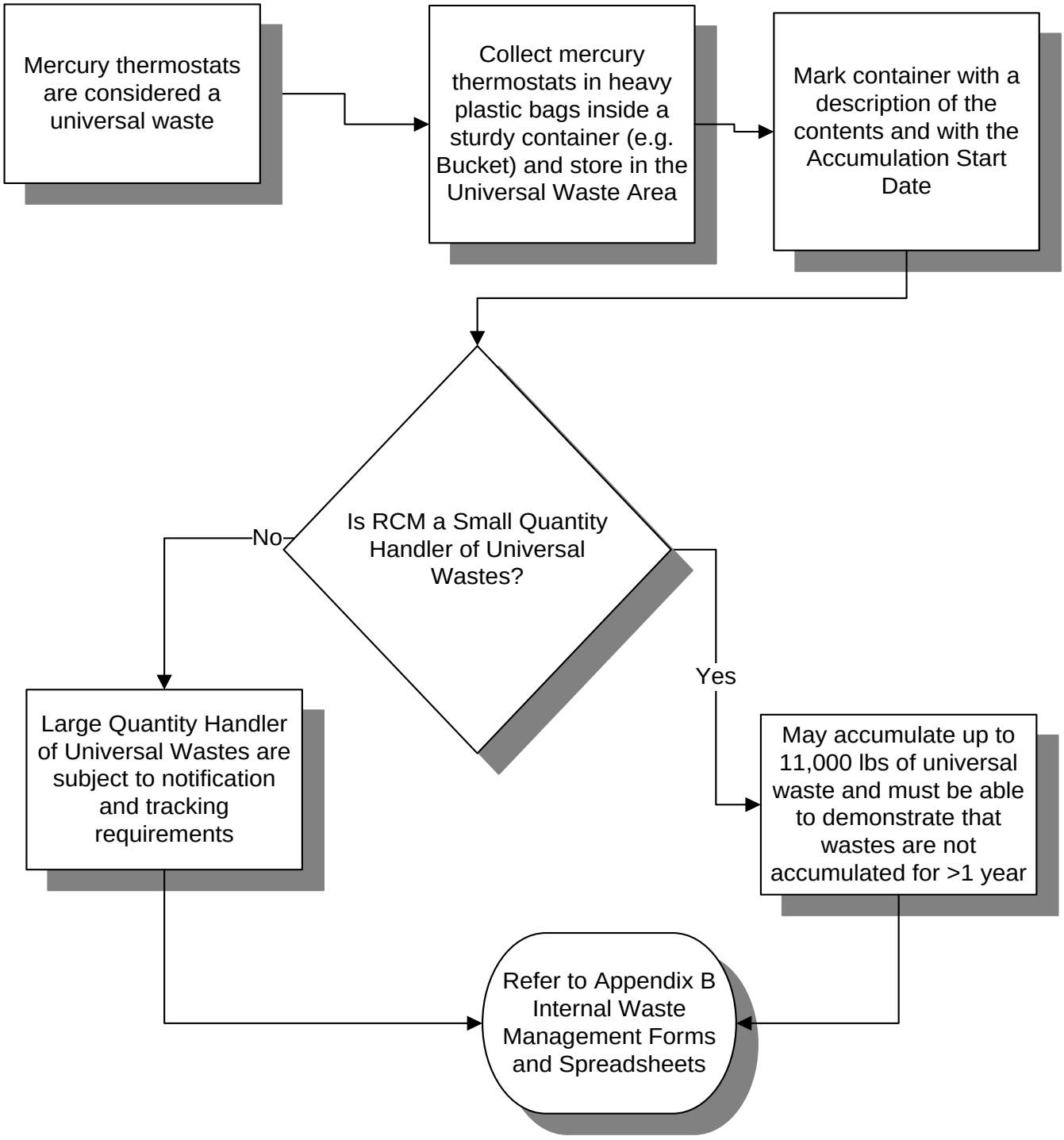

## USED OIL FILTER HANDLING PROCEDURES FOR OPERATORS



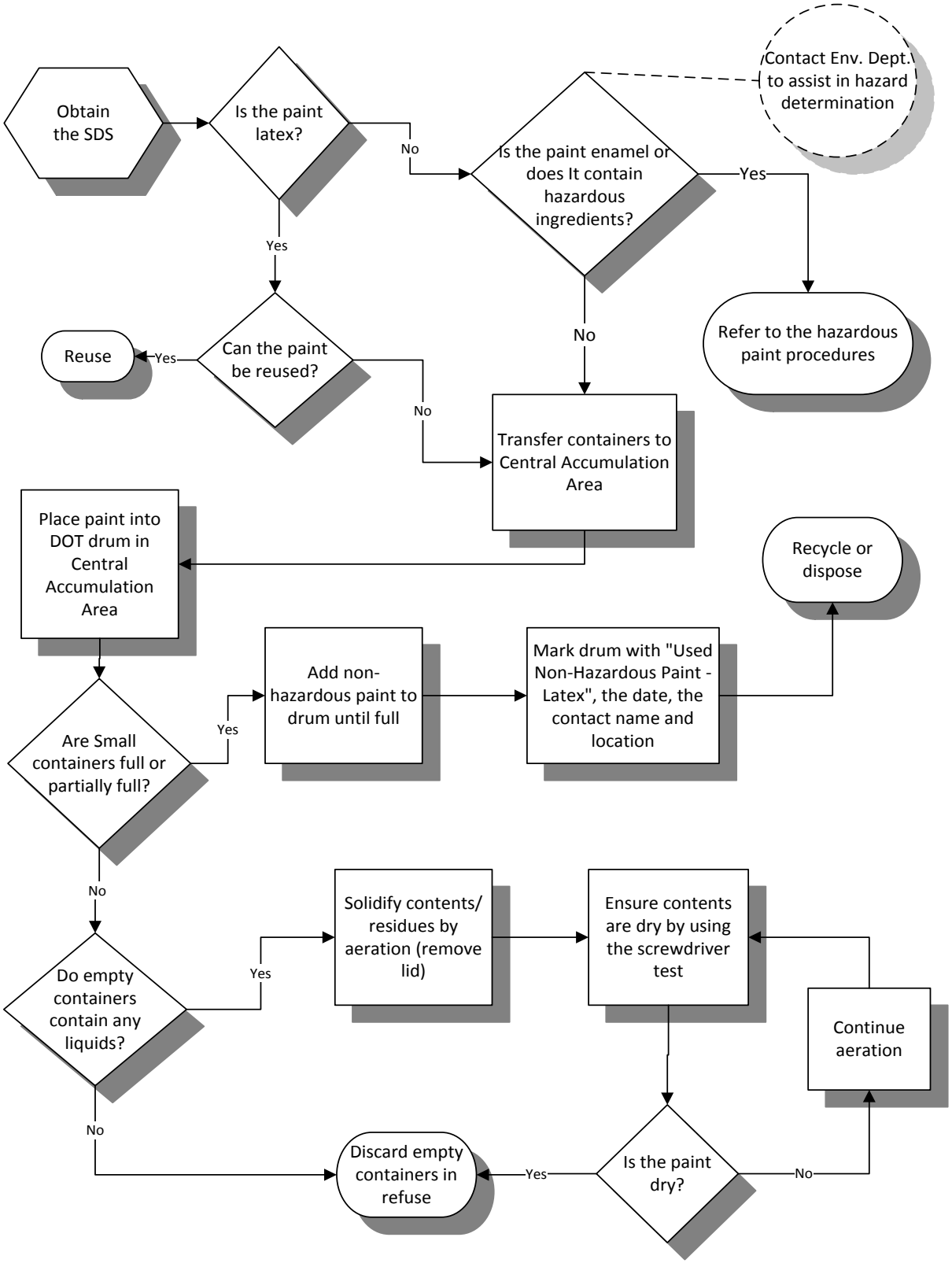

**INTACT USED MERCURY LAMP (UNIVERSAL WASTE) HANDLING PROCEDURES FOR OPERATORS**



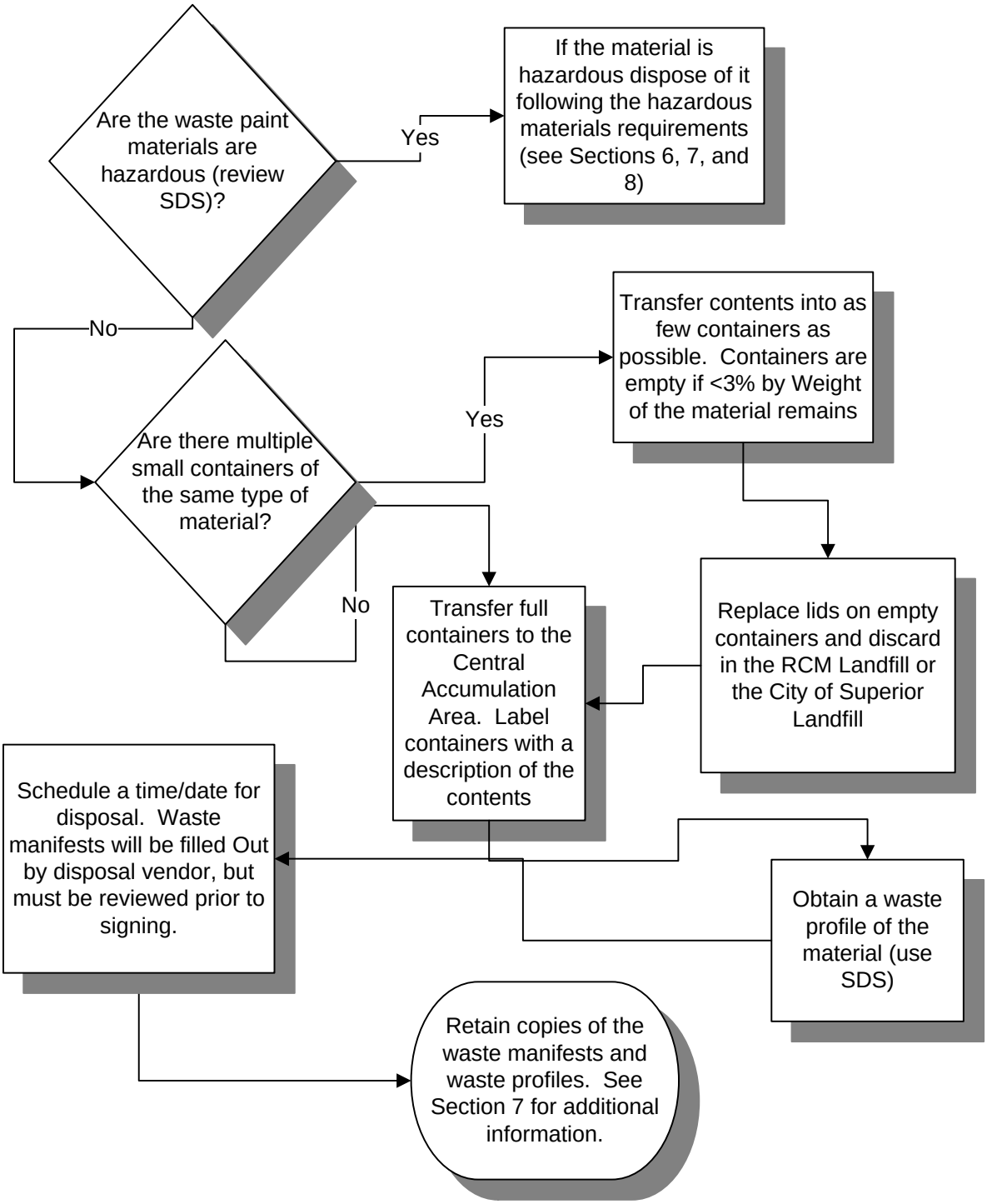

**BROKEN MERCURY LAMP (HAZARDOUS WASTE)**
**HANDLING PROCEDURES FOR OPERATORS**



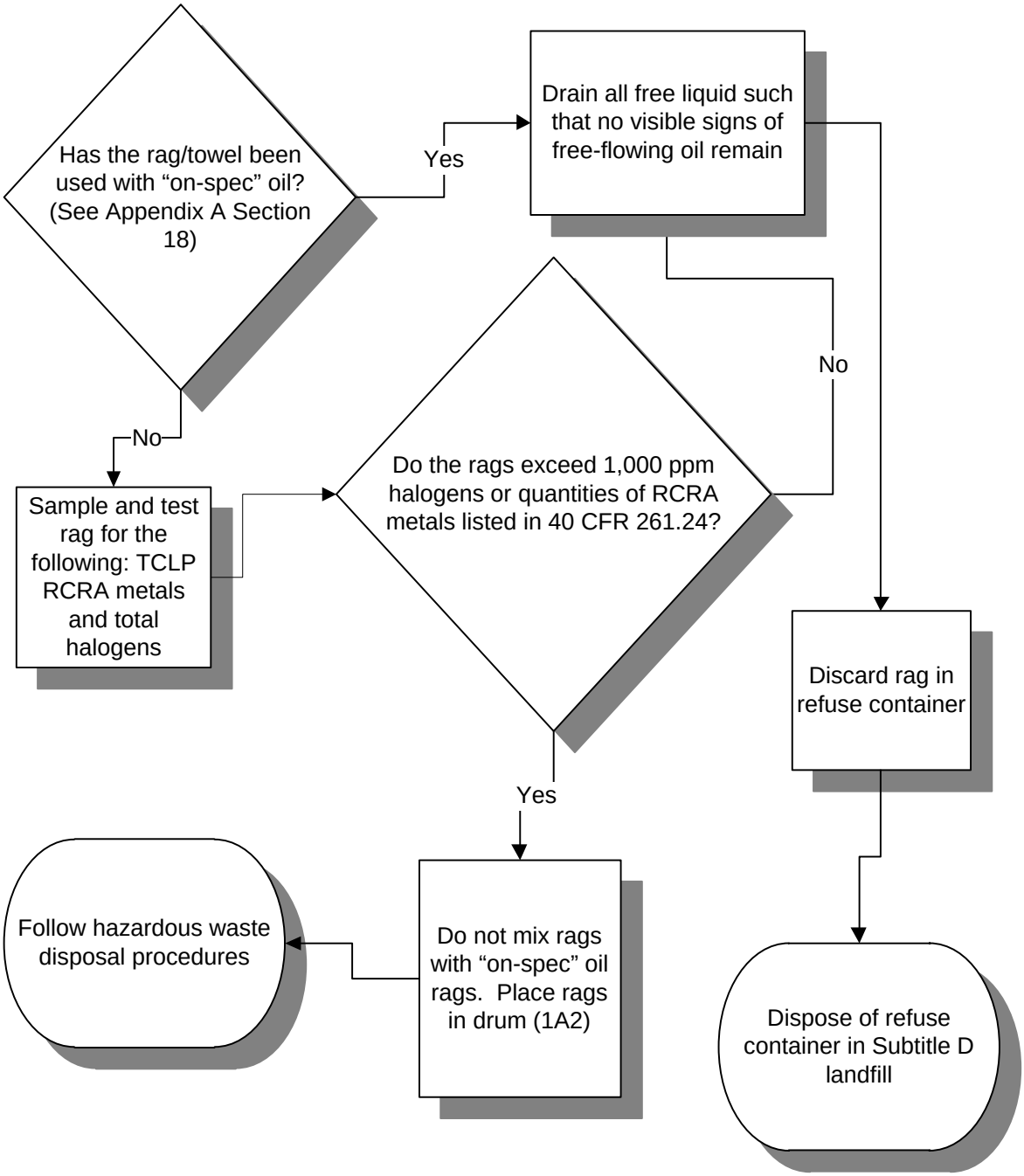

**SPENT MERCURY THERMOSTAT HANDLING PROCEDURES FOR OPERATORS**



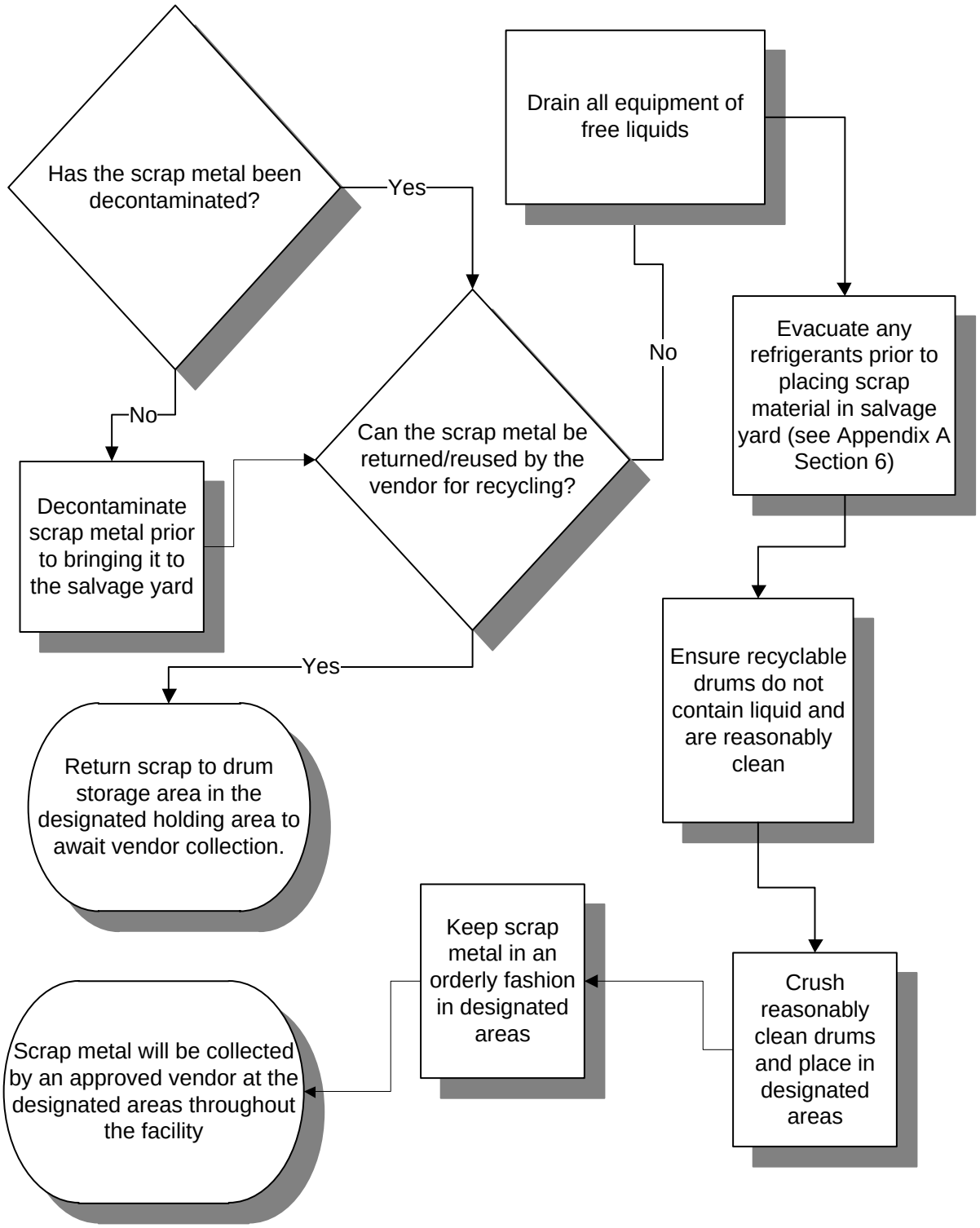

**USED PAINT (LATEX/NON-HAZARDOUS) HANDLING PROCEDURES FOR OPERATORS**




**WASTE PAINT MATERIALS HANDLING PROCEDURES FOR OPERATORS**




**SHOP RAGS HANDLING PROCEDURES FOR OPERATORS**




**SCRAP METAL HANDLING PROCEDURES FOR OPERATORS**

# 1 Introduction

## 1.1 *Purpose and Use of the Document*

The purpose of this document is to provide personnel in all areas of the Resolution Copper Mining LLC (RCM) operation access to procedures for the proper handling and disposal of hazardous materials and hazardous waste so as to protect the environment and to comply with laws and regulations.

### 1.1.1 Disclaimer

1. The procedures in this handbook are provided to aid in the proper handling and disposal of materials in order to prevent releases to the environment and in compliance with environmental regulations and the Rio Tinto Health Safety and Environment (HSE) Performance Standards. Although procedures may recommend the use of personal protective equipment, this document does not address the procedures needed for protecting the health and safety of workers.
2. Workers should consult with their supervisor and the Safety Department regarding any concerns related to personal safety and job training.
3. Some procedures described in this document may require specialized training of personnel prior to commencing work activities.
4. Adherence to the procedures in this document does not guarantee full compliance with all hazardous waste statutes and rules. Resource Conservation and Recovery Act (RCRA) is a complex law with correspondingly complex regulations that have been the subject of ongoing clarification in the courts. How the rules are implemented is under constant adjustment and interpretation.
5. When a question arises regarding a handling of disposal procedure, the appropriate statutes and rules should be consulted as the authority. The rule citations provided in this document may not include all of the pertinent rules, regulations, laws or sections of same that would apply to the subject topic.
6. This document does not purport to have identified every waste stream for the proposed RCM operation. The absence of a waste stream from this document does not mean that there are no corresponding procedures that should be followed or regulations that would apply. Additional identified waste streams may be added to the document throughout operations if identified.

# 2 Hazardous Material Management

Rio Tinto has developed a HSE performance standard for hazardous materials and contamination control (HSE Environment Standard E5). The purpose of the standard is to prevent spillage and environmental contamination as a result of the handling, storage and processing of materials. The following sections outline how RCM complies with Rio Tinto Corporate HSE Environment Standard E5 and hazardous materials management is regulated and managed under RCRA. Compliance is also demonstrated via the operational procedure flow charts.

## 2.1 *Planning*

HSE Environment Standard E5 requires that each facility identify potential contamination risks at each site so that appropriate transport, storage, use, transfer and disposal can be implemented. This includes identifying hazardous materials at the site (i.e., virgin materials such as fuel or acid) as well as contamination areas that have not been remediated.

An inventory of oil products to be managed at the facility can be found in the facility's Spill Prevention, Control and Countermeasure (SPCC) Plan. Other hazardous materials to be managed at the site are identified in the facility's storm water pollution prevention plan (SWPPP). A Contaminated Sites / Hazardous Materials Sites Register is also maintained on site through the Environmental Department.

## 2.2 *Storage and Handling*

Hazardous materials at RCM are to be stored in aboveground containers constructed to be compatible with the material being stored. The materials will be stored in a manner that will prevent contact by unauthorized personnel, birds and other animals, and will not pose a risk for discharge to streams, drainages, or the environment.

## 2.3 *Secondary Containment*

Hazardous materials containers (including flow through process tanks) will be placed in areas with adequate secondary containment that meet the following criteria:

- Containment drainage valves remain closed and locked except for draining rainwater. Signage must be provided that indicates proper valve position and requirement for locks.
- Containment systems must be free from product spillage. Rainwater or snow must be removed to maintain adequate capacity.
- Measures must be in place to prevent a release from secondary containment from reaching sewer systems, bodies of water or soil.
- Must be able to contain 110% of the volume of the container.

RCM's East Plant and West Plant SPCC Plans and site specific SWPPPs for current activities outline the secondary containment and control measures implemented at the hazardous materials storage areas. SPPC and SWPPPs for the proposed mine plan are contained as appendices to the general plan of operations.

## 2.4 *Inspections*

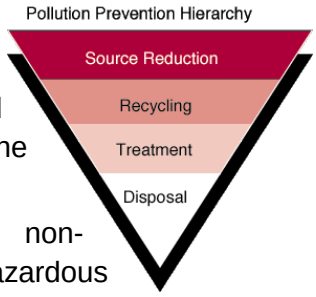
Hazardous materials storage areas are inspected on a routine basis to monitor for leaks and the structural integrity of the storage containers. The inspection procedures are outlined in RCM's SPCC Plans and site specific SWPPPs for the current activities and proposed operation.

## 2.5 *Leak Detection*

Leak detection equipment and/or routine inspections are utilized to determine if a hazardous material leaks from its container. The leak detection equipment, inspection procedures, and or emergency response procedures are outlined in RCM's SPCC Plans and site specific SWPPPs for the current activities and proposed operation.

# 3 Pollution Prevention and Waste Minimization

## 3.1 *Pollution Prevention Hierarchy*




Pollution Prevention activities may include any of the following, (order of preference, if applicable):

1. **Source reduction / Conservation** (e.g. print double-sided documents, using email, purchase products only in the volumes needed, etc.).
2. **Substitution** (e.g. replacing chlorinated products with non-chlorinated products, replacing products containing other hazardous constituents with non-hazardous products).
3. **Recycling** of wastes or secondary materials – send off-site (e.g. diesel, gasoline, used oil, scrap metal, batteries, toner cartridges, etc.).
4. **Reuse** – onsite reuse (e.g. diesel, gasoline, process water, etc.).
5. **Reclamation** (e.g. lead from vehicle batteries).
6. **Volume reduction** (e.g. transferring contents of several small containers of the same substance into one container for disposal).

## 3.2 *Arizona Pollution Prevention Regulation*

The Arizona Revised Statues (A.R.S.) require the development and implementation of a pollution prevention plan for facilities that exceed thresholds related to hazardous waste generation or shipment, and/or toxic substance use. These thresholds are based on the amount of hazardous waste generated, hazardous waste shipped, and/or toxic substances used at a facility. Toxic substances are defined by the toxic chemicals on the EPA's Toxic Chemical Release Inventory (TRI) list. The threshold values established include the following:

- 12,000 kg of hazardous wastes shipped off-site annually
- 1 kg of acutely hazardous wastes shipped off-site annually
- 1 kg (average) of acutely hazardous wastes or 1,000 kg (average) of hazardous waste generated monthly
- 25,000 pounds of a toxic substance manufactured/processed annually
- 10,000 pounds of a toxic substance used annually

Additionally, if a facility meets all three of the following conditions, it is also subject to the Arizona state pollution prevention regulatory requirements:

- The facility filed an EPA TRI form.
- The total number of hours worked by all employees in a calendar year is 20,000 hours or more.
- The facility falls under one of the following SIC codes: 2000-3900, 1021, 1031, 1041, 1044, 1061, 1099, 1221, 1231, 4911, 4931, 4939, 4953, 5169, 5171, and 7389.

## 3.3 *Pollution Prevention Targets*

RCM meets the requirements for the preparation and implementation of a pollution prevention plan, has an active plan with ADEQ, and reports on an annual basis. This plan will be updated through operations as facilities and environmental protections and mitigations change. The following sections outline pollution prevention targets established for the facility.

### 3.3.1 Purchasing of Products

Prior to bringing any product on site, the product must first be approved through the MaxCom system. To initiate the approval process, a product Request/Approval form must be submitted along with an SDS that is less than five years old. Considerations for product purchase include the following:

1. Amounts: For standard materials, limit inventories and individual stockpiling.

   For special projects, purchase only the amount needed for a particular project. Require contractors to remove all of their material from the site when a job is complete.

2. Type: Ensure use of only approved chemical products.

   Refer to **Appendix A, Section 8 Cleaning and Solvent Products** for product evaluation procedures.

### 3.3.2 Proper Chemical Use and Storage

1. Close chemical product containers tightly between uses.
2. Ensure containers are correctly labeled.
3. Ensure that incompatible products are segregated from each other.
4. Implement inventory control:
   a. Use the entire volume of the product.
   b. Open as few containers of the same product as needed.
   c. Rotate stock by placing the new purchase to the back of the inventory. Use the oldest container first to reduce the need for disposal.
   d. If one department cannot use the entire amount of the product, call or contact other departments that may be able to use the remainder of the product.

### 3.3.3 Management Practices

1. Employees must contact the Environmental Department if a container has residual product that is no longer useable for waste disposal. Containers must be properly marked stored in the Central Accumulation Area for collection until disposal arrangements are made.
2. Employees must contact the Safety Department (refer to existing information on MAXCOM or the product manufacturer for obtaining the proper Safety Data Sheet [SDS]), if their department does not possess the SDS.

3. Employees must provide a SDS to the Environmental Department to assist in determining any regulatory requirements prior to disposal.

## 3.4 *Performance Monitoring*

Performance monitoring is tracked through our Yearly Goals Update that is submitted to ADEQ on an annual basis.

# 4 Waste Management

## 4.1 *Overview*

There are two main types of wastes generated at RCM: mineral wastes and non-mineral wastes. The following sections outline how waste materials generated at RCM should be managed.

## 4.2 *Mineral Waste Identification*

Mineral Wastes include the following:

That portion of the mined geological deposit that is not conveyed or transported from the operation as product and is not generated by processing activities:

- Includes development rock and overburden brought to the surface from underground development or mining activities.
- Typically by-products / outputs which do not meet grade requirements due to size, texture etc.

That portion of the mined geological deposit that is not transported from the operation as product and is generated by processing activities such as:

Tailings from mineral processing

Mineral Wastes are divided into two categories: reactive and non-reactive.

Reactive mineral wastes are defined as mineral waste whose innate physical, chemical or biological properties could now or in the future create an environmental exposure hazard above and beyond risks posed by geotechnical issues, inert dust in air or inert total suspended solids in water.

If the mineral waste does not meet the above criteria it is considered a non-reactive mineral waste.

## 4.3 *Non-Mineral Waste Identification*

RCM will determine, based on applicable regulations and laws, if non-mineral wastes (solid wastes) generated by its operations and activities are hazardous or non-hazardous.

### 4.3.1 Identification of Hazardous Wastes

1. A solid waste is a hazardous waste if it is not excluded from hazardous waste regulation, and it:
    a. Is listed as a hazardous waste in subpart D of 40 Code of Federal Regulations (CFR) part 261;
    b. Is mixed with a waste listed in subpart D of 40 CFR part 261; or
    c. Exhibits a characteristic of hazardous waste as described in subpart C of 40 CFR part 261:

(1) ignitability
(2) corrosivity
(3) reactivity
(4) toxicity

2. Determine if a solid waste is hazardous waste by:
   a. Evaluating the exemptions
   b. Reviewing the listed hazardous wastes in subpart D of 40 CFR 261.
   c. Either testing the waste according to the methods set forth in subpart C of 40 CFR part 261 or applying knowledge of the hazard characteristic(s) of the waste in light of the materials and processes used.
   d. Initial and periodic sampling and analysis may be used as the basis for subsequent use of knowledge that the materials are not hazardous. Regulators and vendors may request the analysis for the hazardous/non-hazardous determination of materials being disposed.

#### 4.3.1.1 Assignment of Hazardous Waste Codes

1. Consider the regulations in the following order to assign the proper hazardous waste code to a waste (lists are in 40 CFR 261 Subparts C and D)
   a. U-list: Non-acutely Hazardous Commercial Chemical Products;
   b. P-list: Acutely Hazardous Commercial Chemical Products;
   c. K-list: Hazardous Waste from Specific Sources;
   d. F-list: Hazardous Waste from Non-specific Sources; and
   e. D-numbers: Characteristically Hazardous Waste.

> *An example of a U-listed waste is a container of pure, unused acetone (U002)*
>
> *If the acetone container has been used as a solvent, and contains the ignitable characteristic, the F003 (over 10%) code would apply.*
>
> *Wastes containing less than 10% acetone (with no other F-listed solvents) and possess a flash point of less than 140 degrees F would be a D001 (ignitability).*

2. No analytical testing is required to identify a waste as a listed waste (U, P, K, and F-lists). A listed waste is hazardous by definition, and a single waste stream should carry only a single listed waste number. The only time you would have a waste with more than one listed code is when you mix two or more different listed wastes.
3. If a waste is identified as a P or U-listed waste, do not consider the hazardous characteristics. The P and U listings account for any hazard that the chemical may present. This is also true for the K-listed wastes; however, assign a D code to a mixture of K-listed waste and characteristically hazardous waste.

4. P and U-listed wastes are commercially **pure, unused**, grades of the chemical. It does not refer to a material, such as a manufacturing process waste, that contains any of the substances listed in the P and U waste codes.
5. F-listed wasted should carry only one F code, unless the waste was mixed with more than one waste. Pay careful attention to the listing descriptions, especially the percentage limitations.
6. The characteristically hazardous waste numbers (D codes) are based upon analytical results. A waste can exhibit more than one characteristic.

### 4.3.2 Identification of Petroleum Contaminated Soils (PCS)

All spills, regardless of size, are required to be reported to the Environmental Department.

1. When a spill occurs, the Environmental Department will provide assistance in assessing the situation to determine how to manage the soil.
2. If it is determined that excavation is necessary, excavate soils contaminated with petroleum products with the necessary equipment, such as a shovel for small spills or a backhoe for larger spills.
3. Place the petroleum-contaminated soils (PCS) in an appropriate container for disposal (55-gallon drum for smaller spills, a roll-off bin for larger spills).
4. Mark the drum with the words that best describe the waste, such as “Diesel Contaminated Soil”, Gear Oil Contaminated Soil”, or “Gasoline Contaminated Soil), etc.
5. The Environmental Department will determine if the excavated soil meets the definition of PCS, solid waste PCS, or non-regulated soil by sampling and performing analysis in accordance with EPA SW-845.
6. Excavated soil contaminated with petroleum products in excess of any of the following concentrations listed in **Table 5-1** shall be designated as Petroleum Contaminated Soil (PCS).

**Table 5.1**

**Soil Remediation Levels (SRLs)**

| | Regulated Contaminant | Soil Remediation Standards | |
|---|---|---|---|
| | | Residential, Solid Waste (in ppm, mg/kg) | Non-Residential Special Waste (in ppm, mg/kg) |
| **BTEX** Commonly found in gasoline EPA Method 8031 | Benzene | 0.65 | 1.4 |
| | Toluene | 650 | 650 |
| | Ethylbenzene | 400 | 400 |
| | Total Xylenes | 270 | 420 |

| | Regulated Contaminant | Soil Remediation Standards | |
|---|---|---|---|
| | | Residential, Solid Waste (in ppm, mg/kg) | Non-Residential Special Waste (in ppm, mg/kg) |
| **PAHs**<br>Polynuclear aromatic hydrocarbons<br>Commonly found in diesel<br>EPA Method 8310 | Acenaphthene | 3,700 | 29,000 |
| | Anthracene | 22,000 | 240,000 |
| | Benz[a]anthracene | 0.69 | 21 |
| | Benzo[a]pyrene | 0.069 | 2.1 |
| | Benzo[b]fluoranthene | 0.69 | 21 |
| | Benzo[k]fluoranthene | 6.9 | 210 |
| | Chrysene | 68 | 2,000 |
| | Dibenz[a,h]anthracene | 0.069 | 2.1 |
| | Fluoranthene | 2,700 | 26,000 |
| | Indeno[1,2,3-cd]pyrene | 0.69 | 21 |
| | Naphthalene | 56 | 190 |
| | Pyrene | 2,300 | 29,000 |

7. Sample in accordance with the methodologies specified in A.A.C. R18-8-1604.b.
8. Analysis shall be for total recoverable concentrations of contaminants and shall be conducted by a laboratory licensed by the Arizona Department of Health Service (ADHS).

### 4.3.3 Identification of Universal Wastes

The Standards for Universal Waste Management and the Arizona Administrative Codes establish the requirements for managing the following wastes:

1. Used Batteries
2. Mercury Thermostats
3. Pesticides
4. Used Mercury Lamps

Universal Wastes are less stringently regulated than Hazardous Wastes, as long as the following protocols are followed:

1. The above listed wastes are intact and not broken.
2. The wastes are recycled and not disposed of.
3. The wastes are recycled within one (1) year of the start date of accumulation.
4. The containers are properly marked and stored until recycled.
5. Employees are properly trained on handling and emergency response procedures.
6. Releases are immediately contained.

### 4.3.4 Identification of Used Oil

Used oil has been defined by the federal regulatory programs as any oil that has been refined from crude oil, or any synthetic oil that has been used, handled, transported, or stored, and as a result of such use, handling, transportation, or storage, is contaminated by physical or chemical impurities, and is no longer suitable for its originally intended purpose. In addition to the federal definition of used oil, Arizona's legislator adopted additional provisions which include the following definitions:

- Used oil includes oil that has become contaminated as a result of its handling, transportation, or storage.
- Off-specification used oil means used oil which exceeds any of the allowable levels in 40 CFR 279.11.
- On-specification used oil means used oil that is not off-specification used oil.

In general used oil has the following characteristics:

- Used oil includes motor oils, metalworking fluids, emulsions, transmission fluids, brake fluids, coolants, heating media, refrigeration oils, electrical oils, buoyants, and hydraulic fluids.
- Used oil does not include antifreeze, cleaning agents, and animal and vegetable oils.
- Gasoline, jet, and diesel fuels are not used oil; however, if mixed with used oil, these fuels must be regulated as used oil.
- Used oil is presumed to be recyclable. If it is not recyclable, it is waste oil.
    - The U.S. EPA and Arizona considers burning of used oil for energy recovery a form of recycling.

# 5 Waste Management

## 5.1 *Mineral Waste Management*

Procedures for management of mineral waste at RCM are summarized in the appendix called "Overview of Acid Rock Drainage Operational and Post-Closure Water Management Strategies at Resolution Copper Mining for the Protection of Groundwater and Surface Water."

## 5.2 *Hazardous Waste Management*

Generators of hazardous waste must complete a hazardous waste determination based on process knowledge and/or sampling and analysis. Generators shipping waste for disposal off-site must obtain a RCRA Identification Number; must utilize transporters and transfer storage and disposal (TSD) facilities with RCRA Identification Numbers; and must comply with the Department of Transportation (DOT) requirements.

### 5.2.1 Labeling Requirements

Properly mark hazardous waste containers with the following:

1. Words to best describe the contents,
2. The words "Hazardous Waste", if applicable,
3. Mark the container with the start date of accumulation (for satellite accumulation areas mark the container with the date it became filled).
4. Appropriate DOT labels before transporting off-site for disposal,

### 5.2.2 Container Requirements

Appropriate containers should be used to accumulate wastes as well as to transport wastes. In most cases, containers in which new hazardous materials were shipped should be re-used to transport the same materials after they become wastes. However, for some wastes, purchase of containers may be necessary for compliance, if appropriate containers are not otherwise available. Use of containers must be approved by the Environmental Manager or designee prior to placing wastes in the proposed container.

#### 5.2.2.1 Instructions for all Containers

1. Ensure containers are in good condition.
2. Drums and containers available for shipment must be in good condition and comply with DOT regulations.
3. Containers must be compatible with the waste contents and securely closed.
4. Old markings and labels on containers must be removed or painted over to avoid confusion about the contents.
5. Ensure the lid (and bung if present) is closed and secure.

Drums/containers not approved for transport may contain any <u>one</u> of the following conditions:

1. Interior of the drum is badly rusted.

2. Badly bulged head or bottom.
3. Stripped bung threads.
4. Broken or missing flange.
5. Pipe flange or gate valve welded or rusted in bung.
6. Any hole in the drum.
7. Top or bottom chimes with sharp dents.
8. Any significant dents on drum, especially on the rolling hoops.
6. Container is not compatible with the waste that is stored in it.

## 5.2.3 Storage Requirements

### 5.2.3.1 Central Accumulation Area

There are two designated Central Accumulation Areas for current activities. The Central Accumulation Area for West Plant activities is located within Building #203. Then Central Accumulation Area for East Plant activities is located adjacent to the SRP substation. Refer to **Figures** for the Central Accumulation Areas site locations. The locations of these facilities may change during operations.




### 5.2.3.2 Instructions for Hazardous Waste Containers

1. Once a drum has been filled (55 gallons max for each waste stream) in a satellite accumulation area, transfer the drum to the “90-day” (LQG) Central Accumulation Area. See Figures 2 and 3, for location of the Central Accumulation Area.
2. Hazardous waste is disposed of within 90 days once moved from the satellite accumulation areas to the Central Accumulation Area for Large Quantity Generators (LQGs). If amounts of hazardous waste generated exceeds 1,000 kg (2,200 lbs.) in any calendar month, LQG requirements apply. RCM operates as a LQG.
3. Hazardous waste is disposed of within 180 days once moved from the satellite accumulation areas to the Central Accumulation Area for Small Quantity Generators (SQGs). If the amount of hazardous waste generated exceeds 100 kg (220 lbs.) but is less than 1,000 kg (2,200 lbs.) in any calendar month, SQG requirements apply.
4. Refer to the Arizona Department of Environmental Quality (ADEQ) Inspection Checklist for waste compliance issues.
5. Complete a weekly checklist of the Central Accumulation Areas (**Appendix B**) (40 CFR 65.174).
6. File the completed checklist and retain for three (3) years.

### 5.2.3.3 Inspection Procedures

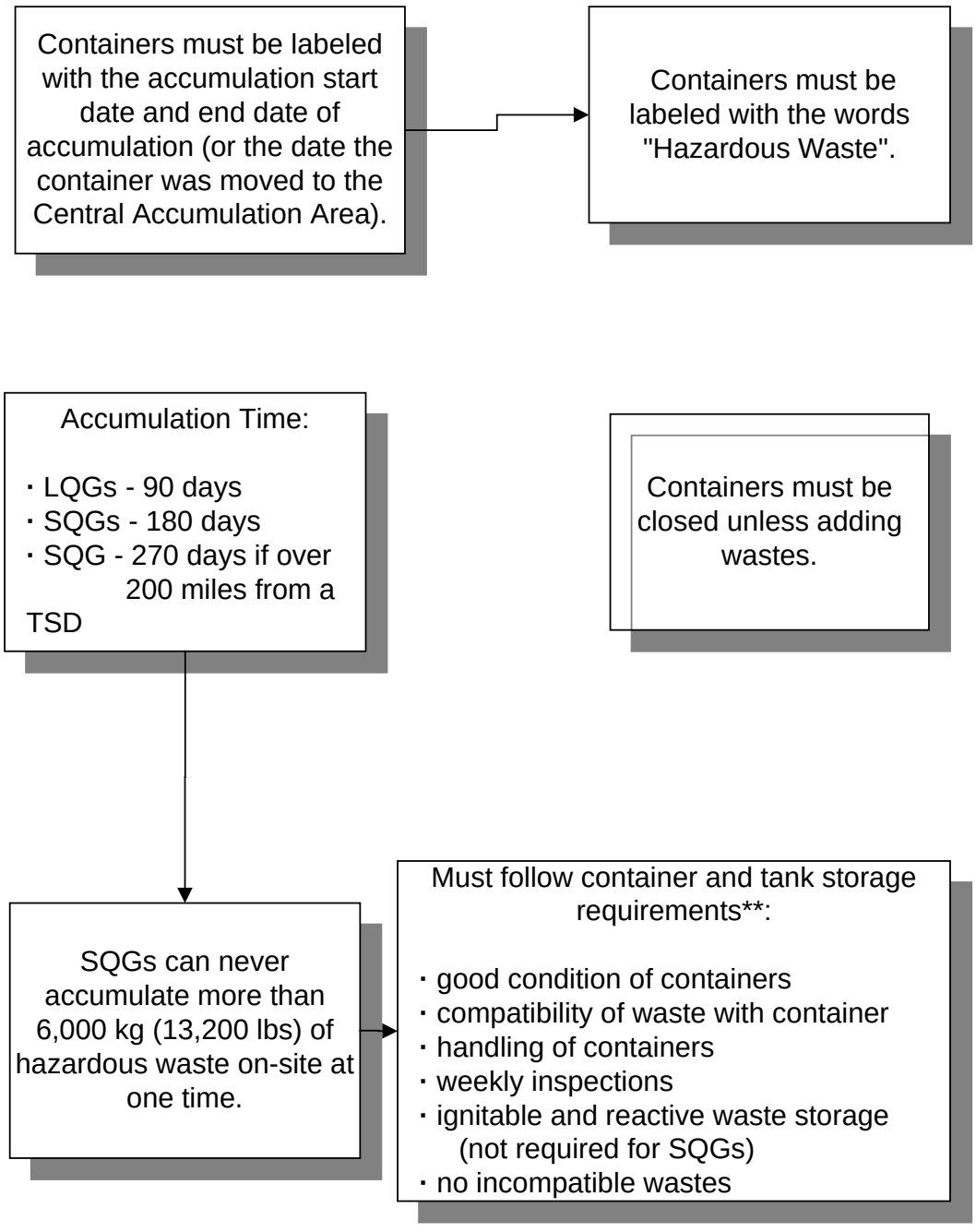
When performing inspections regarding hazardous waste, ensure the following:

1. The waste is packaged in accordance with DOT regulations (49 CFR 172.101; 40 CFR 262.30).

2. A container is made of, or lined with, a material that is compatible with the hazardous waste to be stored. This will prevent the waste from reacting with or corroding the container (40 CFR 265.172).
3. The containers are marked with hazardous waste labels, or equivalent, to identify the contents in accordance with DOT regulations (49 CFR 172.101; 49 CFR 172.301; 49 CFR 172.400, 40 CFR 262.34(a)(3)).
4. The containers are in good shape, and if not, the contents are transferred to a container in good condition (40 CFR 265.171).
5. The containers are closed (40 CFR 265.173(a)).
6. The waste storage areas are inspected weekly (refer to **Appendix B Forms**) and the inspection records are maintained on-site (40 CFR 265.174; A.A.C. R18-8-262.L) for a period of three (3) years. The inspection log must include the following information: inspection date, inspector's name and signature, and remarks or corrections. The completed inspection logs are filed in the Environmental Department.

## Central Accumulation Area Flowchart

The following flowchart displays general requirements for the Central Accumulation Areas.




* 40 CFR 262.34
** 40 CFR 265 Subparts I and J

#### 5.2.3.4 Satellite Accumulation Areas

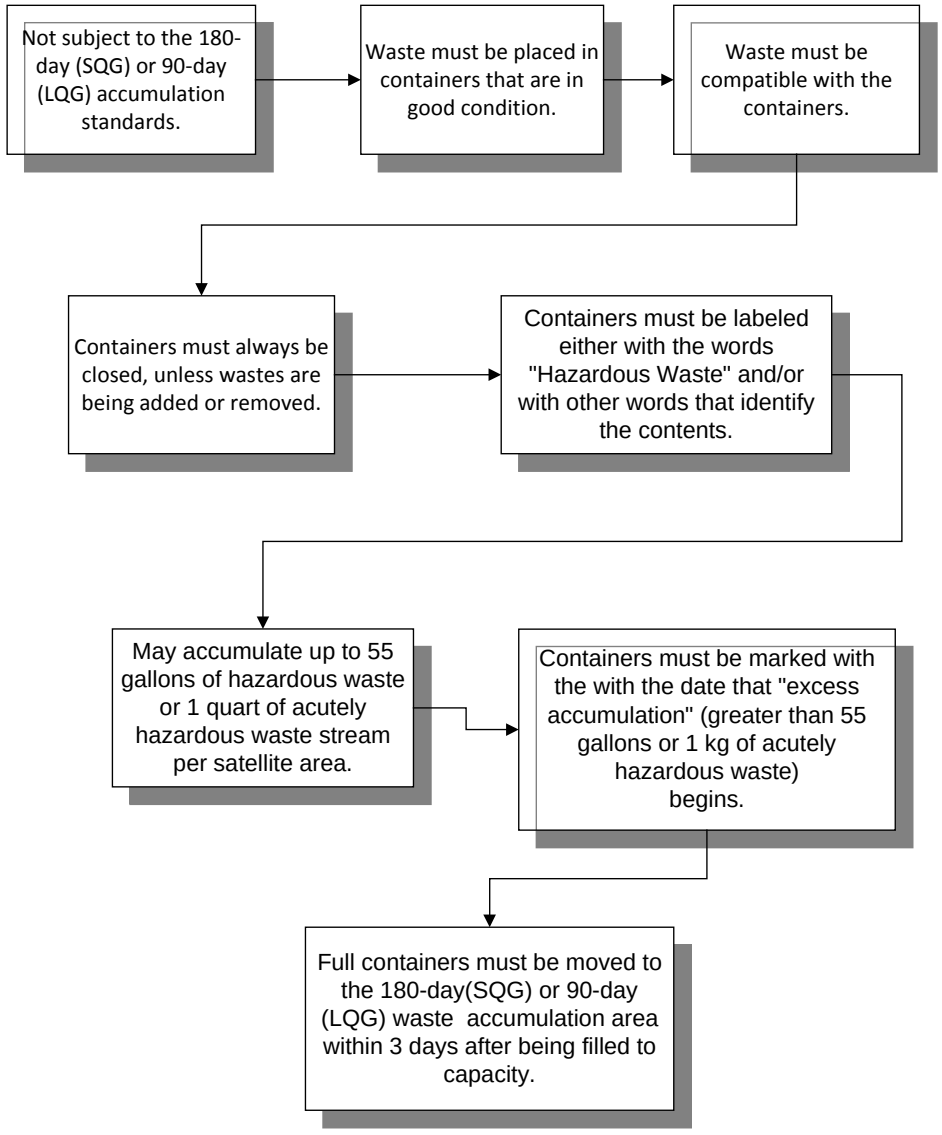
At present, RCM has three (4) established satellite accumulation areas. One of the satellite accumulation areas is located in the E&M shop at the East Plant Site, one (1) satellite accumulation area is located at the Core Processing Facility and the last satellite accumulation area is located within Building 203. Refer to ADEQ's Inspection Checklist for an example of an inspection guidance checklist for hazardous waste compliance. During operations, additional satellite accumulation areas will be in place in per and managed the requirements listed below. **Instructions for Satellite Accumulation Area**



1. Ensure that no more than 55 gallons of any one hazardous waste stream or one quart of acutely hazardous waste is accumulated in this area (40 CFR 262.34(c)(1)).
2. Ensure that the Satellite Accumulation Areas are at or near the point of generation where the waste initially accumulates (40 CFR 262.4(c)(1)).
3. Ensure that the Satellite Accumulation Area is under the control of the operator of the process which generates the waste (40 CFR 262.34(c)(1)).
4. Transfer full drums to the 90-day Central Accumulation Area (refer to **Figures**) **within 72 hours** of becoming full.
5. The containers are marked with a hazardous waste label, or equivalent to identify the contents.
6. The containers are in good shape, and if not, transfer the contents to a container in good condition.
7. The containers are closed unless adding or removing contents.

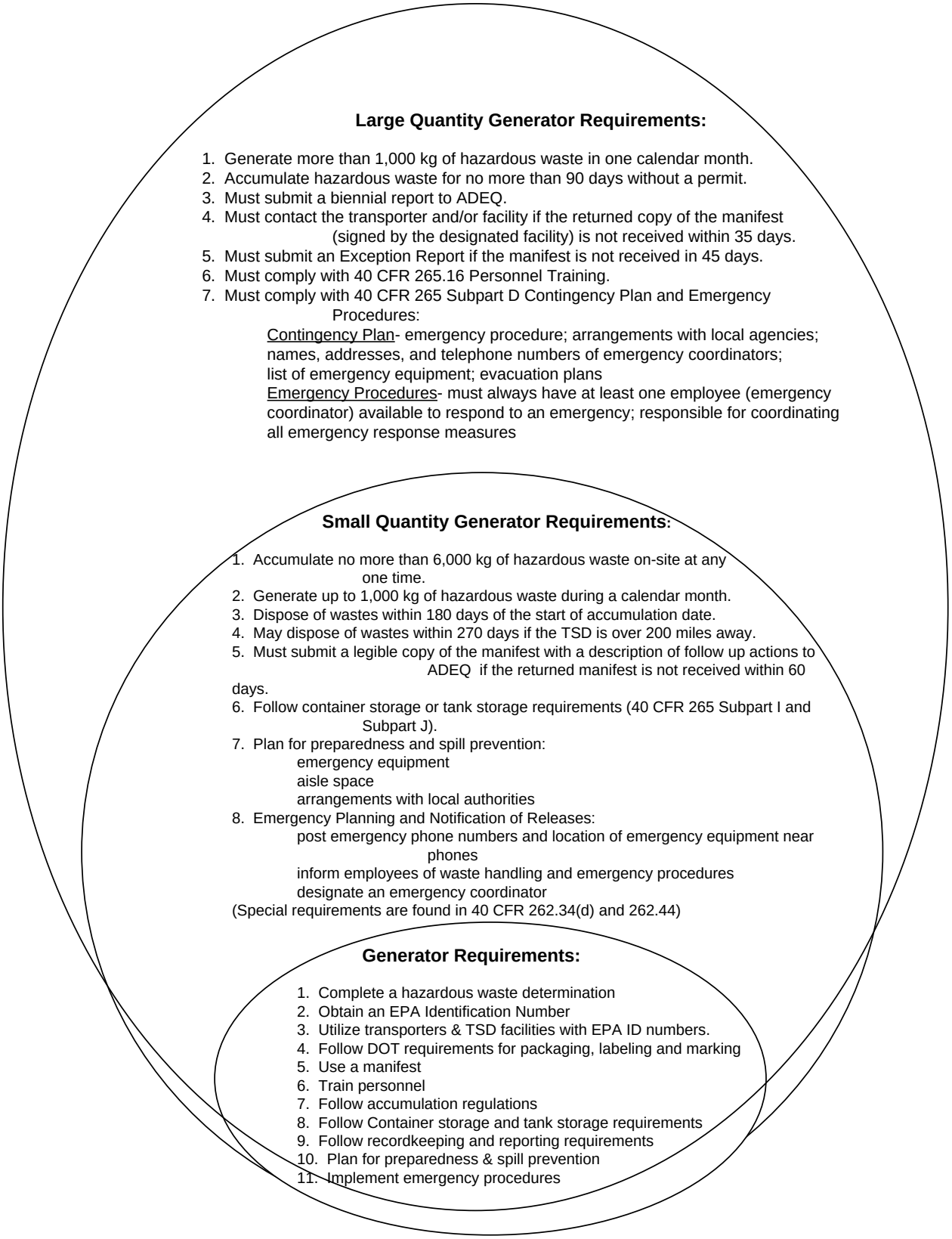
### 5.2.4 Satellite Accumulation Requirements Flowchart

The following flowchart displays regulatory requirements for satellite accumulation areas.




**SATELLITE ACCUMULATION REQUIREMENTS****

**40 CFR 262.34(c)




**GENERATOR REQUIREMENTS**

## 5.3 *Universal Waste Management*

### 5.3.1 Requirements for a Small Quantity Handler of Universal Waste (SQHUW)

1. Small Quantity Handlers of Universal Wastes (SQHUW) may accumulate 5,000 kg (11,000 lbs.) of universal waste (all universal waste categories combined) for up to one (1) year.
2. SQHUW are not subject to notification and tracking requirements.
3. Employees that handle or manage universal wastes must be trained on the proper handling and emergency procedures appropriate to the type(s) of universal waste handled at the facility.

### 5.3.2 Requirements for a Large Quantity Handler of Universal Waste (LQHUW)

1. Large Quantity Handlers of Universal Wastes (LQHUW) are classified as facilities that accumulate over 5,000 kg (11,000 lbs.) of all types of universal wastes and are subject to notification and tracking requirements.
2. Provide notification of the LQHUW status on the EPA Form 8700-12 and submit the completed form to the ADEQ.
3. Provide the tracking requirement by calculating and logging the number of pounds of all types of universal wastes stored in the calendar year.
4. Provide training to inform employees that handle or manage universal wastes of the proper handling and emergency procedures appropriate to the type(s) of universal waste handled at the facility (40 CFR 273.36).

### 5.3.3 Universal Waste Recycling Procedures

1. Recycle all Universal Wastes each year to comply with the Universal Waste Regulations accumulation timeframe of one (1) year (40 CFR 273.15(a)).
2. Collect mercury lamp containers at the Universal Waste Storage Area and log the number of lamps onto the inspection sheet for recycling recordkeeping (refer to **Appendix B, Form #1-A**) Refer to **Figures** for the Universal Waste Storage Area location.
3. Contact the recycling vendor for used mercury lamps and mercury containing devices.
4. Collect battery drums at the Universal Waste Storage Area. Weigh the drums to estimate the cost for recycling and determine universal waste handler status.
5. Contact battery recycling vendors for services.

## 5.4 *Special Waste Management*

### 5.4.1 Procedures for Special Waste Application, Identification Number and Manifest

1. Apply for an Arizona Special Waste Identification Number for generators as described by A.A.C. R18-8-302-A. Appendix A. ADEQ will issue the identification number to the generator within 30 days.
2. RCM's Special Waste Identification Number is 302437.
3. Prior to off-site consignment of special waste, RCRA/DOT certified RCM personnel will perform the following actions:
   a. Complete and sign the "Generator" section of a special waste manifest.
   b. Obtain the handwritten signature of the special waste shipper on the special waste manifest.
   c. Retain the generator's copy of the special waste manifest.
   d. Give the special waste manifest and the remaining attached copies to the special waste shipper, or forward it to the receiving facility.
4. A federal manifest, shipping paper or shipping record may be used in lieu of the Arizona special waste manifest form given the documents include all the required information. Within fourteen (14) days after shipment is accepted by a special waste shipper, submit one (1) legible copy of each manifest to ADEQ.
5. If RCM does not receive a completed returned manifest copy from the receiving facility, contact the shipper and receiving facility operator to determine the status of the special waste.
6. Submit an exception report within 45 days of the date the waste was accepted by the initial special waste shipper.
7. Retain a legible copy of each signed special waste manifest for at least three (3) years from the date of acceptance of a shipment of special waste for off-site consignment.
8. Analyze for the following parameters for PCS if disposing in a Subtitle D landfill:
   a. Diesel fuel, unused motor oil, transformer fluids, etc. (excluding used oils).
      (1) PAHs – EPA SW-846 Method 8310.
      (2) Benzene, Toluene, Ethyl Benzene and Total Xylenes – EPA SW 846 Method 8020, Aromatic Volatile Organic Compounds.
      (3) PCBs – EPA SW-846 Method 8080 (may use generator knowledge to eliminate this analysis).
   b. Unknown sources of petroleum contamination, used oil, etc.
      (1) PAHs – EPA SW-846 Method 8310.
      (2) RCRA TCLP Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver) – EPA SW-846 Method 8240/8270.
      (3) RCRA TCLP Volatiles and Semi Volatiles – EPA SW-846 Method 8240/8270.

(4) Total Benzene, Toluene, Ethyl Benzene and Total Xylenes – EPA SW-846 Method 8021.

(5) PCPs – SW-846 Method 8080 (may use generator knowledge to eliminate this analysis).

c. Gasoline (unleaded), jet fuel and kerosene.

(1) PAHs – EPA SW-846 Method 8310.

(2) Benzene, Toluene, Ethyl Benzene and Total Xylenes – EPA SW-846 Method 8021.

(3) Paint filter test EPA SW-846 Method 9095.

9. Submit a “Declaration of Environmental Use Restriction” (DEUR) when remediation is performed to a level less protective than residential standards that has been completed and RCM agrees to restrict the property to non-residential use. A DEUR is a written document, signed by the real property owner and the Arizona Department of Environmental Quality (ADEQ), and recorded with the county recorder on the chain of title for a particular parcel of real property.
10. Prepare and submit annual waste report (including special waste) to the ADEQ by March 1 of each year.

# 6 Disposal Coordination

## 6.1 *Hazardous and Non-Hazardous Waste Disposal Procedures*

1. Select and contact the disposal vendor for the appropriate waste streams.
2. Establish a waste profile for each hazardous and non-hazardous waste stream with the selected disposal vendor. (Refer to **Appendix A, Section 15** for general acceptance criteria for non-hazardous wastes from a Subtitle D landfill facility.)
   a. Sample and obtain a baseline analysis for each waste stream or, if possible, use information obtained from the Safety Data Sheet (SDS).
   b. The vendor will assist in the completion of the profile by obtaining information from SDSs, analysis results, generator knowledge, etc.
   c. Review the profile for accuracy.
   d. Retain a copy of the profile for documentation with the copy of the hazardous waste manifest.
   e. Waste recycling/disposal companies require re-certification of waste profiles each year, but may accept “generator knowledge” of certain waste streams if processes, procedures, and products do not change.
3. Retain a copy of the profile.
4. Schedule a time and date for the collection, transportation, and disposal of the hazardous and non-hazardous wastes in agreement with the vendor. Provide information, such as the quantity of waste, the number of containers, the sizes of the containers, the exact collection site, the point of contact, and any other relevant information to the vendor to avoid delays.
5. Dispose of the wastes within 90 days of the start date of accumulation for Large Quantity Generators (LQGs) or 180 days of the start date of accumulation for Small Quantity Generators (SQGs).

   *Note: For containers that are located in satellite accumulation areas, the start date of accumulation is the date that a waste is moved from a satellite accumulation area to the central accumulation area. This typically happens when a waste stream has reached the 55 gallon maximum (or 1kg of acutely hazardous waste) in a satellite accumulation area.*
6. The vendor will provide the necessary shipping documents, such as the hazardous waste manifest and the land disposal restrictions forms.
7. Complete the hazardous waste manifest (EPA Form 8700-22) in accordance with 40 CFR 262.23:
   a. Instructions to complete the hazardous waste manifest are contained in 40 CFR 262, Appendix to Part 262.
   b. RCM information to be inserted on the manifest including the Generator U.S. RCRA ID No., Generator Name, Mailing Address, and Phone number as follows:

Line Item 1 AZD001886654

Line Item 3 Resolution Copper Mining – Superior Operations
PO Box 1944
Superior, AZ 85173

Line Item 4 (520) 689-3254

c. RCM personnel authorized to sign the manifests must be trained in 49 CFR Transportation of Hazardous Materials.

8. Complete the Land Disposal Restriction (LDR) form in accordance with 40 CFR 268 and retain for five (5) years.

## 6.2 *Transportation of Hazardous Materials*

### 6.2.1 Introduction

The Arizona Department of Transportation (ADOT) administers the Hazardous Materials Transportation Act (HMTA). The regulations for the transportation of hazardous materials are located in 49 CFR.

### 6.2.2 Determination of a Hazardous Substance

A hazardous substance is a material, including its mixtures and solutions that:

1. Is listed in **Appendix A** to 49 CFR 172.101;
2. Is in a quantity, in one package, which equals or exceeds the reportable quantity (RQ) listed in **Appendix A** to 49 CFR 172.101; and
3. Is in a mixture or solution at a concentration by weight of the contaminate which equals or exceeds the concentration corresponding to the RQ of the contaminated material (will require total metals analysis to determine metals concentration in the waste material).

| Substance | Reportable Quantity of Impacted Material (RQ) (pounds) | Concentration by Weight of Contaminant (percent) |
|---|---|---|
| Ag | 1,000 | 2 |
| As | 1 | 0.002 |
| Be | 10 | 0.02 |
| Cd | 10 | 0.02 |
| Cr | 5,000 | 10 |
| Cu | 5,000 | 10 |
| Hg | 1 | 0.002 |
| $H_2SO_4$ | 1,000 | 2 |
| Ni | 100 | 0.0 |
| Pb | 10 | 0.02 |
| Sb | 5,000 | 10 |
| Se | 100 | 0.0 |
| Ti | 1,000 | 2 |
| Az | 1,000 | 2 |

For example, a mixture containing a listed substance whose RQ is 5,000 lbs. is regulated in transportation only when the concentration of the listed substance is 10 percent or greater **and** at least 5,000 lbs. of the listed substance is present in one package.

### 6.2.3 Transportation

RCM contracts with various Department of Transportation (DOT) approved firms to transport various materials and waste; confirm approved vendors through SAP.

### 6.2.4 Shipping Papers

1. All shipping papers must be signed by authorized, DOT trained Resolution Copper Mining employees or contractors.
2. Copies of all shipping papers will be forwarded to the Environmental Department for documentation and recordkeeping for at least three (3) years.
3. The Environmental Department will retain documents for a minimum of three (3) years.

### 6.2.5 Procedures for Hazardous Waste Manifests

1. All hazardous waste manifests must be reviewed for accuracy and signed by authorized, RCM personnel certified in 49 CFR Transportation of Hazardous Materials.
2. Copies of all hazardous waste manifests must be forwarded to the Environmental Department for documentation and recordkeeping for at least three (3) years.
3. Hazardous waste manifests (EPA Form 8700-22) must be completed in accordance with 40 CFR 262.23.
4. If a manifest for a shipment of hazardous waste is improperly completed, ADEQ may return it and require the generator to properly complete and resubmit the manifest with a fee of twenty dollars ($20).
5. Instructions to complete the hazardous waste manifest are contained in the 40 CFR 262, Appendix to Part 262.
6. Information to be inserted on the manifest for the Generator – The U. S. RCRA ID No., Generator Name and Mailing Address, and Phone number for RCM is as follows:

   Line Item 1 AZD001886654

   Line Item 3 Resolution Copper Mining – Superior Operations
   PO Box 1944
   Superior, AZ 85173

   Line Item 4 (520) 689-3383
7. Generators must retain one copy of each signed manifest received from the designated facility which received the waste for three (3) years. This signed copy must be retained for at least three (3) years from the date the waste was accepted by the initial transporter.

8. Within 45 days following the end of a month when hazardous waste was shipped off-site under a manifest, the generator must send a copy of the returned manifest to the ADEQ. Send a copy of the manifest to the address below:

   Arizona Department of Environmental Quality
   Hazardous Waste, Facilities Assistance Unit (FAU)
   1110 West Washington
   Phoenix, AZ 85007

   Note: Manifests used to document shipments of special waste need to be submitted to ADEQ within 14 days
9. Upon discovering a significant discrepancy, the owner or operator (of the TSD facility) must attempt to reconcile the discrepancy with the waste generator or transporter (e.g., with telephone conversations).
10. Significant discrepancies are listed below:
    (1) For bulk waste, variations greater than 10 percent (10%) in weight, and
    (2) For batch waste, any variation in piece count, such as a discrepancy of one drum in a truckload.
11. Submit a letter describing the discrepancy and attempts to reconcile it and a copy of the manifest or shipping paper at issue to ADEQ. On the copy of the manifest, mark through the incorrect information, insert the correct information, and initial the change. Ensure the words “Corrected Copy” are noted on the manifest to provide clarification for the ADEQ submittal and the facility records.

#### 6.2.5.1 Authorized Personnel and Requirements to Sign Manifests

RCM or contractors authorized to sign manifests have been trained and certified in 49 CFR Transportation of Hazardous Materials.

### 6.2.6 Land Disposal Restrictions (LDR)

1. General LDR and waste information:
   a. For wastes subject to land disposal restriction, a land disposal notification must accompany the waste shipment to the treatment and disposal facility.
   b. The LDR treatment standards are given in the table in 40 CFR 268-40. This table lists waste code, waste description, regulated constituents, and treatment standards for wastewater and non-wastewater. The table includes several categories for certain waste codes. For instance, there are three categories of D001 waste.
   c. Types of Waste
      (1) *Listed Wastes*. The regulations set standards for specified constituents. There is no need to consult the universal treatment standards for listed wastes.
      (2) *Listed Wastes which also exhibit a hazardous characteristic*. If the listed waste treatment standard addressed the characteristic, then the listed

standard is sufficient. However, if the treatment standard for the listed waste code does not address the characteristic, both the listed and characteristic standards apply.

(3) *Characteristic Wastes*.

- ***D001***. The treatment standards for ignitable wastes are divided into three categories. High-TOC (Total Organic Carbon) D001 wastes that are treated in Clean Water Act (CWA) systems may be treated by deactivation (removing the ignitable characteristics). Dilution may be used to achieve deactivation. All other D001 wastes must be treated by combustion, recovery of organics or deactivation, (removing the ignitable characteristic). Dilution may be used to achieve deactivation. All other D001 wastes must be treated by combustion, recovery of organic, or deactivation - dilution is prohibited. In addition, these wastes must be treated for applicable underlying hazardous constituents.
- ***D002***. The D002 corrosive wastes are divided into two categories, corrosives managed in CWA or Class 1 Safe Drinking Water Acts (SDWA) systems, and all other D002 wastes. Corrosives managed in CWA wastewater treatment systems or in SDWA Class 1 injection wells may be diluted to meet the treatment standards. All other D002 wastes must be deactivated and treated for underlying hazardous constituents.
- ***D004-D011***. These wastes are characteristically hazardous for heavy metals. Most must be treated to remove the toxicity characteristic. High concentration mercury wastes must be treated by a specific method.

#### 6.2.6.1 Procedures for Land Disposal Restrictions (LDR)

1. Determine the waste code (i.e. D001, F006).
2. Assess the presence of underlying hazardous constituents (UHCs) (as required).
3. Determine the matrix (Wastewater/Non-wastewater).
4. Research and determine treatment standards in 40 CFR 268.40.
5. Determine if the waste meets LDR treatment standards.
6. Determine if UHCs meet treatment standards in CFR 268.48 (as required).
7. Prepare appropriate LDR Notification Form.
8. Ship the Waste with the manifest and LDR Form.
9. File copies of the manifest and LDR forms.
10. Maintain records for five (5) years.

### 6.2.7 DOT Eight Step Procedure for Preparation of Hazardous Materials Shipment

| Procedure | Reference (49 CFR) |
|---|---|
| 1. Determine proper shipping name, hazard, class/division, ID number and packaging group | 172.101(2), (3), (4), and (5) |
| 2. Is this material regulated by 49 CFR?<br>a. As a hazardous material?<br>b. As a hazardous substance?<br>c. Marine pollutant?<br>d. By highway mode?<br>e. As a poison inhalation hazard? | 172.101(1) and (2)<br><br>Appendix A to 172.101<br>Appendix B to 172.101<br>172.101, Column (1)<br>172.101, Column (7) |
| 3. Determine proper packaging<br>a. Determine if an exception is authorized for the particular hazardous materials.<br>b. If no exception is authorized, determine the specific packaging requirements.<br>c. Determine the maximum net quantity of the hazardous material that may be shipped in one package by passenger-carrying and/or cargo-only aircraft as appropriate.<br>d. Ensure that completed package meets general packaging requirements.<br>e. Determine special provisions. | <br>172.101(8A) and reference to sections indicated<br><br>172.101(8B) or (8C) and reference to section listed<br><br>172.101(9A) and (9B)<br><br>173.24, 173.24a, and 173.24b<br><br>172.101(7) |
| 4. Mark the package | Subpart D of Part 172 commencing at 172.300 |
| 5. Label the package:<br>a. With appropriate table label(s)unless excepted<br>b. With appropriate additions or multiple labeling requirements | <br>172.101(6)<br><br>172.402, 404, and 406 |
| 6. Prepare shipping papers with shipper's certification and signature | 172.200, 201, 202, 203, 204 |
| 7. Provide emergency response information | Subpart G of 172 commencing at 172.600 |
| 8. Provide place carding as appropriate | Subpart F of 172 commencing at Section 172.500 |

# 7 Recordkeeping and Reporting

## 7.1 *Introduction*

Generators of hazardous waste must obtain a RCRA identification number (formerly known as U.S. EPA ID) number that is site-specific before transporting wastes off-site for disposal. The Generator ID number must be included on all hazardous waste manifests and land disposal restriction forms.

### 7.1.1 Calculate Quantities

1. Calculate and insert the quantities of hazardous waste, non-hazardous wastes disposed of/recycled, and quantities of recycled universal wastes in each respective spreadsheet (**Appendix B, Form #1-A, #1-E, and #2**) and file.

## 7.2 *Hazardous Waste*

### 7.2.1 RCRA Identification Number for Superior Operations

1. RCM's waste generator identification number is AZD001886654.
2. Refer to **EPA Notification Form 8700-12** to update notification information.

### 7.2.2 Annual Registration of Hazardous Waste Generators

1. All hazardous waste generators must register annually with the Arizona Department of Environmental Quality (ADEQ).
2. The application for registration shall be accompanied by a registration fee based on the following:
   a. Small Quantity Generators (SQGs) – one hundred dollars ($100)
   b. Large Quantify Generators (LQGs) – three hundred dollars ($300)

### 7.2.3 Hazardous Waste Fees

1. Generators of hazardous waste that is shipped off-site are required to pay ten dollars ($10) for each ton of waste generated on a quarterly basis to ADEQ.
2. Generators who comply with the pollution prevention planning requirements (submit a written Pollution Prevention Plan) are required to pay five dollars ($5) for each ton of waste generated to ADEQ

### 7.2.4 Hazardous Waste Recordkeeping

1. The Environmental Department completes a weekly inspection sheet (**Appendix B, Forms #1-A and #1-E**) for the Central Accumulation Area and maintains the completed forms on-site for three (3) years.
2. When wastes are shipped off-site for disposal, retain the completed generator's copy of the hazardous waste manifest and a copy of the waste profile for documentation for at least three (3) years.

3. Within 45 days following the end of a month when hazardous waste was shipped off-site under a manifest send a copy of the returned manifest to the Arizona Department of Environmental Quality (ADEQ).

   Arizona Department of Environmental Quality
   Hazardous Waste, Facilities Assistance Unit (FAU)
   1110 West Washington
   Phoenix, AZ 85007

4. Retain one (1) copy of each signed manifest received from the designated facility which received the waste for three (3) years. This signed copy must be retained for at least three (3) years from the date the waste was accepted by the initial transporter.
5. Calculate and include the quantity of generated or accumulated regulated waste for determining generator and associated waste generation fees. Refer to **Section 7 Recordkeeping and Reporting and Acronyms, Definitions, and Regulations** – Conditionally Exempt Small Quantity Generator, Small Quantity Generator, Large Quantity Generator for guidance and tracking information.
6. If hazardous waste is shipped off-site for disposal, and RCM does not receive the returned copy of the manifest (with the disposal facility's signature – Line Item 20 on the manifest) within the allotted time frame (45 days for LQGs and 60 days for SQGs) of the date waste was accepted by the initial transporter, RCM shall do both of the following:
   a. Contact the transporter or the designated facility to determine the status of the hazardous waste.
   b. Submit an **exception report** that includes the following:
      (1) a legible copy of the manifest of which confirmation of delivery is in question.
      (2) a letter explaining the returned copy was never received. An exemption report for LQGs requires a cover letter signed by the generator explaining the efforts taken to locate the waste and results of those efforts.
7. File the returned manifest, profiles, and analysis and retain for three (3) years. Records of any test results, waste analyses, or other determinations made in accordance with 40 CFR 262.11 must be retained for at least three (3) years from the date that the waste was last sent to off-site treatment, storage, or disposal. The periods of retention are extended automatically during the course of any unresolved enforcement action regarding the regulated activity.
8. Retain land disposal restrictions for five (5) years.
9. Calculate and insert the quantities of hazardous waste and non-hazardous wastes disposed of/recycled in the respective spreadsheet (**Appendix B**) and file.

### 7.2.5 Waste Analysis Record Requirements

1. Records of any test results, waste analyses, or other determinations made in accordance with 262.11 must be retained for at least three (3) years from the date that the waste was last sent to off-site treatment, storage, or disposal.

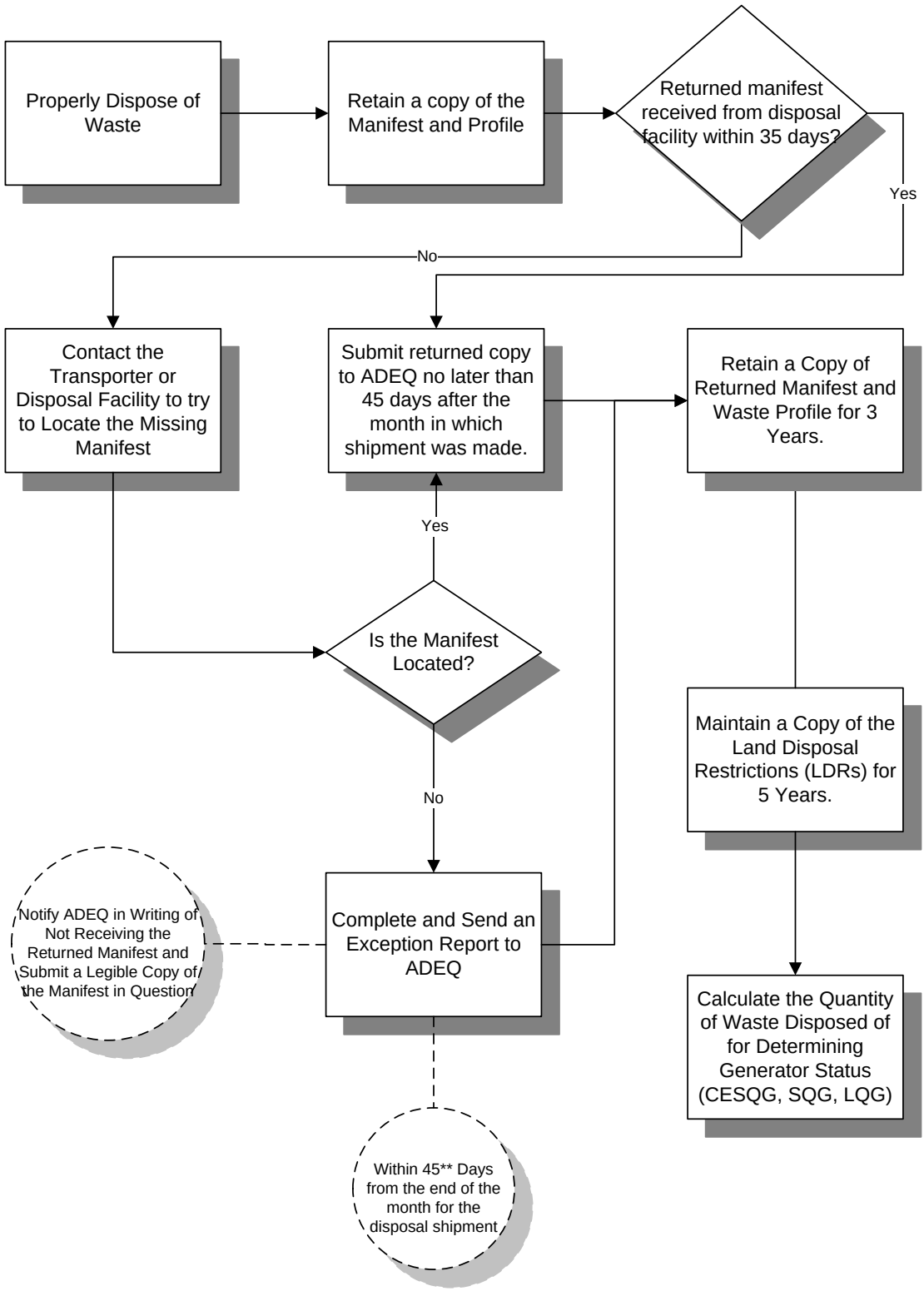
2. Refer to Environmental Files.
3. The periods of retention are extended automatically during the course of any unresolved enforcement action regarding the regulated activity (40 CFR 262.40(d)).

### 7.2.6 Hazardous Waste Reporting

1. Use only the hazardous waste quantities generated for determining the generator status of the facility:
   a. Large Quantity Generator (LQG) is a facility which generates over 1,000 kg (2,200 lbs.) of hazardous waste in one (1) calendar month.
   b. Small Quantity Generator (SQG) is a facility which generates over 1000 kg (220 lbs.) and up to 1,000 kg (2,200 lbs) of hazardous waste in one (1) calendar month and accumulated at any one time up to 6,000 kg (13,300 lbs.).
   c. Conditionally Exempt Small Quantity Generator (CESQG) is a facility which generates under 1000 kg (220 lbs.) in one (1) calendar month and accumulates at any time on-site up to 1,000 kg (2,200 lbs.) of hazardous waste.
2. Large Quantity Generators (LQGs) must submit, by March 1 each year, the Facility Annual Report (FAR) to ADEQ. This report shall describe generator activities during the previous calendar year and a description of the efforts undertaken to reduce the volume and toxicity of waste generated.
3. Refer to the requirements for each status of hazardous waste generators listed on the Generator Flowchart on the following page.

### 7.2.7 Exception Reporting

If hazardous waste is shipped off-site for disposal, and RCM does not receive the returned copy of the manifest (with the disposal facility's signature – Line Item 20 on the manifest) within 45 days following the end of the month of shipment, a legible copy of the manifest must be submitted to ADEQ with a note stating the returned manifest was never received.




**MANIFEST EXCEPTION REPORTING AND GENERAL RECORDKEEPING PROCEDURES**

** 45 days for LQGs
60 days for SQGs

## 7.3 *Universal Waste*

### 7.3.1 Universal Waste Recordkeeping

1. Calculate and insert the quantity of Universal Waste recycled. Include all quantities of mercury lamps, mercury thermostats, and spent batteries recycled.
2. File completed forms in the Environmental Department.
3. LQHUW are classified as facilities which accumulate over 5,000 kg (11,000 lbs.) of all types of universal wastes and are subject to notification and tracking requirements.
4. SQHUW may accumulate 5,000 kg (11,000 lbs.) of universal waste (all universal waste categories combined) up to one (1) year.
5. Do not count the universal waste quantities in the hazardous waste generated amounts for determining RCRA generator status.

### 7.3.2 Universal Waste Reporting

1. LQHUW must notify ADEQ of the LQH status and are subject to tracking requirements. Notification of the LQHUW status is submitted on the Hazardous Waste Generator Notification Form (8700-12) to the Arizona Department of Environmental Quality (ADEQ).
2. SQHUW may accumulate up to 5,000 kg (11,000 lbs.) of universal wastes and are not subject to notification and tracking requirements.

## 7.4 *Special Waste*

### 7.4.1 Special Waste Reporting

1. Prepare and submit the Special Waste annual report to ADEQ by March 1 of each year to include the following information for generators:
    a. The volume or weight of each type of special waste treated, stored, or disposed of **on-site** for the preceding year.
    b. The volume or weight of each type of special waste treated, stored, or disposed of **off-site** for the preceding year.
    c. For each type of special waste disposed, a description of the methods and practices used to minimize the amount of toxicity of the waste before disposal or reuse that constitutes disposal.
    d. The volume or weight of waste received pursuant to Section 49-863, subsection G.

### 7.4.2 PCB Annual Report

1. Refer to **Appendix A, Section 17 Oil-Filled Electrical Devices/PCB Ballasts/ Transformers**.

2. The Electrical Supervisor shall develop and maintain all annual records and the written annual document log of the disposition of PCBs and PCB Items.
3. The written annual document log must be prepared for each facility by July 1 covering the previous calendar year (January through December).
4. The annual document log shall be maintained for three (3) years after the facility ceased using or storing PBCs and PCB Items. Annual records (manifests and certificates of disposal) shall be maintained for the same period.
5. The written annual records shall include the following.
    a. All signed manifests generated by the facility during the calendar year.
    b. All Certificates of Disposal that have been received by the facility during the calendar year.
6. The written annual document log shall include the requirements listed in 40 CFR 761.180(a)(2)).

# 8 Preparedness and Prevention

1. Hazardous material and waste storage facilities must be equipped with the following:
   a. An internal communications or alarm system capable of providing immediate emergency instruction (voice of signal) to facility personnel;
   b. A device, such as a telephone (immediately available at the scene of operations) or a hand-held two-way radio capable of summoning emergency assistance from local police departments, fire departments, or State or local emergency response teams;
   c. Portable fire extinguishers, fire control equipment, spill control equipment, and decontamination equipment; and
   d. Water at adequate volume and pressure to supply water hose streams or foam producing equipment, automatic sprinklers or water spray systems.
2. All facility communications or alarm systems, fire protection equipment, spill control equipment, and decontamination equipment, where required, must be tested and maintained as necessary to assure its proper operation at the time of emergency.
3. All personnel involved in the areas where hazardous waste is being “poured, mixed, spread, or otherwise handled” must have immediate access to an internal alarm or emergency communication device. Use of the “Buddy System” (two person team) meets this requirement.
4. Hazardous material and waste storage facilities must maintain required aisle space to allow unobstructed movement of personnel, fire protection equipment, spill control equipment and decontamination equipment.
5. Hazardous material and waste storage facilities must arrange for emergency services with appropriate agencies (such as police, fire departments, emergency response teams, and local hospitals) to become familiar with the layout of the site, the materials handled, entrances to roads inside the facility, and evacuation routes. The facility should document into the operating record any incidence of State or local authorities declining to enter into such arrangements.

## 8.1 *Training*

### 8.1.1 Introduction

Personnel responsible for handling hazardous wastes must receive specialized training in hazardous waste management within six (6) months after the date of their employment or assignment to a facility and must take part in an annual review of the initial training. As a facility that utilizes hazardous materials and generates hazardous waste, RCM is required to provide training in accordance with OSHA HazWoper regulations, DOT HazMat regulations and RCRA regulations.

### 8.1.2 Content of Hazardous Materials and Waste Training

RCM is dedicated to provide on-going comprehensive training for required personnel. In addition, all personnel exposed to hazardous materials and wastes as a function of their work detail will take part in periodic spill prevention and response training programs. These programs will address, but are not limited to, the following:

1. Procedures for identifying, handling, packaging, labeling, accumulation, storing, and transporting hazardous wastes, and preparing manifests and other forms.
2. Procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment.
3. Procedures for personal protection in handling of hazardous wastes and in responding to spills, fires or explosions.
4. Health effects of exposure to oil and hazardous substances.
5. Spill classification according to Levels 1, 2, and 3 response and RQ allowances.
6. Applicable First Aid procedures to be used following exposure.
7. Personal Protective Equipment (PPE) requirements and procedures for using equipment.
8. Evacuation procedures.
9. Combustibility of materials and hazards associated with controlled releases, including flash back potential along vapor trails.
10. Applicable firefighting and fire-control procedures for dealing with special hazards associated with combustible materials.
11. Reactivity potential and hazards associated with mixed material spills, including water reactivity.
12. Use and maintenance of spill response and control procedures.
13. Initial response and notification procedures.
14. Location of posted site-specific spill response plans.
15. Immediate spill response actions and protocols, including:
    - The location and operation of pump controls and valves used to stop or control releases;
    - The location and use of fire extinguishers, considering the composition of materials released; and
    - The use of absorbents and neutralizing agents, given the composition of released materials.
16. Hazardous material storage protocols, standard good housekeeping practices, and safe handling measures, required for the prevention of substance releases.
17. Understanding of probable flow-path routes in the event of an uncontrolled release. Particular emphasis will be placed on off-base discharge potentials.

RCM has implemented programs that ensure that HazMat employees and local fire departments have familiarity with the general provisions of the hazardous material regulations, are able to recognize and identify hazardous materials on site, and have knowledge of specific requirements of the hazardous material regulations applicable to functions performed by the employee.

### 8.1.3 Site Specific Training

RCM provides a site-specific training program, designed to provide familiarity with identifying hazards and emergency response procedures RCM personnel, contractors and visitors as well as local fire department personnel per emergency services agreements. This training is conducted as a yearly refresher for personnel and contractors.

### 8.1.4 Task Training

Task training addresses requirements and methods to properly handle hazardous materials and hazardous wastes. This training includes measures to protect the individual from the hazards associated with the hazardous materials/wastes they utilize in the workplace. Methods and procedures for avoiding accidents are also presented.

### 8.1.5 First Responder Awareness Level

This training is for individuals who are likely to witness or discover a hazardous substance release and who have been trained to initiate an emergency response sequence by notifying the proper authorities of the release. The Awareness Level consists of recognizing the emergency situation, securing the scene, identifying the substance, and notifying appropriate personnel. Members of RCM environmental team require the initial 40 hour HazWoper and annual refresher training. The first responders shall have competency in the following areas:

1. Understanding what hazardous substances are and the risks associated with them in an incident.
2. Understanding the potential outcomes associated with an emergency where hazardous substances are present.
3. Ability to recognize the presence of hazardous substances in an emergency and to identify the hazardous substance, if possible.
4. Understanding the first responder's role in the emergency response plan including site security and control and the U.S. DOT Emergency Response Guidebook.
5. Ability to recognize the need for additional resources, and to make appropriate notifications to the communication center.

### 8.1.6 First Responder/Operations Level

First Responder personnel are individuals who initially respond to releases, or potential releases, of hazardous substances for the purpose of protecting nearby persons, property, or the environment from the effects of the release. They are trained to respond in a **defensive** fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading, and prevent exposures. The Operations Level personnel

recognize the emergency, secure the scene, identify the hazardous substance, notify appropriate personnel and contain the release (using absorbents, pads, berms, etc.) from a safe distance. RCM provides an annual 8-hour HazWoper First Responder Operations Level course.

Operational Level personnel shall possess the following information:

1. Knowledge of basic hazard and risk assessment techniques.
2. Knowledge of how to select and use proper personal protective equipment (PPE) provided to the first responder and operational level personnel.
3. Understanding of basic hazardous materials terms.
4. Knowledge of how to perform basic control, containment and/or confinement operations within the capabilities of the resources and PPE available within their unit.
5. Knowledge of how to implement basic decontamination procedures.
6. Understanding of the relevant standard operating procedures and termination procedures.

### 8.1.7 Mine Safety and Health Administration (MSHA)

RCM is considered an underground mining facility and is regulated under the Mine Safety and Health Administration (MSHA). All RCM personnel and contractors as well as emergency responders from local fire departments performing work onsite are required to obtain the initial MSHA training. Those individuals who have already obtained initial MSHA training must complete an 8-hour refresher annually to keep their MSHA certifications current.

### 8.1.8 Occupational Safety and Health Administration (OSHA)

Some areas of RCM operations are regulated under the Occupational Safety and Health Act (OSHA) (e.g. Core Building). RCM requires the Operations Level personnel to receive the initial 40-Hour OSHA HazWoper training, the 8-Hour OSHA annual refresher training and to have had sufficient experience to objectively demonstrate competency in the preceding areas in addition to those in the awareness level.

## 8.2 *Transportation Training*

1. Each hazmat employee will be tested by appropriate means on the training subjects covered in 49 CFR 172.704.
2. Training requirements for **hazmat employees** shall include the following:
   a. General Awareness/familiarization training
   b. Function-specific training
   c. Safety Training
3. OSHA or EPA training may be used to satisfy the training requirements listed above to avoid unnecessary duplication of training.
4. Initial and recurring training.

a. Initial training – A new hazmat employee or an employee who changes job functions may perform hazmat functions prior to the completion of training provided:
   (1) The employee is under the direct supervision of a properly trained and knowledgeable hazmat employee; **and**
   (2) The training is completed within 90 days after the employment of a change in job function.
b. Recurrent training – A hazmat employee shall receive the training required at least **once every three years**.
c. Relevant training – Relevant training received from a previous employer or source may be used to satisfy the training requirements provided a current record of training is obtained from hazmat employee's previous employer.
d. Compliance – RCM, as the hazmat employer, is responsible for compliance with the transportation requirements regardless of whether the required training has been completed.

5. Transportation training may be provided onsite or off site.
6. Recordkeeping - RCM will create and retain a record of current training inclusive of the preceding three (3) years, for as long as the employee is employed and for 90 days thereafter. The individual employee retains the original training certificate(s), while the Health & Safety Department and/or Environmental Department retain a copy of the training certificate(s) for documentation.

### 8.2.1 Training Records

Each generator of hazardous waste is required to keep records of hazardous waste management training for their personnel. Training records on current personnel must be kept until closure of the facility. Training records on former employees must be kept for at least three (3) years from the date the employee last worked at the facility.

Training records must include:

1. Name of employee;
2. Job Title;
3. Written job description (including duties related to hazardous waste handling); and
4. Records (*i.e.*, copies of certificates) or completed training. Retain a copy of the written training agenda with the attendance roster(s) and documentation for implementing the emergency response drill to fires, explosions, or spills.

## 8.3 *Vendors*

Materials/waste to be purchased/recycled/disposed and the current, associated vendors can be located in SAP

# 9 Additional Environmental Management Plans & Documents

## 9.1 *Emergency Response Plan (ERP)*

The ERP is a document maintained and controlled by RCML Environmental Department. The plan provides guidance during environmental emergencies and incidents. These can include spills, dam breaches, reporting requirements, etc. A copy of the ERP can be located on the portal, and should be used as a reference in all environmental incidents.

## 9.2 *Hazardous Materials and Contaminated Site Map*

RCML maintains an EP and WP map and register to show locations of all open and closed contaminated sites, along with hazardous materials storage locations. A copy of this register can be located on the portal.

## 9.3 *Refrigeration Management Plant*

The underground cooling system requires the use of hazardous chemicals. A list of chemicals and their SDS can be found in Maxcom as well as in the Refrigeration Management Plan. Also listed in the Refrigeration Management plan is disposal and spill cleanup procedures, inspection/ maintenance schedules and responsibilities, emergency response procedures, and responsible parties. The refrigeration plan is managed by the Operations Team. A copy of this plan can be located on the portal.

## 9.4 *Wildlife Handling and Avoidance Plan/ Aviation Protection Plan*

RCML has current and historic facilities that have the potential to pose a threat to local wildlife. A Wildlife Handling and Avoidance Plan and an Aviation Protection Plan has been developed to help guide RCM personnel on how to handle wildlife spotted on site. Reporting requirements are outlined in these plans. RCM environmental tracks all wildlife sightings and will report to the necessary agencies if any sick, injured, or deceased wildlife is spotted on site.

# 10 Additional Environmental Procedures

## 10.1 *Concrete Washout and Equipment Washbay Areas*

Concrete washouts and washbays are subject to an APP permit. Each washout or washbay needs to be approved through environmental and has items for which it must comply. The compliance table is listed below. All washbays and washout areas are documented on the site Hazardous Materials Map.

| Item | Requirement |
|---|---|
| 1 | Vegetation at the soil base is cleared & grubbed. |
| | Base compacted to uniform density not less than 95%. |
| | Berms compacted to a uniform density not less than 95% |
| 2 | Located at least 50 feet from any storm drain inlet |
| | Located at least 50 feet from open drainage facility or water course |
| | Located at least 50 feet from any water supply well |
| 3 | Designed and operated to maintain adequate freeboard to prevent overflow or discharge of wastewater |
| 4 | Wastewater from any wash pad is routed to the impoundment |
| 5 | Has an annual average daily flow of wastewater is less than 3,000 gallons per day |

## 10.2 *Pinal County Dust Control*

RCML maintains an air permit through Pinal County Air Quality Control District. Any earthmoving activities have the potential to be regulated by Pinal County under this permit. Dust is the major concern under this activity. Different earthmoving activities include:

- land stripping,
- earthmoving,
- blasting,
- trenching,
- road construction,
- grading,
- landscaping,
- stockpiling/storing/loading excavated materials,
- any other activity associated with land development which results in a disturbed surface area or dust generation operations, equal to or greater than .1 acres.

Any earth moving activities must be reviewed to stay in compliance with the RCML air permit.

## 10.3 *Radiation Gauges*

During construction activities it may be necessary to do ground compaction testing. The equipment to run this test often times has radioactive material. RCM requires all radioactive gauges to undergo annual testing and inspections. Copies of these records must be given to RCM HSE department before equipment is brought on site. It is also required that copies of training records of the equipment technicians be given to RCM before any work is commenced. Contractors using radiation gauges must have emergency response procedures and provide copies to RCM personnel.

## 10.4 *RCML Activities Environmental Checklist*

Any activity undertaken at RCM or on behalf of RCM has the potential to create new conditions for which a permit revision or application may need to occur. A checklist has been created that highlights common changes that could occur. This checklist should be reviewed with all new contractors or before the commencement of any new project at RCM or on behalf of RCM. This checklist can be located on the portal under Environmental Documents. A copy can be scene below.

| **Environmental Activities Checklist** | | | |
|---|---|---|---|
| **Activity** | **Description** | **Y/N** | **Project Manager comments** |
| Will there be any digging, removing, or relocating soil/dirt/land? | *Some soil disturbance activities require an addition to our existing Stormwater permits and will require additional storm water BMPs (i.e. berms, waddles, etc.).* | | |
| Will soil or fill material need to be brought on site? | *Certain soils and fill materials have to be approved.* | | |
| Will there be any construction or demolition? | *Certain construction or demolition may require dust, noise, and vibration monitoring and may also require us to notify the surrounding community.* | | |
| Will there be material that needs to be disposed of during construction/demolition? | *Certain construction and demolition waste may be disposed of in RCM's on site landfill and tracked. Other materials may need to be disposed of off site.* | | |
| Will soil or dirt need to be sifted using a mechanical separator? | *This requires a special air permit from Pinal County.* | | |
| Will a concrete washout or washbay area be needed or created? | *Permitting is required for the installation of a washbay or concrete washout area.* | | |
| Will diesel equipment (i.e. stormwater pumps, emergency generators, etc.) be brought on or removed from site? | *Certain activities will require a change to RCM's air permit.* | | |
| Will tanks, equipment, drums storing any hydrocarbons be brought on or removed from site? | *Anything over 50 gallons will require a change to RCM's Spill Prevention Control and Countermeasures Plan/Map and will need secondary containment.* | | |
| Will chemicals be needed for this project? | *All chemicals must be pre-approved before brought on site. Chemical storage areas and containers need to be reviewed.* | | |
| Will any waste be created during this project? | *Waste profiles will need to be created and proper waste storage procedures addressed.* | | |
| Will there be a change to or an installation of a new water line or potable water system? | *This will require Drinking Water Permit approval and specific procedures.* | | |
| Will there be new sewage lines or septic systems installed | *New Aquifer Protection Permits may be needed.* | | |

| Environmental Activities Checklist | | | |
|---|---|---|---|
| **Activity** | **Description** | **Y/N** | **Project Manager comments** |
| during this project? | | | |
| Will water lines be installed, removed, or changed? | *Updates to line drawings and flow meters may be needed for site water balance.* | | |
| Will a new drill pad need to be constructed? | *An NOI may need to be filed and an addition to or change to the current SWPPP may be needed.* | | |
| Is there a well being installed or closed? | *An NOI or NOT will be need to be submitted.* | | |
| Will any ground water be discharged from a hydro well? | *A permit may be required.* | | |

## 10.5 *Well Abandonment and Installation*

All wells must be registered with Arizona's Department of Water Resources (ADWR). Before the installation of any well, an authorization to drill must be received. To receive authorization a Notice of Intent (NOI) must be completed by RCML and submitted to ADWR. The NOI must include the following information:

- your name, address and telephone number
- county assessor's parcel identification information
- the location of the proposed well by legal description
- a description of the proposed well to include an explanation of how you intend to use the water from the well
- the name, address, and license number of the well drilling firm

Before the abandonment of any well, a Notice of Intention to Abandon a Well (NOIA) must be filed with ADWR. After RCML receives the well abandonment card from ADWR, the abandonment of the well by a licensed well drilling company may commence.

# 11 Record of Reviews and Revisions

| Revision # | Description | Author | Approver | Approved Date | Effective Date |
|---|---|---|---|---|---|
| 0 | EMMP | Westland Resources | | 2007 | |
| 1 | EMMP Update | Resolution Copper | | 2010 | |
| 2 | EMMP Update | ARCADIS | | 2011 | |
| 3 | EMMP Update | Resolution Copper | C. McKeon | 6/2012 | |
| 4 | EMMP Update | Resolution Copper | V. Peacey | 9/2014 | |

# 12 Additional Information Sources

Arizona Department of Environmental Quality (ADEQ)
http://www.adeq.state.az.us/

Arizona Division of Emergency Management
http://www.dem.azdema.gov/

U.S. Environmental Protection Agency (EPA)
http://www.epa.gov/

U.S. EPA – RCRA Online
http://www.epa.gov/rcraonline

U.S. EPA – Contaminated Site Clean-Up Information (CLU-IN)
http://www.clu-in.com/

U.S. EPA – Office of Air and Radiation
http://www.epa.gov/oar/

U.S. EPA – Office of Ground Water and Drinking Water
http://www.epa.gov/safewater/

U.S. EPA –Wastes
http://www.epa.gov/epawaste/index.htm

Department of Energy, Office of Health, Safety and Security – Environmental Policies
http://www.hss.energy.gov/nuclearsafety/env/policy/

Department of Energy, Office of Health, Safety and Security - Environmental Reports
http://www.hss.energy.gov/nuclearsafety/env/reports/

Department of Energy, Office of Science
http://www.er.doe.gov/

Department of Energy – Office of Environmental Management
http://www.em.doe.gov/Pages/EMHome.aspx

Department of Health – Agency for Toxic Substances and Disease Registry
http://www.atsdr.cdc.gov/

Department of Housing and Urban Development (HUD) – Office of Lead Hazard Control
http://www.hud.gov/offices/lead/

# APPENDIX W

Preliminary MSGP-2010
Stormwater Pollution Prevention Plan (SWPPP)

# Preliminary MSGP-2010
# Stormwater Pollution Prevention Plan (SWPPP)

# RESOLUTION COPPER MINING
# GENERAL PLAN OF OPERATIONS

***Task Schedule***

| Activity[1] | Phase of Mining Operations | SWPPP Section |
|---|---|---|
| | Active | |
| Routine Facility Inspections | Quarterly | 5.1 |
| Visual Assessments[2] | None | 5.2 |
| Comprehensive Facility Inspections | Annually | 5.3 |
| Monitoring[3] | | |
| General Analytical | None | 6.2 |
| Effluent Limitations | None | 6.3 |
| Impaired Waters | None | 6.4 |

[1] See ***Attachment* 1** for requirements applicable to the exploration and construction phases of mining.

[2] Visual assessments are not required as the only discharging outfall is covered under an individual AZPDES permit. See ***Section 5.2*** and ***Attachment 11B*** of this SWPPP.

[3] General analytical monitoring for Active Copper Mines (***Table 8.G-8.1***) is not required for discharges to ephemeral waters. See ***Section 6.2.1*** of the SWPPP and MSGP-2010 Part 8.G.8.1.

**AZPDES Stormwater Multi-Sector General Permit Number: AZMSG-To Be Determined**

**September 2014**

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## CERTIFICATIONS

The Multi-Sector General Permit (MSGP-2010) requires the following certifications (identified below with the applicable MSGP-2010 Part) for a discharger to qualify for the permit.

**Non-Stormwater Discharges Certification [5.1.3.4; and 8.G.5.3]**

*An evaluation of the General Plans of Operation activities for the presence of unauthorized non-stormwater (dry weather) discharges to its stormwater conveyance systems was performed in [to be determined]. A visual examination of the outfalls and drainage patterns within the designated stormwater drainage areas was performed to identify any unauthorized non-stormwater discharges. No unauthorized non-stormwater discharges to the Project's stormwater conveyance systems were observed during the evaluation. This evaluation was conducted in accordance with the provisions provided in Parts 5.1.3.4; and 8.G.5.3 of the MSGP-2010. See* ***Attachment 7****.*

**Stormwater Pollution Prevention Plan Certification [5.1.6]**

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

| | |
|---|---|
| Authorized Signature | Title |
| Name of Authorized Representative | Date |

# 1. INTRODUCTION [5.0; AND 8G]

This preliminary Stormwater Pollution Prevention Plan (SWPPP) was prepared in support of the Resolution Copper Mining, LLC (Resolution Copper) General Plan of Operations (GPO) for construction of the proposed underground mine, ore processing operation, and associated facilities and infrastructure described in the GPO (collectively, the Resolution Project or Project). The Project is located near Superior in Pinal County, Arizona.

The existing East Plant Site (EPS) and West Plant Site (WPS) activities are covered under separate Multi-Sector General Permit (MSGP-2010) SWPPPs. Both EPS and WPS are permitted as active and staffed *Sector G - Metal Mining (Ore Mining and Dressing*) facilities. Additionally, the EPS has an active concrete batch plant which is considered a co-located *Sector E - Cement and Concrete Products* facility for the purposes of the SWPPP. The facilities and activities covered under these existing permits are not considered further in this preliminary plan in support of the GPO permitting effort.

This draft SWPPP has been prepared in accordance with the requirements of the Arizona Pollutant Discharge Elimination System (AZPDES) Stormwater Multi-Sector General Permit (MSGP-2010) for *Sector G - Metal Mining (Ore Mining and Dressing*) as an active and staffed Project. It is organized with bracket references to the corresponding parts of the MSGP-2010 to facilitate compliance verification. Any activities related to exploration and construction, including pollutants, control measures, and inspection and monitoring requirements, are provided separately in ***Attachment 1***. The duration of the overall GPO permitting effort is unknown and the MSGP-2010 will likely have expired prior to Project permitting. As such, the SWPPP will be revised to reflect the current permit prior to beginning construction activities in support of the planned Resolution Project.

Pursuant to Part 1.3 of the MSGP-2010, once the National Environmental Policy Act (NEPA) permitting is complete, a Notice of Intent (NOI) for discharging stormwater will be filed by the Project. That NOI and the corresponding authorization to discharge issued by the Arizona Department of Environmental Quality (ADEQ) stormwater NOI processing center will be provided in ***Attachment 2***. As required in Part 5.4 of the MSGP-2010, a copy of the Mining MSGP-2010 is provided in ***Attachment 3***.

This SWPPP provides anticipated implementation procedures for pollution prevention measures required by the MSGP-2010. The finalized SWPPP will be designed for modification and revision according to the conditions provided within the MSGP-2010. Components subject to change are generally included in the form of attachments to facilitate this process without requiring major SWPPP document changes.

Note that only those areas of the facility that may discharge impacted stormwater to downstream receiving waters or areas not regulated under a different permit are covered under this preliminary SWPPP. Areas that discharge runoff into contained areas, where it is either collected and used as process water or left in the collection area and disposed of through evaporation (i.e., do not discharge to downstream receiving waters) are contained within a hydrologic boundary and are not subject to coverage under the MSGP-2010. Therefore, no further assessment of stormwater collecting in these areas is

provided in this SWPPP. Additionally, areas of the Project which are regulated under other environmental permits are only briefly described here.

# 2. SITE DESCRIPTION [5.1.2]

## 2.1 GENERAL

| | |
|---|---|
| Facility Name and Address: | Resolution Copper Mining, LLC<br>General Plan of Operations Project<br>102 Magma Heights Road<br>Superior, Arizona 85273 |
| Operator Name and Address: | Resolution Copper Mining, LLC<br>102 Magma Heights Road<br>Superior, Arizona 85273 |
| MSGP-2010 Authorization Number: | AZMSG-To Be Determined |
| Primary Standard Industrial Classification: | 1021 – Copper Ores |

## 2.2 PLANNED ACTIVITIES AT THE FACILITY [5.1.2.1; AND 8.G.6.1]

Resolution Copper is a joint venture between Rio Tinto and BHP Copper, Inc. (BHP). Rio Tinto took over management of the mining operations in May 2004 at both the EPS and WPS. As noted above, separate SWPPPs have been prepared for Resolution's EPS and WPS facilities.

The Resolution Project is in the planning and environmental review stage. Resolution Copper's administrative headquarters are currently located at Resolution Copper's WPS. These administrative offices are located immediately north of Superior at 102 Magma Heights. The office is accessed from US Highway 60 (US 60) by taking the State Route 177 off ramp and going north to the end of Magma Heights to the guard gate. The office building is known as the Verde Building. The EPS encompasses the proposed underground mine, associated shafts, and surface support facilities. The support facilities, some of which are already in existence, are located in a previously disturbed area and include a mine site where Shaft 9 was constructed in the 1970s. The EPS is located approximately 6 road miles east of the WPS, and is accessed from US 60 by turning south on Magma Mine Road (also known as Forest Road [FR] 469). Magma Mine Road ends at the EPS guard gate. Project facilities and attendant infrastructure components are located in north-central Pinal County and their proposed locations are herein referred to as the General Project Area (GPA) (***Figures 1 through 8***).

Some information relevant to the SWPPP is not yet available as the planning process for the Project has not yet been completed. Current Project-specific plans for proposed activities are summarized in the following paragraphs.

New ore processing facilities (the Concentrator) will be located at the WPS in an area disturbed by legacy mining features (i.e., those related to previous mining activity).

The existing mine site and related surface support facilities at the EPS are currently located on private lands, and during production will largely expand on private lands. The expansion associated with this GPO will be primarily on FS lands, with a smaller portion on state and private lands. Additional area encompassed by the EPS includes the land surface above the ore body, comprised of unpatented mining claims on lands administered by the FS, specifically Tonto National Forest (TNF).

A copper concentrate filtration plant and concentrate loadout facility (the Filter Plant and Loadout Facility) will be constructed near Magma Junction (Magma), proximate to the existing Magma Arizona Railroad Company (MARRCO) right-of-way. The MARRCO right-of-way crosses lands owned by Resolution Copper and the FS, as well as state trust lands administered by the Arizona State Land Department (ASLD) and will be the site of connecting infrastructure, such as water supply pipelines, dewatering pipelines, concentrate pipelines, and power lines; these features and the existing rail line are referred to collectively as the MARRCO Corridor.

A Tailings Storage Facility (TSF) will be situated west of the WPS and north of Queen Station within the TNF. Tailings will be delivered to the TSF from the WPS via a pipeline that traverses the intervening area (along with other infrastructure) along the Tailings Corridor. Linear infrastructure elements of the Project are primarily located within the Tailings Corridor, within the MARRCO Corridor on private land alongside existing infrastructure, or underground, and include ore conveyors, roads, power lines, copper concentrate pipelines, tailings pipelines, the MARRCO Railroad, and water supply pipelines. These elements connect the Project features and traverse multiple jurisdictions, representing several land ownership types, including private, state, and federal lands.

## 2.3 GENERAL LOCATION MAP [5.1.2.2]

The GPA is located near the Town of Superior, Pinal County, Arizona (in Township 1 South, Range 13 East; Township 2 South, Range 13 East; Township 1 South, Range 12 East; Township 2 South, Range 12 East; Township 1 South, Range 11 East; Township 2 South, Range 11 East; Township 2 South, Range 10 East; Township 2 South, Range 9 East; Township 3 South, Range 9 East; and Township 3 South, Range 8 East of the Gila and Salt River Baseline and Meridian) as depicted on ***Figure 1***.

The primary receiving waters from the proposed construction activities will be unnamed ephemeral tributaries to Queen Creek, Queen Creek, Devils Canyon, and Arnett Creek. Queen Creek from the headwaters to the Superior Wastewater Treatment Plant (WWTP) and from the Superior WWTP to Potts Canyon has been designated by ADEQ as impaired due to elevated levels of copper. A total maximum daily load (TMDL) has not yet been developed for the impaired reaches.

## 2.4 SITE MAP [5.1.2.3; AND 8.G.6.2]

The following information will be illustrated on ***Figures 1 through 8*** once the final Project design has been determined:

- Size of the property in acres;
- Location of significant structures;
- Directions of stormwater flow (e.g., use arrows);
- Locations of stormwater conveyances (e.g., ditches, pipes, and swales);
- Locations of all existing structural control measures;
- Locations of surface waters receiving the Project's discharges and any impaired waters or Outstanding Arizona Waters (OAWs) within 2.5 miles downstream of the Project;
- Locations where the Project's stormwater discharges to a regulated Municipal Separate Storm Sewer Systems (MS4);
- Locations of potential pollutant sources identified under MSGP-2010 Part 5.1.3.2;
- Locations where significant spills or leaks identified under Part 5.1.3.3 have occurred;
- Locations of all stormwater monitoring points;
- Locations of stormwater outfalls, with a unique identification code for each outfall (e.g., Outfall No. 1, No. 2, etc.), indicating whether one or more outfalls are being treated as "substantially identical" under Parts 4.2.3; 5.1.5.2; and 6.1.1.1 and an approximate outline of the areas draining to each outfall;
- Identification of all outfalls having the potential to contain allowable non-stormwater discharges under Part 1.1.3 and the corresponding type(s) of discharges (see ***Section 3.4.1*** of this SWPPP);
- Location of onsite drywell(s); include a list of the onsite drywells and their registration number(s);
- Locations of the following activities where such activities are exposed to stormwater with potential to discharge from the Project:
    - fueling stations;
    - vehicle and equipment maintenance and/or cleaning areas;

  - loading/unloading areas;
  - locations used for the treatment, storage, or disposal of wastes;
  - liquid storage tanks;
  - processing and storage areas;
  - immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the Project;
  - transfer areas for substances in bulk; and
  - machinery;

- Locations and sources of run-on to the Project from adjacent property that contains significant quantities of pollutants; and
- All Sector G specific requirements [8.G.6.2].

# 3. POTENTIAL POLLUTANT SOURCES [5.1.3; AND 8.G.6.3]

Pollutant sources described in this section relate to active mining activities and features. Any pollutants related to exploration or construction activities at the Project will be documented in ***Attachment 1***.

## 3.1 INDUSTRIAL ACTIVITIES AND MATERIALS IN AREA [5.1.3.1]

Specific industrial activities or materials that could contribute pollutants to stormwater discharges will be described in this section.

Descriptions of control measures used to control stormwater throughout the GPA will be provided in ***Section 4*** and ***Attachment 9*** of this SWPPP. Potential pollutants and associated sources will be summarized in ***Attachment 4*** of this SWPPP.

## 3.2 POLLUTANTS [5.1.3.2; AND 8.G.6.3]

Based on the activities described in the previous section, ***Attachment 4*** will provide a table identifying potential pollutants present in discharging areas of the GPA. A summary of potential pollutants will be described in this section.

A summary of any existing ore or waste rock or overburden characterization data and test results for potential generation of acid rock drainage, if applicable, will be provided in ***Attachment 5***. If any new data is acquired due to changes in ore type being mined, the SWPPP will be updated with this information.

## 3.3 SPILLS AND LEAKS [5.1.3.3]

Spills and leaks within discharging areas of the Project may occur in fueling areas, loading and unloading areas, petroleum storage areas or where vehicles travel along roads or in the active construction area.

A record of any spills and leaks within the GPA which occur within a discharging area of the Project, including spills occurring during the three years prior to SWPPP preparation or amendment, and subsequent events occurring during permit coverage thereafter, will be provided and maintained in ***Attachment 6***.

Significant spills and leaks include, but are not limited to releases of oil or hazardous substances in excess of quantities that are reportable under the Clean Water Act Part 311 (see 40 CFR 110.10 and 40 CFR 117.21) or Section 102 of the Comprehensive Environmental Response, Compensation and Liability Act. Significant spills may also include releases of oil or hazardous substances that are not in excess of reporting requirements, but could significantly impact stormwater due to the location of the spill and other relevant factors.

## 3.4 NON-STORMWATER DISCHARGES [1.1.3; 5.1.3.4; AND 8.G.5.3]

### 3.4.1 Allowable Non-Stormwater Discharges [1.1.3]

Allowable non-stormwater discharges and associated appropriate Best Management Practice (BMP) pursuant to the MSGP-2010 Part 1.1.3 are described in ***Table 1*** below:

Table 1. Allowable Facility Discharges

| Source | Discharge Location | Appropriate BMP |
|---|---|---|
| Emergency firefighting activities | Activity dependent | Not applicable |
| Firefighting system testing and maintenance, including hydrant flushings | Not applicable | Not applicable |
| Discharges related to installation and maintenance of potable water supply systems, including disinfection and flushing activities, discharges resulting from pressure releases or overflows, and discharges from wells approved by ADEQ for drinking water use | Office areas | Erosion control, if necessary |
| Uncontaminated condensate from air conditioners, evaporative coolers, and other compressors and for the outside storage of refrigerated gases or liquids | Office areas | Erosion control, if necessary |
| Irrigation drainage and irrigation line flushing | Not applicable | Not applicable |
| Landscape watering provided all pesticides, herbicides, and fertilizer have been applied in accordance with the approved labeling | Not applicable | Not applicable |
| Pavement wash waters where no detergents are used and no spills or leaks of toxic or hazardous materials have occurred (unless all spilled material has been removed) | Not applicable | Not applicable |
| Routine external building wash down which does not use detergents | Not applicable | Not applicable |
| Water used to control dust, provided effluent or other wastewaters are not used | Throughout, as needed | Erosion control, if necessary |
| Uncontaminated groundwater or spring water | Along the MARRCO corridor | Erosion control, if necessary |
| Foundation or footing drains where flows are not contaminated with process materials such as solvents | Not applicable | Not applicable |
| Incidental windblown mist from cooling towers, but not intentional discharges (e.g. “piped” cooling tower blowdown or drains) | Not applicable | Not applicable |
| Hydrostatic testing of new pipes, tanks or vessels using potable water, surface water, or uncontaminated groundwater | Along the MARRCO corridor | Erosion control, if necessary |
| Water used for drilling, rehabilitation and maintenance of water wells and piezometers, or water supply or water quality evaluations | Proposed well field along the MARRCO corridor | Erosion control, if necessary |
| Non-stormwater discharges subject to an effluent limitation guidelines listed in MSGP-2010 Table 1-2 | Not applicable | Not applicable |

### 3.4.2 Unauthorized Non-Stormwater Discharges [5.1.3.4; and 8.G.5.3]

Parts 5.1.3.4 and 8.G.5.3 of MSGP-2010, require dischargers to test or evaluate all outfalls covered under the MSGP-2010 and/or upgradient drainage locations to identify all unauthorized non-stormwater discharges from the Project including for the presence of specific mining-related non-stormwater discharges such as seeps or adit discharges that do not directly result from precipitation events, or discharges subject to effluent limitations guidelines, such as mine drainage or process water. Unauthorized non-stormwater discharges are those not specifically allowed under MSGP-2010 Part 1.1.3 (see ***Section 3.4.1***, above).

Specific information included for this evaluation and determination will be provided in ***Attachment 7***, if applicable. If any future sources are identified, they will be clearly discussed in a modification to this section and mapped on ***Figures 2 through 8***.

## 3.5 SALT STORAGE [5.1.3.5]

There are no salt storage piles anticipated to be utilized for the Project.

## 3.6 SAMPLING DATA [5.1.3.6]

A summary of stormwater sampling data collected for the Project during the MSGP-2000 permit term will be provided in ***Attachment 8***, if applicable.

# 4. CONTROL MEASURES [5.1.4; 2.0; 8.G.5; AND 8.G.6.4]

The following sections generally describe the control measures (including BMPs) that will be selected for each of the activities and potential pollutants identified in ***Section 3*** of this SWPPP. The control measures identified in the following sections will be selected to ensure that stormwater discharges from the Project meet the requirements in MSGP-2010 Part 2.2. Control measures described in this section relate to active or inactive mining areas which are not regulated by a separate permit. Any control measures related to exploration or construction activities at the Project will be documented in ***Attachment 1***, if applicable.

Selection and design of control measures will be based on the following principles, as applicable:

- Preventing stormwater from coming into contact with polluting materials is generally more effective, and less costly, than trying to remove pollutants from stormwater;
- Using control measures in combination is more effective than using control measures in isolation for minimizing pollutants in the Project's stormwater discharge;
- Attenuating high discharge flows with such control measures as using open vegetated swales and natural depressions to reduce in-stream impacts of erosive flows;
- Conserving and/or restoring of riparian buffers help protect streams from stormwater runoff and improve water quality; and
- Using containment to intercept stormwater flows before they leave the site, such as directing flows to non-discharging areas (pits), or installing runoff containment.

***Attachment 9*** will provide a summary table of control measure applications, including non-structural, structural and sector-specific control measures. Additional discussion is provided below.

## 4.1 NON-STRUCTURAL CONTROL MEASURES [2.1.1; AND 5.1.5.1]

### 4.1.1 Minimizing Exposure [2.1.1.1]

Where applicable, and to the extent practicable, materials will be kept covered or kept in appropriate containers or within containment so as to minimize discharges of stormwater associated with industrial activity.

### 4.1.2 Good housekeeping [2.1.1.2; and 5.1.5.1]

Good housekeeping is practiced as needed and as scheduled, including but not limited to the following:

- Keeping materials orderly and labeled;
- Storing materials in appropriate containers;

- Cleaning up spills and leaks promptly using dry methods (e.g., absorbents) to prevent the discharge of pollutants;
- Regular waste removal; and
- Using drip pans and absorbents under or around leaky vehicles and equipment, or storing such vehicles and equipment indoors where feasible.

### 4.1.3 Maintenance [2.1.1.3; 2.2.1; 2.2.2; 2.2.3; and 5.1.5.1]

Vehicles and equipment will be maintained on a routine basis to reduce the potential for leaks or spills in discharging areas of the GPA.

If control measures are not achieving the intended effect of minimizing pollutant discharges (i.e., control measures need repair or replacement), any necessary changes shall be made within **14 calendar days** following discovery, or before the next measurable storm event (see MSGP-2010 Part 6.1.2.2), whichever is sooner. If necessary changes cannot be implemented within the specified timeframe(s), the following information shall be documented with the SWPPP: the reasons for the delay, a schedule for completing the necessary changes, date completed and any back-up control measures in place to ensure compliance with the applicable numeric effluent limitations in Part 2.2.1 and water quality-based limitations in Parts 2.2.2 and 2.2.3 of MSGP-2010 should a runoff event occur while a control measure is off-line (either in part or in whole).

### 4.1.4 Spill Prevention and Response Procedures [2.1.1.4; and 5.1.5.1]

Spill prevention and response procedures are addressed in the Project Spill Prevention Control and Countermeasures (SPCC) plan. This plan will be kept, along with the SWPPP, in the Environmental Offices and is available to the necessary personnel. Spill prevention will be provided through secondary containment of petroleum products and chemicals; overflow sensing devices; spill kit availability; and employee training. Routine inspections and maintenance provide the backbone of spill prevention. The SPCC plan provides the methodology for safely addressing all manner of spill events.

### 4.1.5 Employee Training [2.1.1.9; 5.1.5.1; and 8.G.6.5]

On an annual basis, employees who work in areas where industrial materials or activities are exposed to stormwater with the potential to discharge, or who are responsible for implementing activities necessary to meet the conditions of the MSGP-2010, including all members of the Stormwater Pollution Prevention Team (see ***Section 9.1*** and ***Attachment 14***), will receive SWPPP training.

The employee training program will cover the specific control measures at the site used to achieve the requirements in MSGP-2010 Part 2.2 and (for those who will be involved in these activities), the monitoring, inspection, planning, reporting, and documentation requirements in the MSGP-2010. The following table (***Table 2***) identifies areas that each annual training session will address.

Table 2. Annual Employee Training Areas

| Part | Description | Training Requirements |
|---|---|---|
| 1 | Non-structural control Measures | • Review non-structural control measures<br>• Review procedures for implementing non-structural control measures |
| 2 | Facility inspection procedures and maintenance of structural control measures | • Review facility inspection procedures and schedules<br>• Completing BMP inspection forms<br>• Maintenance of control measures |
| 3 | Annual Comprehensive Facility Inspection | • What to evaluate<br>• Completing the forms |
| 4 | Monitoring and record keeping | • Review monitoring procedures and schedules<br>• Review prior year records and record-keeping procedures |
| 5 | Annual Reporting | • Compiling and reporting analytical monitoring data<br>• Filling out Discharge Monitoring Reports (DMRs) |

A form for documenting attendance at stormwater management training sessions is provided in ***Attachment 10*** of this SWPPP. The form will be completed and signed by a responsible corporate officer or a duly authorized representative per MSGP-2010, and filed with the SWPPP records.

### 4.1.6 Non-Stormwater Discharges [2.1.1.10]

Non-stormwater discharges are addressed in ***Section 3.4*** of this SWPPP.

## 4.2 STRUCTURAL CONTROL MEASURES [2.1.1]

### 4.2.1 Erosion and Sediment Controls [2.1.1.5]

Where practicable, onsite erosion and sedimentation, and the resulting discharge of pollutants, will be minimized by using methods such as:

- Containing runoff using structural and/or non-structural control measures;
- Placing flow velocity dissipation devices at any discharge locations and within channels where necessary to reduce erosion and/or settle out pollutants;
- Diverting runoff away from roads and other denuded areas by using berms, ditches, and other functionally equivalent diversions;
- Reducing runoff velocities by using energy dissipation devices and minimizing grade, where practical; and/or
- Trapping sediment on site in sediment ponds or other functionally equivalent structural controls.

In addition, wherever possible, structural control planning will be conducted to include the following elements:

- Fit development to terrain when possible;
- minimize the length and grade of slopes;
- time maintenance activities, such as road grading and BMP upkeep to minimize soil exposure to stormwater;
- retain existing vegetation whenever feasible; and
- vegetate and mulch barren areas that are susceptible to erosion.

Structural, vegetative, and/or stabilization control measures will be implemented in areas of the Project that have a potential for soil erosion due to topography, land disturbance or other factors. This includes all property boundaries, wash borders, areas adjacent to discharge outfalls with potential for or that show evidence of erosion.

Routine inspections will evaluate effectiveness of erosion and sediment controls. If control measures are insufficient, improvements will be made and documented in ***Attachment 9***.

### 4.2.2 Management of Runoff/Stormwater Diversions [2.1.1.6; 2.1.1.8; and 8.G.5.1.1]

Management of runoff will be accomplished at the Project through the use of stormwater diversions and catchments, to be described in ***Attachment 9*** and will be shown on the finalized Site Maps (***Figures 2 through 8***). In general, runoff from unpaved and disturbed areas of the GPA will be directed towards structural control measures as much as possible, to allow solids settling and percolation. Routine inspections will evaluate effectiveness of runoff control BMPs. If BMPs are insufficient, improvements will be made and documented in ***Attachment 9***.

### 4.2.3 Capping [8.G.5.1.2; and 2.1.1.8]

Capping may be utilized for the GPO Project. If capping of potential pollutant sources is determined to be appropriate, the nature and extent of the capping program will be described here.

### 4.2.4 Treatment [8.G.5.1.3; and 2.1.1.8]

Given the potential pollutants described in ***Section 3***, treatment may not be an appropriate control measure for the GPO Project. If treatment of potential pollutant sources is determined to be appropriate in the future, the nature and extent of the treatment program will be described here.

### 4.2.5 Salt Storage Piles or Piles Containing Salt [2.1.1.7]

It is not anticipated there will be any salt storage piles or piles containing salt for the Project.

### 4.2.6 Litter, Garbage and Floatable Debris [2.1.1.11]

The discharge of litter, garbage, and floatable debris to surface waters will be prevented largely by keeping exposed areas free of such materials, or by intercepting them before they leave the site.

### 4.2.7 Dust Generation and Vehicle Tracking of Industrial Materials [2.1.1.12]

The generation of dust and offsite tracking of raw, final, or waste materials will be minimized to the extent practicable through the application of dust suppressants or water to unpaved access roads and construction areas.

## 4.3 SECTOR SPECIFIC CONTROL MEASURES [2.1.1.8; AND 8.G.5]

Part 8 of MSGP-2010 lists additional control measures relevant to Sector G facilities. The potential pollutants identified in ***Section 3.2*** of this plan (per Part 8.G.6.3 of MSGP-2010) shall determine the priority and appropriateness of the control measures selected.

### 4.3.1 Additional Stormwater Controls [8.G.5.1]

Sector-specific control measures required in MSGP-2010 Part 8.G.5.1 are addressed in ***Section 4.2*** of this SWPPP.

### 4.3.2 Construction and Exploration Phase Sediment and Erosion Control [8.G.5.2]

Sediment and erosion controls utilized during any exploration or construction phase activities will be addressed in ***Attachment 1*** as necessary.

### 4.3.3 Certification of Discharge Testing [8.G.5.3]

Discharge testing related to unauthorized non-stormwater discharges is addressed in ***Section 3.4.2*** of this SWPPP.

## 4.4 DISCHARGES TO IMPAIRED WATERS OR OUTSTANDING ARIZONA WATERS [1.1.4.5 (ONLY APPLIES TO NEW DISCHARGERS); 1.1.4.6 (ONLY APPLIES TO NEW DISCHARGERS); 2.2.3.1; 2.2.3.2; AND 2.2.3.3 (ONLY APPLIES TO NEW DISCHARGERS)]

Resolution Copper is not a new discharger. This section will be expanded to include the requirements of the stormwater permits to reflect discharge to the impaired Queen Creek, as appropriate.

# 5. INSPECTIONS [2.2.1; 2.2.2; 2.2.3; 4.0; 5.1.5.2; AND 8.G.7]

The MSGP-2010 includes schedules and procedures for three types of inspections: routine facility inspections, visual assessment of stormwater discharges, and comprehensive facility inspections. General requirements apply to all permitted facilities. Additional specific requirements apply for MSGP-2010 Sector G.

Inspection procedures described in this section relate to active and staffed mining activities. Any inspection procedures related to exploration or construction activities at the facility will be documented in ***Attachment 1***, if applicable.

If, during any quarterly routine facility inspection, visual assessment, or comprehensive facility inspection the facility's control measures are found to be inadequate or otherwise not being properly operated and/or maintained, the permittee will review the selection, design, installation, and implementation of the control measures to determine if maintenance and/or modifications are necessary to meet the applicable numeric effluent limitations in MSGP-2010 Part 2.2.1 and water quality-based requirements in MSGP-2010 Parts 2.2.2 and 2.2.3. Such modifications will be documented in the SWPPP and implemented as expeditiously as practicable.

## 5.1 ROUTINE FACILITY INSPECTIONS [4.1; 5.4; AND 8.G.7]

On a quarterly basis, qualified personnel (including at least one member of the stormwater pollution prevention team) will conduct routine inspections of all areas of the facility where industrial materials or activities are exposed to precipitation and that contribute to stormwater discharges from the site covered under the MSGP-2010, and of all stormwater control measures used to comply with MSGP-2010. Inspections and follow-up actions will be documented on the Routine Inspection Form provided in ***Attachment 11A***. Completed inspection forms will be maintained with the SWPPP, as required in MSGP-2010 Part 5.4.

At a minimum, the documentation for each routine facility inspection will include:

- The inspection date and time;
- The name(s) and signature(s) of the inspector(s);
- Weather information and a description of any discharges occurring at the time of the inspection;
- Evidence demonstrating that previously unidentified discharges of pollutants have occurred from the site;
- Any control measures needing maintenance or repairs;
- Any failed control measures that need replacement;
- Any other evidence of deviations from the permit or SWPPP observed; and
- Any additional control measures needed to comply with the permit requirements.

Inspections will be performed during periods when the Project is in operation. Once per calendar year, a routine facility inspection will be initiated while a stormwater discharge is occurring at one or more outfalls, but in no case later than **24 hours** or the first business day (whichever comes later) following the end of the measurable storm event. If there is no measurable storm event(s) during a calendar year, that fact will be documented on the quarterly inspection form that completes the inspections for that calendar year.

***Additional Sector G Inspection Requirements*** **[8.G.7]**

Unless otherwise approved by ADEQ, active sites which discharge to waters designated as OAWs or waters which are impaired for sediment must be inspected monthly. The permittee may submit a request to ADEQ to reduce the inspection frequency to quarterly at one or more outfalls to an OAW or a water impaired for sediment. The request must be based on the frequencies of discharges and the performance of the control measure(s). This requirement is not applicable to the Project.

## 5.2 VISUAL ASSESSMENT OF STORMWATER DISCHARGES [4.2]

Two visual assessments will be performed by qualified personnel (including at least one member of the stormwater pollution prevention team) during the summer wet season and two visual assessments during the winter wet season when the Project is discharging.

Wet seasons, for the purposes of visual assessments, are defined as follows:

- Summer wet season: June 1 – October 31
- Winter wet season: November 1 – May 31

The term "wet season" applies statewide and includes areas of the state where freezing conditions exist that prevent runoff from occurring for extended periods. In areas where freezing conditions exist, the four visual assessments may be distributed during seasons when precipitation runoff occurs.

Visual assessment monitoring requirements in MSGP-2010 begin immediately after authorization to discharge is received by the permittee unless authorization is received 90 calendar days or more after a wet season has begun, in which case visual assessment monitoring shall commence with the start of the next wet season.

### 5.2.1 Visual Assessment Procedures [4.2.1; 6.1.2.2; and 6.1.2.3]

Visual assessment samples are not required to be collected consistent with 40 CFR Part 136 procedures. The visual assessment shall be made:

- Of a sample in a clean, clear glass, or plastic container, and examined in a well-lit area;
- On samples collected within the first 30 minutes of an actual discharge from a storm event. If it is not possible to collect the sample within the first 30 minutes of discharge, the sample must be

collected as soon as practicable after the first 30 minutes and the reason why it was not possible to take samples within the first 30 minutes will be documented. In the case of snowmelt, samples shall be taken during a period with a measurable discharge from the Project (see also Part 6.1.2.3); and

- On discharges that occur at least 72 hours (3 calendar days) from a previous discharge (see also Part 6.1.2.2).

The following water quality observations will be documented during visual assessments:

- Color;
- Odor;
- Clarity;
- Floating solids;
- Settled solids;
- Suspended solids;
- Foam;
- Oil sheen; and
- Other obvious indicators of stormwater pollution.

Wet season visual assessments are currently not required for the Project. If they become necessary the representative outfall(s) will be identified in ***Attachment 11B***.

### 5.2.2 Visual Assessment Documentation [4.2.2; and 5.4]

The results of the visual assessments will be documented and the documentation will be maintained with this SWPPP as required in MSGP-2010 Part 5.4. The visual assessment findings need not be submitted to ADEQ, unless specifically requested.

A Visual Assessment Form is provided in ***Attachment 11C*** and includes the following:

- Sample location(s);
- Sample collection date and time, and visual assessment date and time for each sample;
- Personnel collecting the sample and performing visual assessment, and their signatures;
- Nature of the discharge (i.e., runoff or snowmelt);
- Results of observations of the stormwater discharge;
- Probable sources of any observed stormwater contamination; and

- If applicable, why it was not possible to take samples within the first 30 minutes.

## 5.2.3 Exceptions to Visual Assessments [4.2.3; and 5.1.5.2]

### *5.2.3.1 Absence of Discharge*

If no storm event results in a discharge from the Project or outfall(s) during a wet season, the reason why an assessment could not be completed during that wet season will be documented and that documentation will be maintained with the SWPPP. In this case, supplementary visual assessment is not required.

### *5.2.3.2 Adverse Conditions*

Adverse conditions are those that are dangerous or create inaccessibility for personnel, such as local flooding, high winds, or electrical storms, or situations that otherwise make sampling unsafe. When adverse conditions prevent the collection of either visual assessment sample in a given wet season, those conditions will be documented and that documentation maintained with the SWPPP. Visual assessment monitoring will then be resumed in the subsequent wet season.

### *5.2.3.3 Substantially identical outfalls*

If the Project has two or more outfalls that discharge substantially identical pollutants, the visual assessment of the discharge at just one of the outfalls may be conducted, and the results applied to the substantially identical outfall(s). The following shall be described when using this visual assessment exception (as well as the exception for the Project's general analytical monitoring requirements, as described in MSGP-2010 Part 6.2.1 and ***Section 6.1.1.1*** of this SWPPP):

- Location of each of the substantially identical outfalls;
- Description of the general industrial activities conducted in the drainage area of each outfall;
- Description of the control measures implemented in the drainage area of each outfall;
- Description of the exposed materials located in the drainage area of each outfall that are likely to be significant contributors of pollutants to stormwater discharges;
- An estimate of the runoff coefficient of the drainage areas (low = under 40%; medium = 40 to 65%; high = above 65%); and
- Why the outfalls are expected to discharge substantially identical effluents.

An analysis of substantially identical outfalls will be documented in ***Attachment 11B***.

If possible, visual assessments of each substantially identical outfall shall be performed on a rotating basis throughout the period of coverage under the MSGP-2010.

If a visual assessment performed on a sample collected at a substantially identical outfall demonstrates that control measures are not functioning as intended, the control measures will be assessed and modified as appropriate for that outfall and, if necessary, other outfalls represented by the monitored outfall.

## 5.3 COMPREHENSIVE FACILITY INSPECTIONS [4.3; AND 6.2]

On an annual basis, qualified personnel (including at least one member of the stormwater pollution prevention team) will conduct a comprehensive facility inspection (CFI). Annual, as defined in Part 4.3.1 means once per calendar year, but not within 6 months of the previous inspection for the Project throughout the duration of permit coverage.

### 5.3.1 Scope of Comprehensive Facility Compliance Inspection [4.3; and 6.2]

CFIs must cover all areas of the Project affected by the requirements in MSGP-2010, including areas identified in this SWPPP as potential pollutant sources, any areas where control measures are used to comply with the permit, and areas where significant spills (or spills that would contribute to the discharge of pollutants in stormwater) and leaks have occurred in the past 3 years. CFIs must also include a review of any monitoring data collected in accordance with the MSGP-2010.

Inspectors must evaluate the results of the past year's visual assessments and analytical monitoring when planning and conducting inspections to determine potential areas of concern for stormwater pollution. Inspectors shall look for the following:

- Industrial materials, residue, or trash that may have or could come into contact with stormwater;
- Leaks or spills from industrial equipment, drums, tanks, and other containers;
- Offsite tracking of industrial or waste materials, or sediment where vehicles enter or exit the GPA;
- Tracking or blowing of raw, final, or waste materials from areas of no exposure to exposed areas; and
- Control measures needing replacement, maintenance, or repair.

Inspectors shall examine all stormwater control measures required by MSGP-2010 to ensure that they are functioning correctly. If discharge locations are inaccessible, nearby downstream locations shall be inspected.

The Project's annual CFI may also be used as one of the routine inspections (see ***Section 5.1*** of this SWPPP), provided that all components of both types of inspections are included.

### 5.3.2 Comprehensive Facility Inspection Documentation [4.3.2; and 7.2]

The findings of each annual CFI will be documented and the documentation maintained with this SWPPP, as required in MSGP-2010 Part 5.4. ***Attachment 11D*** provides a report form for the CFI and includes the following:

- The date of the inspection;
- The name(s) and title(s) of the personnel making the inspection;
- Findings from the examination of areas of the Project identified in ***Section 5.3.1***, above;
- All observations relating to the implementation of the control measures including:
    - Previously unidentified discharges from the site;
    - Previously unidentified pollutants in existing discharges;
    - Evidence of, or the potential for, pollutants entering the drainage system that are not contemplated in the SWPPP;
    - Evidence of pollutants discharging to surface waters from any Project outfall(s) in a manner inconsistent with the SWPPP, and the condition of and around the outfall, including the condition of flow dissipation measures (if present) designed to prevent scouring; and
    - Additional control measures needed to address any conditions requiring corrective action identified during the inspection.
- Any required revisions to the SWPPP resulting from the inspection;
- Any incidents of noncompliance observed or a certification stating the Project is in compliance with this permit (if there is no noncompliance); and
- A statement signed and certified in accordance with Appendix B, Subsection 9 of MSGP-2010.

In addition, permittees that operate facilities that discharge directly to an impaired water or OAW or to an upstream tributary within 2.5 miles of an impaired water or OAW shall submit the CFI findings with the annual report (see ***Section 8.2***, below).

# 6. MONITORING [5.1.5.2; AND 6]

Several types of monitoring are required under MSGP-2010, including:

- General analytical monitoring [6.2.1];
- Effluent limitations guidelines monitoring [6.2.2];
- Impaired waters monitoring [6.2.3]; and
- Additional monitoring as required by ADEQ [6.2.4].

The procedures and schedules for conducting the types of analytical monitoring specified by MSGP-2010, when and where applicable, are described in the sections below. For the required monitoring, a Sampling and Analysis Plan (SAP) will be incorporated into ***Attachment 12***.

Per MSGP-2010, Parts 6.2.1, and 8.G.8, the requirement for general analytical monitoring is not applicable to a Sector G facility which discharges to an ephemeral water.

## 6.1 PROCEDURES COMMON TO ALL MONITORING [6.1]

### 6.1.1 Monitoring Locations [6.1.1]

#### *6.1.1.1 Outfalls [6.1.1.1]*

Monitoring of multiple outfalls can be reduced to representative outfalls provided they discharge "substantially identical stormwater and/or allowable non-stormwater." Substantially identical outfalls are addressed in ***Section 5.2.3.3*** and ***Attachment 11B*** of this SWPPP.

The allowance for monitoring only one of the substantially identical outfalls is not applicable to any outfalls with numeric effluent limitations. Each outfall covered by a numeric effluent limitation is required to be monitored.

#### *6.1.1.2 Commingled Discharges [6.1.1.2; and 8.G.6.6]*

If discharges authorized by MSGP-2010 commingle with discharges not authorized under the permit, any required sampling of the authorized discharges must be performed at a point before they mix with other unauthorized discharges to the extent practicable.

#### *6.1.1.3 Monitoring for Allowable Non-Stormwater Discharges [6.1.1.3]*

Unless otherwise specified by ADEQ, permittees are required to monitor allowable non-stormwater discharges only when they are commingled with stormwater discharges associated with industrial activity. Allowable non-stormwater discharges are addressed in ***Section 3.4.1*** of this SWPPP.

## 6.1.2 Monitoring Events [6.1.2]

### *6.1.2.1 Monitoring Periods [6.1.2.1]*

Monitoring requirements in MSGP-2010 begin within 90 calendar days of receiving authorization to discharge. The required monitoring events may be distributed during seasons when precipitation occurs, or when snowmelt results in a measurable discharge from the Project.

Wet seasons, for the purposes of analytical monitoring, apply statewide and are defined as follows:

Summer wet season: June 1 – October 31

Winter wet season: November 1 – May 31

### *6.1.2.2 Measurable Storm Events [6.1.2.2]*

All required monitoring must be performed on a storm event that results in a discharge from the Project ("measurable storm event") that follows the preceding measurable storm event by at least 72 hours (3 calendar days). The 72-hour (3-day) storm interval does not apply if the permittee is able to document that less than a 72-hour interval is representative for local storm events during the sampling period. In the case of snowmelt, the monitoring must be performed at a time when a measurable discharge occurs at the site.

For each monitoring event, except snowmelt monitoring, the permittee shall identify the person performing the monitoring, the date and estimated duration (in hours) of the rainfall event, estimated rainfall total (in inches) for that rainfall event, and time (in days) since the previous measurable storm event. For snowmelt monitoring, the permittee shall identify the sample as 'snowmelt' and the date of the sampling event.

### *6.1.2.3 Sample Type [6.1.2.3]*

A minimum of one grab sample will be collected from a discharge resulting from a measurable storm event that produces a sufficient volume to allow collection of a sample. With the exception of samples to be analyzed for Suspended Sediment Concentration (SSC), samples must be collected within **the first 30 minutes of a measurable storm event**. If it is not possible to collect the sample within the first 30 minutes of a measurable storm event, the sample must be collected as soon as practicable after the first 30 minutes and documentation must be kept with this SWPPP explaining why it was not possible to take samples within the first 30 minutes.

Samples for SSC shall be collected 48 hours after the storm event that resulted in a measurable discharge. In the case of snowmelt, samples must be taken during a period with a measurable discharge.

### *6.1.2.4 Adverse Conditions [6.1.2.4]*

When adverse conditions (as described in ***Section 5.1.2.3*** of this plan) prevent the collection of the analytical sample(s) required in a given wet season, those conditions will be documented and the

documentation maintained with this SWPPP. Analytical monitoring will resume in the subsequent wet season. Note that adverse conditions do not exempt the permittee from the requirement to file a discharge monitoring report (DMR) in accordance with the Project's sampling schedule. The permittee shall report any failure to monitor as specified in MSGP-2010 Part 7.1, indicating the basis for not sampling during the usual reporting period.

### 6.1.3 Sampling and Analysis Plan [6.1.3]

The requirements of the SAP will be provided in ***Attachment 12***, if applicable.

## 6.2 General Analytical Monitoring [6.2.1; and 8.G.8]

This section will describe general analytical monitoring requirements, as applicable.

## 6.3 Effluent Limitations Monitoring [6.2.2]

This section will describe effluent limitation requirements, as applicable.

## 6.4 Impaired Waters Monitoring [6.2.3]

This section will describe impaired waters requirements, as applicable.

## 6.5 Additional Monitoring Required by ADEQ [6.2.4; and 8.G.8.2.3]

This section will describe additional monitoring required by ADEQ, as appropriate. The Project has not been directed by the ADEQ to conduct additional monitoring; therefore, it is not required to conduct additional monitoring.

## 6.6 Outfall Monitoring Summary

This section will summarize outfall monitoring requirements once a final Project has been permitted.

## 6.7 Follow-up Actions if a Numeric Effluent Limit or a Water Quality Standard is Exceeded [6.3]

If a numeric effluent limit is exceeded during a stormwater discharge, or if there is information that a stormwater discharge is causing or contributing to an exceedance of an applicable water quality standard, follow-up monitoring will be conducted within 30 calendar days (or during the next qualifying runoff event, should none occur within the 30 days) of implementing corrective action(s) taken in accordance with Part 3. Monitoring must be performed for any pollutant(s) that exceeds the numeric effluent limit or for which there has been an exceedance of an applicable water quality standard.

If this follow-up monitoring exceeds the applicable numeric effluent limit or demonstrates that the stormwater discharges are causing or contributing to an exceedance of an applicable water quality standard, the following requirements apply:

- Submit an Exceedance Report to ADEQ (see ***Section 8.3*** of this SWPPP).

- Continue to monitor, at least twice per wet season, until the discharge is in compliance with the numeric effluent limit or is no longer causing or contributing to an exceedance of an applicable water quality standard or until ADEQ waives the requirement for additional monitoring.

# 7. CORRECTIVE ACTIONS [3]

## 7.1 CORRECTIVE ACTION TRIGGERS [3.1]

### 7.1.1 Conditions Requiring Review and Revision of Control Measures to Eliminate a Problem [3.1.1; 2.1; and 2.2.]

If any of the following conditions occur resulting in or from a failure of a control measure, the selection, design, installation, and implementation of the Project's control measures shall be reviewed and revised as necessary to ensure that the condition is eliminated:

- An unauthorized discharge (e.g., discharge of non-stormwater not authorized by this or another AZPDES permit) to a water of the U.S. or to a regulated MS4 occurs at the facility (MSGP-2010 Part 2.1);
- A discharge violates a numeric effluent limitation guideline (MSGP-2010, Table 6-1);
- The permittee becomes aware, or ADEQ determines, that the Project's discharge causes or contributes to an exceedance of applicable water quality standard(s) (MSGP-2010 Part 2.2.2) or an adopted waste load allocation (WLA) (Part 2.2.3); and/or
- ADEQ, or an operator of a regulated MS4, determines that modifications to the control measures are necessary to meet the requirements of MSGP-2010 Part 2.2.

### 7.1.2 Substantially Identical Outfalls [3.1.2]

If the event triggering corrective action is linked to an outfall that represents other substantially identical outfalls, the above review must assess the need for corrective action for each outfall represented by the outfall that triggered the review.

## 7.2 CORRECTIVE ACTION DEADLINES [3.2]

The discovery of any of the conditions listed in ***Section 6.1.1*** will be documented within 72 hours of making such discovery. Within 14 calendar days of such discovery, any corrective action(s) taken or to be taken to eliminate or further investigate the condition will be documented, or if no corrective action is needed, the basis for that determination. The specific documentation required within 72 hours and 14 calendar days is detailed in ***Section 7.3***, below.

When actions are determined necessary, any necessary changes will be made within 14 calendar days following discovery, or before the next measurable storm event (see MSGP-2010 Part 6.1.2.2), whichever is sooner. If necessary changes cannot be implemented within the specified timeframe(s), the following shall be documented with the SWPPP: the reasons for the delay, a schedule for completing the necessary changes, date completed and any back-up practices in place to ensure compliance with the applicable numeric effluent limitations in Part 2.2.1 and water quality-based requirements in Parts 2.2.2 and 2.2.3 of this permit should a runoff event occur while a control measure is off-line.

## 7.3 CORRECTIVE ACTION REPORT [3.3; AND 7.2]

Within 72 hours of discovery of any condition listed in ***Section 7.1.1***, the following information shall be documented and maintained with the SWPPP:

a. Identification of the condition triggering the need for corrective action review;

b. Description of the problem identified; and

c. Date the problem was identified.

Within 14 calendar days of discovery of any condition listed in Section 6.1.1, the following information shall be documented and maintained with the SWPPP:

a. Summary of corrective action taken or to be taken;

b. Whether SWPPP modifications are required as a result of this discovery or corrective action;

c. Date corrective action initiated or will be initiated; and

d. Date corrective action completed or expected to be completed.

When any condition listed in ***Section 7.1.1*** occurs, a permittee that operates a facility that discharges to an impaired water or OAW shall submit this documentation in an annual report (see ***Section 8.2***, below) as required in MSGP-2010 Part 7.2 and retain a copy of the corrective action report onsite with the SWPPP as required in Part 5.4.

# 8. REPORTING AND RECORDKEEPING

## 8.1 REPORTING MONITORING DATA TO ADEQ [7.1]

All analytical monitoring data (see ***Section 6*** of this SWPPP) shall be submitted to ADEQ at the address in ***Section 8.6***, using the MSGP DMR form available at http://www.azdeq.gov/environ/water/permits/download/2010/dmr.pdf and in ***Attachment 13A***.

All sampling results for the previous two wet seasons will be compiled onto the DMR form(s) and, except as provided in ***Section 8.2*** below, submitted to ADEQ not later than July 15 of each year of permit coverage. The first DMR form must be submitted to ADEQ by no later than July 15th of each permit year.

## 8.2 ANNUAL REPORT [7.2]

All facilities shall prepare an Annual Report on the form provided in ***Attachment 13B*** and retain a copy of the report with this SWPPP. The Annual Report for the reporting period June 1 to May 31 shall be completed by July 15 (the first report must be completed by July 15th of each permit year) and include, at a minimum:

- The findings from the Project's comprehensive facility inspection (***Section 5.3***);
- Any corrective action documentation (***Section 7.3***);
- The DMR form(s) for the preceding two wet seasons; and
- The results of any monitoring required in MSGP-2010 Part 6.2 for those facilities that discharge to a water (or within 2.5 miles of a water if required by ADEQ) or portion thereof, classified as an OAW or an impaired water; or
- The results of any monitoring required in MSGP-2010 Part 6.2 if notified by ADEQ in accordance with MSGP-2010 Part 1.3.1(2)(c).

For facilities that discharge to a water (or within 2.5 miles of a water if required by ADEQ, or is otherwise referenced within an approved TMDL) or portion thereof, classified as an OAW or an impaired water, the annual report shall be submitted to ADEQ on or before July 15 (postmark date).

## 8.3 EXCEEDANCE REPORT FOR NUMERIC EFFLUENT LIMITS OR WATER QUALITY STANDARDS [7.3]

If follow-up monitoring pursuant to Part 6.3 exceeds a numeric effluent limit or demonstrates that a stormwater discharge is causing or contributing to an exceedance of an applicable water quality standard, an Exceedance Report shall be submitted to ADEQ no later than 30 calendar days after receiving the Project's lab results. The Project's Exceedance Report shall include the following:

- Facility name, physical address and location;
- AZPDES permit tracking number;
- Name of receiving water;
- Monitoring data from this and the preceding monitoring event(s);
- An explanation of the situation, including what actions the permittee has completed or intends to complete (if corrective actions are not yet complete) to correct the exceedance; and
- Contact person name, title, and phone number.

## 8.4 OTHER REPORTING [7.4]

The permittee is subject to the reporting requirements stipulated in MSGP-2010 Part 7, in addition to the standard permit reporting provisions of MSGP-2010 Appendix B, Subsection 12.

- 24-hour reporting (see MSGP-2010 Appendix B, Subsection 12.d);
- 5-day follow-up reporting to the 24 hour reporting (see Appendix B, Subsection 12.d.(ii)];
- Reportable quantity spills (verbal report only; see Part 2.1.1.4);
- Planned changes (see Appendix B, Subsection 12.a);
- Anticipated noncompliance (see Appendix B, Subsection 12.c);
- Transfer of ownership and/or operation (see MSGP-2010 Table 1-3);
- Other noncompliance (see Appendix B, Subsection 12.e); and
- Other information (see Appendix B, Subsection 12.f).

Where a written report is required, these reports shall be submitted to ADEQ's address listed in ***Section 8.6*** of this plan. If the facility discharges to a regulated MS4, these reports shall also be submitted to the MS4 operator (in accordance with MSGP-2010 Part 5.1.2).

## 8.5 RECORDKEEPING [7.5]

The following shall be retained for a period of at least three (3) years from the date the Project's coverage under MSGP-2010 expires or is terminated:

- Copies of the SWPPP (including any modifications made during the term of MSGP-2010);
- Additional documentation requirements pursuant to MSGP-2010 Part 5.4 (including documentation related to corrective actions taken pursuant to Part 3);
- All reports and certifications required by this permit;
- Monitoring data; and

- Records of all data used to complete the NOI to be covered by the MSGP-2010.

## 8.6 ADDRESSES FOR REPORTS [7.6]

Signed copies of monitoring data and any other reports required, shall be submitted to the address below. Other options (i.e., electronic submission) may also be used if ADEQ makes the information available on the Internet or by public notice. Notices of Intent and Notices of Termination (or a photocopy/reproduction) shall be signed and dated in accordance with Appendix B, Subsection 9 of MSGP-2010 and submitted to ADEQ at the address below. DMR forms and paper copies of any reports required in ***Sections 5, 6 and 7*** shall be sent to the address below. All other written correspondence concerning discharges covered under this permit shall likewise be sent to the address listed below:

Arizona Department of Environmental Quality
Surface Water Section, Stormwater Permits Unit—MSGP Monitoring
1110 West Washington Street, Mail Code 5415 A-1
Phoenix, Arizona 85007
Office: (602) 771-4508

Reports of non-compliance shall be reported to:

Arizona Department of Environmental Quality
Water Quality Compliance Section
1110 West Washington Street, Mail Code 5515 B-1
Phoenix, Arizona 85007
Office: (602) 771–4513

# 9. ADMINISTRATIVE

## 9.1 POLLUTION PREVENTION TEAM [5.1.1]

The Project will identify and train a Stormwater Pollution Prevention Team that will ensure effective SWPPP implementation. The team will include personnel who are responsible for development and implementation of the SWPPP as well as maintaining control measures and taking corrective actions where required. Components of the preventive maintenance and inspection program will be supervised and/or carried out by the team. Members and their assigned tasks and responsibilities will be specifically identified in ***Attachment 14***.

## 9.2 SIGNATURE, PLAN REVIEW, AND PLAN AVAILABILITY [5.1.6; 5.3; AND B.9]

This SWPPP will be certified in accordance with MSGP-2010 Appendix B, Subsection 9 and retained at the facility available for regulatory review at the time of inspections, or upon request. It will also be available to the public upon written request. Certification will be provided in the front of this document.

## 9.3 REQUIRED SWPPP MODIFICATIONS [5.2]

This SWPPP shall be modified whenever necessary to address any of the triggering conditions for corrective action in MSGP-2010 Part 3.1 (see ***Section 7*** of this SWPPP). Changes to the SWPPP to reflect corrective actions shall be made in accordance with the corrective action deadlines in Parts 3.2 and 3.3, and signed and dated in accordance with MSGP-2010 Appendix B, Subsection 9.

In addition, the SWPPP shall be modified to reflect new or modified control measures (see MSGP-2010 Parts 2.1 and 4.0), including measures implemented at active mining operations as mining activities expand into previously undisturbed areas (see MSGP-2010 Part 8.G.5.2).

## 9.4 DOCUMENTATION REQUIREMENTS [5.4]

The following inspection, monitoring, and certification records shall be kept complete and up-to-date. Retaining these records with the SWPPP (unless otherwise specified below) is necessary to demonstrate compliance with the conditions of this permit.

- A copy of the NOI submitted to ADEQ, including: any correspondence exchanged between the operator and ADEQ specific to coverage under this permit and the permit authorization number assigned by ADEQ - see ***Attachment 2***;
- A copy of this permit (an electronic copy easily available to SWPPP personnel is also acceptable) – see ***Attachment 3***;
- Descriptions and dates of any incidences of significant spills, leaks, or other releases that resulted in discharges of pollutants in stormwater to a regulated MS4 or to waters of the U.S., the circumstances leading to the release and actions taken in response to the release, and measures

taken to prevent the recurrence of such releases [2.1.1.4; and 5.1.3.3] – see SWPPP ***Section 3.3*** and ***Attachment 6***;

- Records of employee training, including date training received. Training records need not be maintained with the SWPPP but shall be made available to ADEQ, EPA, or another federal, state or local agency upon request [2.1.1.9] – see SWPPP ***Section 4.1.5*** and ***Attachment 10***;
- Documentation of repairs of structural control measures, including the date(s) of discovery of areas in need of repair/replacement, date(s) that the structural control measure(s) returned to full function, and the justification for any extended repair schedules [2.1.1.3] – see SWPPP ***Section 4.1.3***;
- Documentation of maintenance of industrial equipment and systems in accordance with part 2.1.1.3 need not be maintained with the SWPPP but shall be made available to ADEQ, EPA, or another Federal, State or local agency upon request. The maintenance records shall include the date(s) of regular maintenance. However, the justification for any extended maintenance schedules shall be maintained with the SWPPP [ 2.1.1.3] – see SWPPP ***Section 4.1.3***;
- All inspection reports, including the Routine Facility Inspection Reports [4.1] – see SWPPP ***Section 5.1***, the Visual Assessment Reports [4.2] – see SWPPP ***Section 5.2***, and the Comprehensive Facility Inspection Reports [4.3] – see SWPPP ***Section 5.3***;
- Description of and rationale for any deviations from the schedule for visual assessments and/or monitoring, and the reason for the deviations (e.g., adverse weather or it was impracticable to collect samples within the first 30 minutes of a measurable storm event) [ 4.1.1; 4.2.1; 6.1.2.3; and 6.2.1] – see SWPPP ***Section 5.2***;
- Description of any corrective action taken at the site, including triggering event and dates when problems were discovered and modifications occurred– see SWPPP ***Section 7.3***; and
- Documentation to support a claim that the Project has changed its status from active to inactive and unstaffed with respect to the requirements to conduct routine facility inspections [4.1.3], visual assessments [4.2.3], and/or general analytical monitoring [6.2.1.4].

## 9.5 DEFINITIONS [APPENDIX A; AND 8.G.3]

Refer to MSGP-2010 Parts 8.G.3 and Appendix A in ***Attachment 3*** of this SWPPP for applicable definitions.

## 9.6 STANDARD PERMIT CONDITIONS [APPENDIX B]

A discussion of standard permit conditions is not included in the SWPPP. Refer to MSGP-2010 Appendix B in ***Attachment 3*** for additional information.

## 9.7 TERMINATION OR TRANSFER OF COVERAGE [1.4; 8.G.9; AND B.19]

### 9.7.1 Termination of Permit Coverage [1.4]

To terminate permit coverage, a complete and accurate Notice of Termination (NOT) form shall be submitted to the address listed in ***Section 7.6***. Other NOT options (i.e., electronic submission) may also be used if ADEQ makes the information available on the Internet or by public notice. The Project's authorization to discharge under the MSGP-2010 terminates at midnight of the day that a complete NOT form is received by ADEQ. An NOT shall be submitted within 30 calendar days after a new owner or operator assumes ownership of or has taken over responsibility for the Project.

An NOT shall also be submitted when there are not or no longer will be discharges of stormwater associated with industrial activity from the Project.

The permittee is responsible for meeting the terms and conditions of this permit until the Project's authorization is terminated.

#### *9.7.1.1 Termination of Permit Coverage for Sites Reclaimed After December 17, 1990 [8.G.9.1]*

A site or a portion of a site that has been released from applicable state or federal reclamation requirements after December 17, 1990, is not required to maintain coverage under MSGP-2010.

If the site or portion of a site reclaimed after December 17, 1990, was not subject to reclamation requirements, the site or portion of the site is not required to maintain coverage under MSGP-2010 if the site or portion of the site has been reclaimed as defined in ***Section 9.9.1.2***, below.

#### *9.7.1.2 Termination of Permit Coverage for Sites Reclaimed Before December 17, 1990 [8.G.9.2]*

A site or portion of a site that was released from applicable state or federal reclamation requirements before December 17, 1990, or that was otherwise reclaimed before December 17, 1990, is no longer required to maintain coverage under MSGP-2010 if the site or portion of the site has been reclaimed. A site or portion of a site is considered to have been reclaimed if:

1) Stormwater runoff that comes into contact with raw materials, intermediate byproducts, finished products, and waste products does not have the potential to cause or contribute to violations of state water quality standards;
2) Soil disturbing activities related to mining at the sites or portion of the site have been completed;
3) The site or portion of the site has been stabilized as necessary to minimize soil erosion; and

4) As appropriate depending on location, size, and the potential to contribute pollutants to stormwater discharges, the site or portion of the site has been revegetated, will be amenable to natural revegetation, or will be left in a condition consistent with the post-mining land use.

### 9.7.2 Transfer of Permit Coverage [1.3.1; and B.19]

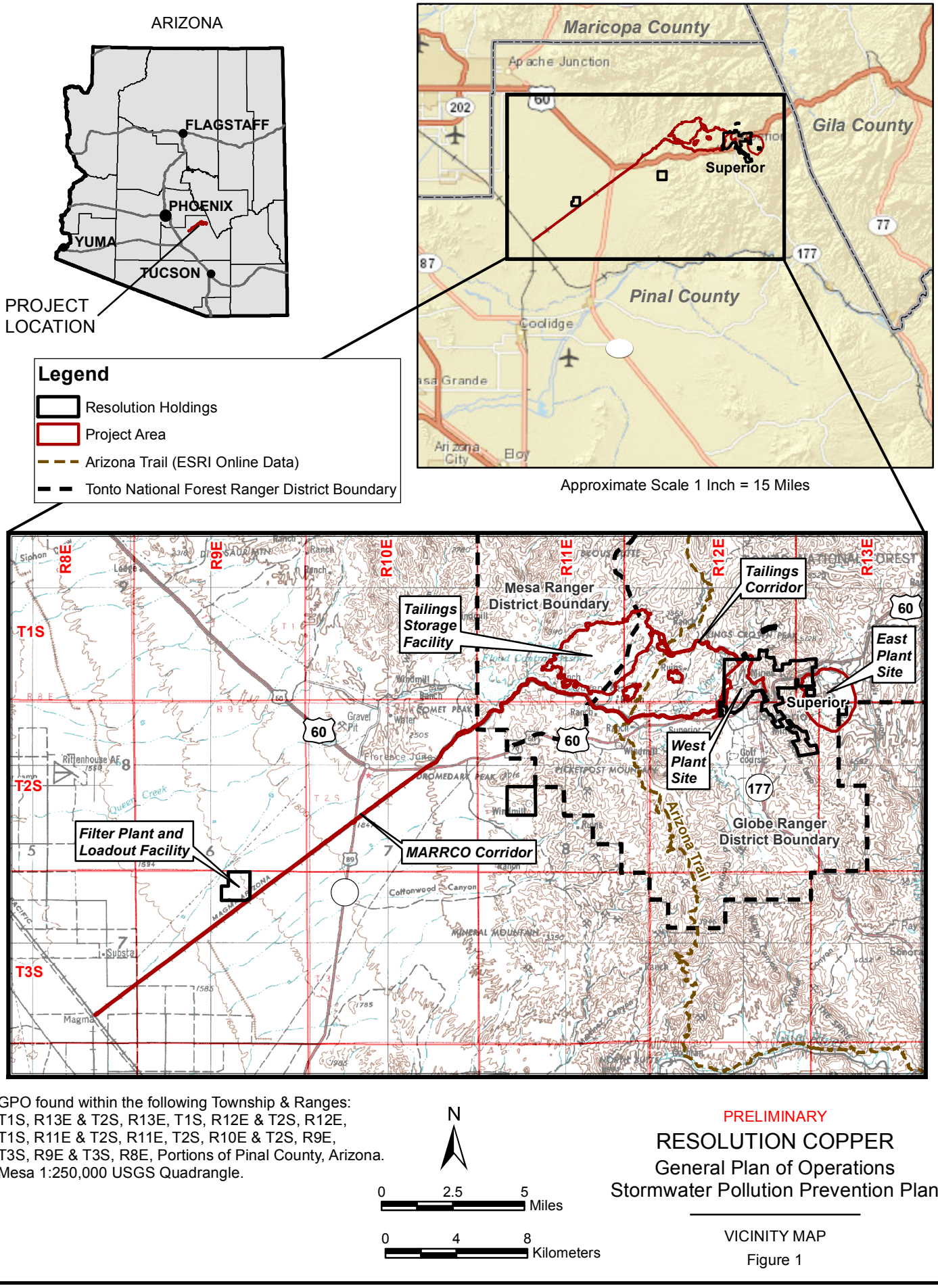
Transfer of coverage from one operator to another under the MSGP-2010 is not permitted. If the Project changes owner/operator, an NOI must be completed and filed by the *new* company at least seven (7) days prior to taking over operational control of the Project. A NOT must be submitted by the *old* owner/operator within 30 days after the new owner/operator has assumed responsibility for the Project. Blank NOI and NOT forms are provided in ***Attachment 15***. If such a change occurs, copies of the completed NOI and NOT forms will be maintained in ***Attachment 2***.

Simple name changes of the permittee (e.g., Company "A" changes name to "ABC, Inc.") may be done by filing an amended Notice of Intent referencing the Project's assigned permit number and requesting a simple name change.

## 10. SECTOR-SPECIFIC REQUIREMENTS FOR INDUSTRIAL ACTIVITY [8]

Requirements of Sector G – Metal Mining (Ore Mining and Dressing) [8.G] are incorporated into previous applicable sections of this document. Corresponding permit section numbers are included to facilitate compliance verification (i.e., 8.G.X).

# FIGURES




GPO found within the following Township & Ranges:
T1S, R13E & T2S, R13E, T1S, R12E & T2S, R12E,
T1S, R11E & T2S, R11E, T2S, R10E & T2S, R9E,
T3S, R9E & T3S, R8E, Portions of Pinal County, Arizona.
Mesa 1:250,000 USGS Quadrangle.

N

0 2.5 5 Miles

0 4 8 Kilometers

PRELIMINARY

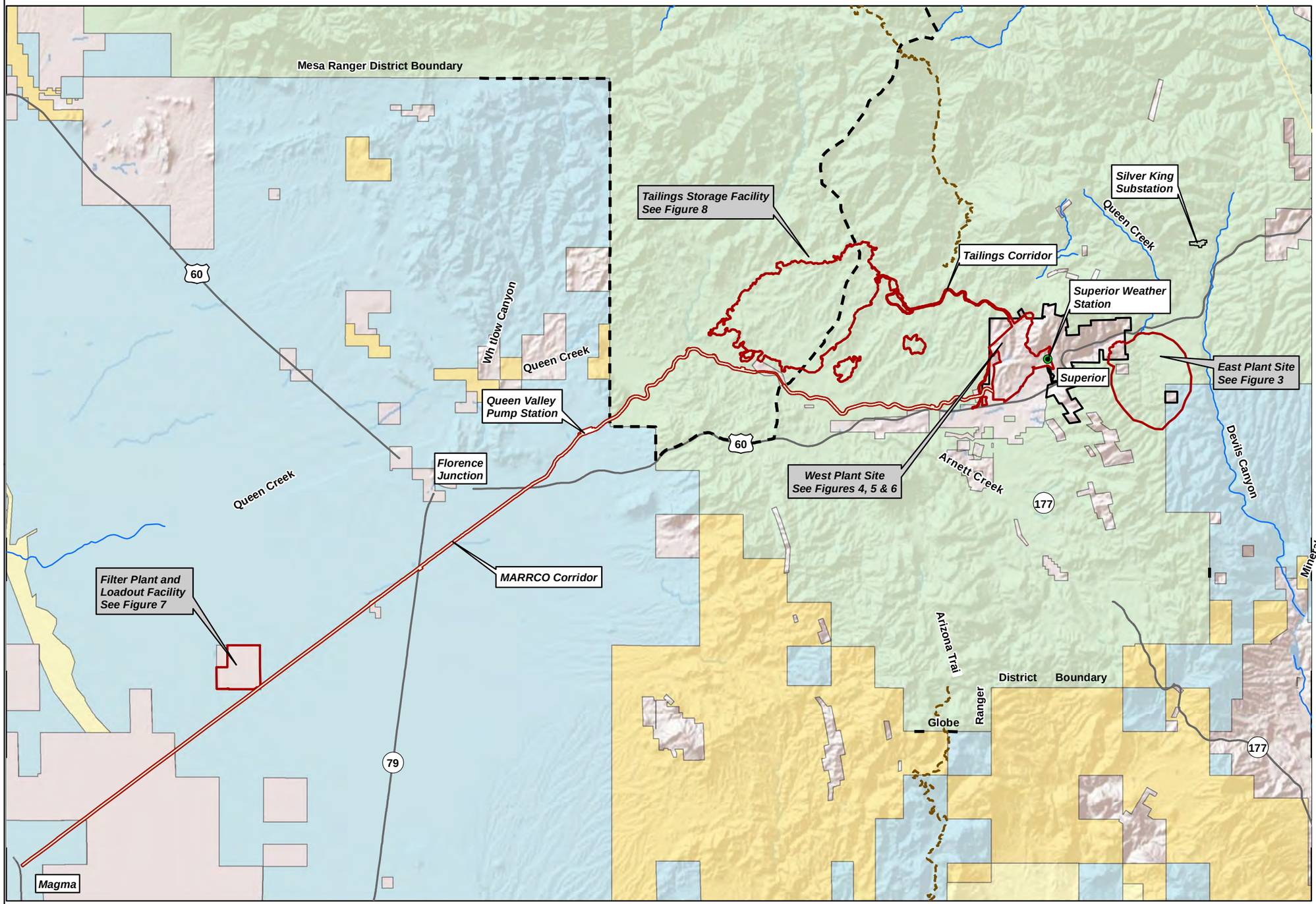
# RESOLUTION COPPER

## General Plan of Operations
## Stormwater Pollution Prevention Plan

VICINITY MAP

Figure 1

Path: M:\Jobs\800's\807.94\ENV\SWPPP&SpillPlan\SWPPP\Figures_07_03_2014\MXD_Figures\Fig2_SWPPP_Overview.mxd




**Legend**

- Resolution Holdings
- Project Area
- Arizona Trail (ESRI Online Data)
- Tonto National Forest Ranger District Boundary

**Surface Management (Source: BLM 2011)**

- Bureau of Land Management (BLM)
- Bureau of Reclamation
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

GPO found within the following Township & Ranges:
T1S, R13E & T2S, R13E, T1S, R12E & T2S, R12E,
T1S, R11E & T2S, R11E, T2S, R10E & T2S, R9E,
T3S, R9E & T3S, R8E, Portions of Pinal County, Arizona.
Mesa 1:250,000 USGS Quadrangle.

Image Source: ESRI Online World Shaded Relief

N

0 6,000 12,000 Feet

PRELIMINARY

# RESOLUTION COPPER

## General Plan of Operations
## Stormwater Pollution Prevention Plan

OVERVIEW MAP
Figure 2

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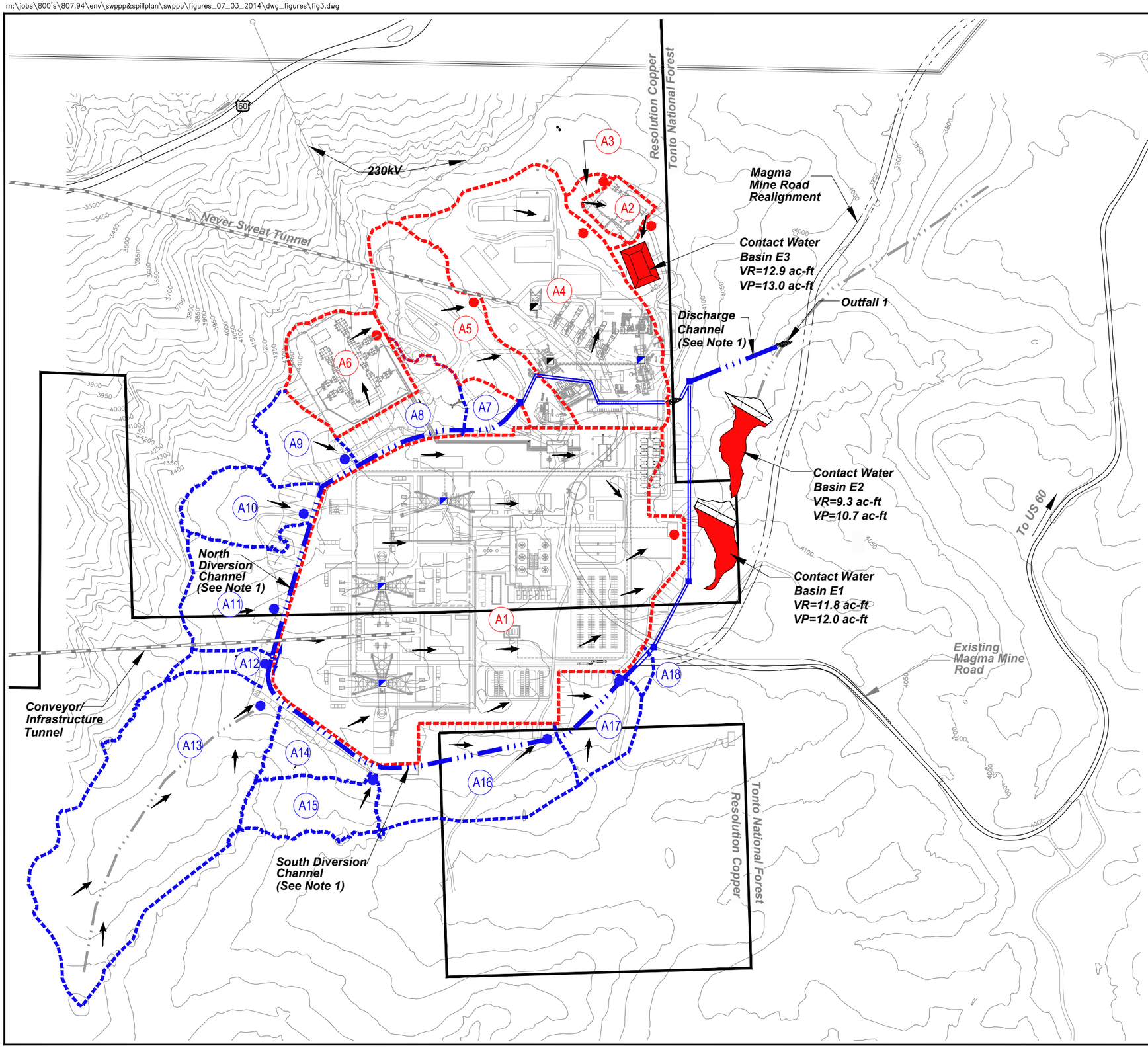


**Legend**

- Resolution Holdings
- Existing Mine Shaft
- Mine Shaft
- Onsite Concentration Point
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Non-Contact Water Channel/Drainage
- Existing Drainage
- Drainage Vault
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 250 500 Feet

0 100 200 Meters

**Data Source: East Plant Facilities Provided by AMEC 2012**

**Note 1: Route Non-Contat Water to Existing Drainage Downstream of Contact Water Basin E1 & E2**

***Note: These preliminary SWPPP figures were created using the draft Stormwater Drainage Design Memorandum. Once a final alternative is selected, a map will be generated that complies with the industrial general permit at that time. The map is anticipated to identify, at a minimum, potential pollutant sources, Best Management Practices, and discharge outfalls as required by the current MSGP.***

PRELIMINARY

# RESOLUTION COPPER
## General Plan of Operations
## Stormwater Pollution Prevention Plan

EAST PLANT SITE
Figure 3

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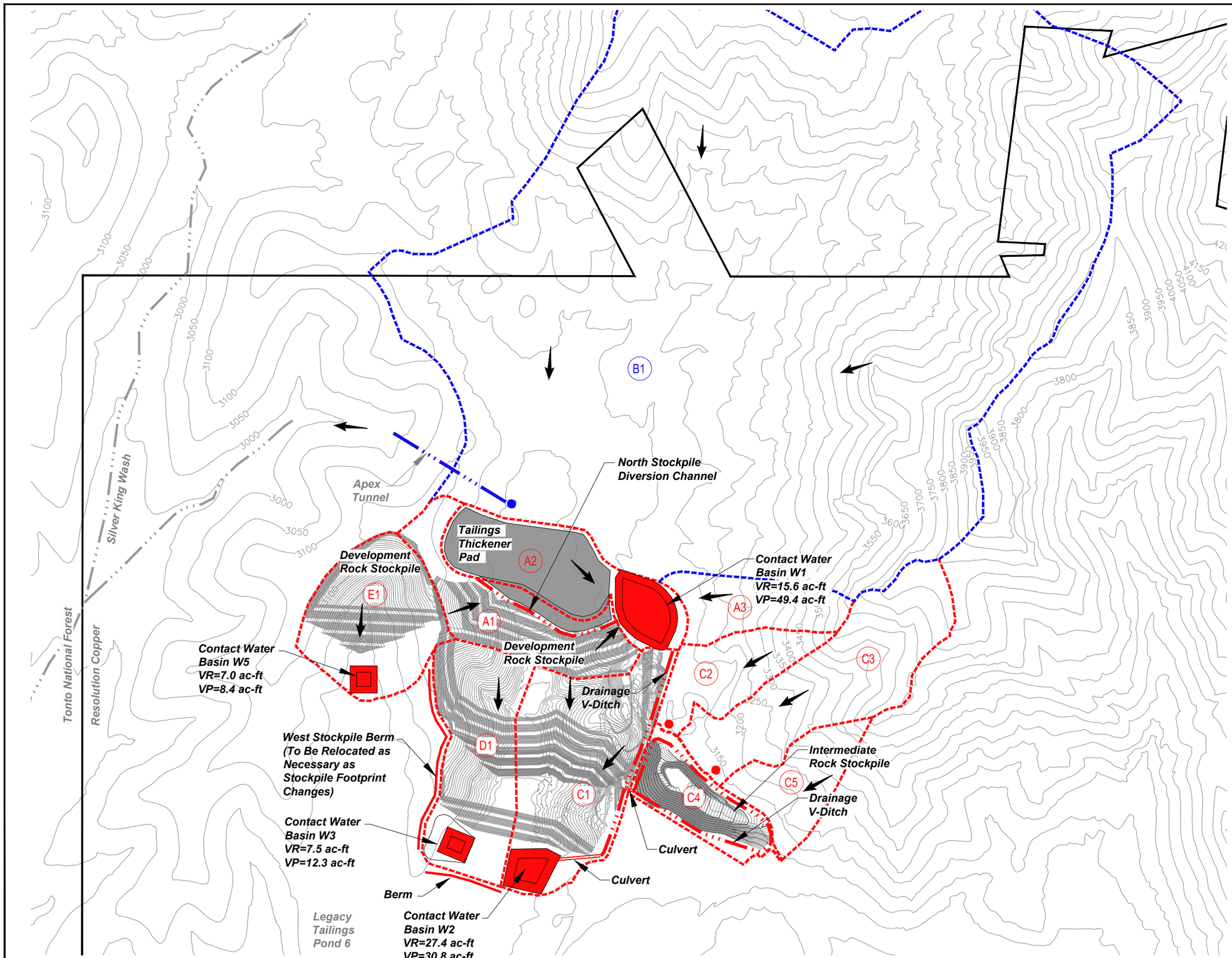


## Legend

- Resolution Holdings
- Onsite Concentration Point
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Contact Water Buried Culvert
- Non-Contact Water Channel/Drainage
- Contact Water Channel/Drainage
- Contact Water Berm
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

Data Source: West Plant Facilities
Provided by M3 Engineering
July 10, 2013

Development Rock Stockpile
Provided by Resolution Copper 2013

Intermediate Rock Stockpile
Provided by Golder Associates 2012

**Note: These preliminary SWPPP figures were created using the draft Stormwater Drainage Design Memorandum. Once a final alternative is selected, a map will be generated that complies with the industrial general permit at that time. The map is anticipated to identify, at a minimum, potential pollutant sources, Best Management Practices, and discharge outfalls as required by the current MSGP.**

PRELIMINARY

# RESOLUTION COPPER
## General Plan of Operations
## Stormwater Pollution Prevention Plan

WEST PLANT SITE
STOCKPILES
Figure 4

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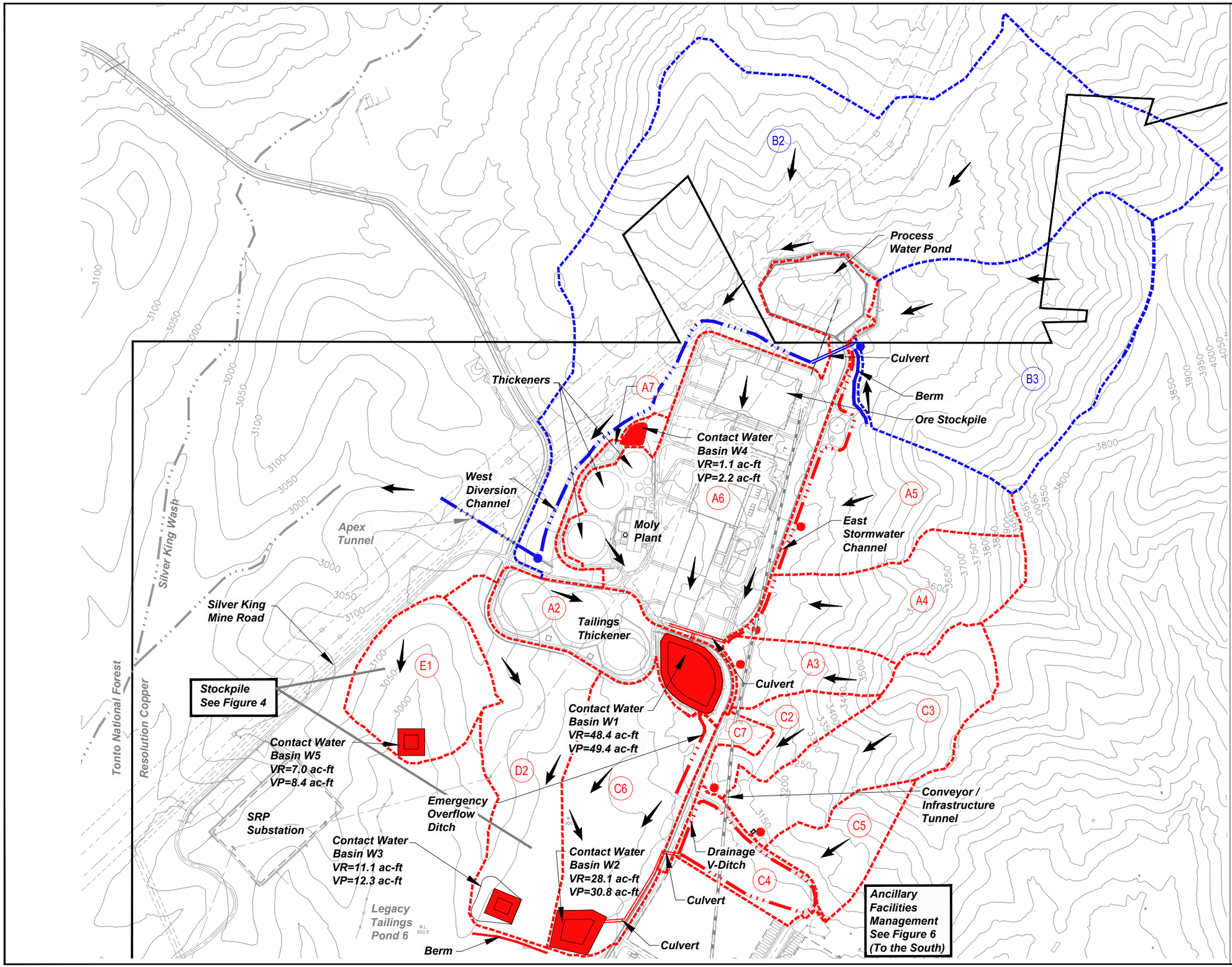


## Legend

- Resolution Holdings
- Onsite Concentration Point
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Contact Water Buried Culvert
- Non-Contact Water Channel/Drainage
- Contact Water Channel/Drainage
- Non-Contact Water Berm
- Contact Water Berm
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

Data Source:
West Plant Site Facilities
Provided by M3 Engineering
July 10, 2013

**Note: These preliminary SWPPP figures were created using the draft Stormwater Drainage Design Memorandum. Once a final alternative is selected, a map will be generated that complies with the industrial general permit at that time. The map is anticipated to identify, at a minimum, potential pollutant sources, Best Management Practices, and discharge outfalls as required by the current MSGP.**

PRELIMINARY

# RESOLUTION COPPER
## General Plan of Operations
## Stormwater Pollution Prevention Plan

WEST PLANT SITE
CONCENTRATOR COMPLEX
Figure 5

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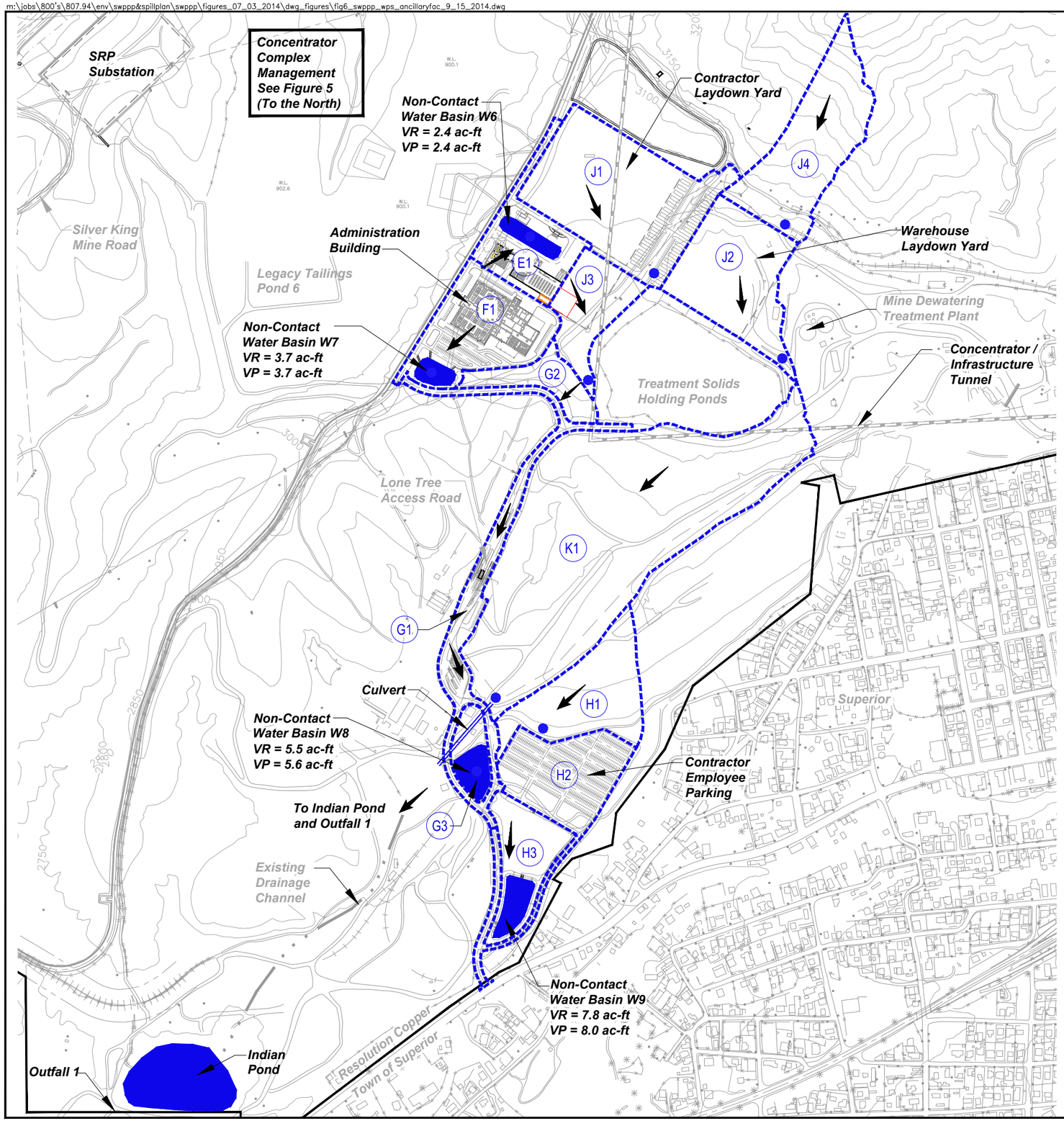


**Legend**

- Resolution Holdings
- Offsite Concentration Point
- A2 — Offsite Catchment
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

Data Source:
West Plant Site Ancillary Facilities
Provided by M3 Engineering
July 10, 2013

**Note: These preliminary SWPPP figures were created using the draft Stormwater Drainage Design Memorandum. Once a final alternative is selected, a map will be generated that complies with the industrial general permit at that time. The map is anticipated to identify, at a minimum, potential pollutant sources, Best Management Practices, and discharge outfalls as required by the current MSGP.**

PRELIMINARY

RESOLUTION COPPER
General Plan of Operations
Stormwater Pollution Prevention Plan

WEST PLANT SITE
ANCILLARY FACILITIES
Figure 6

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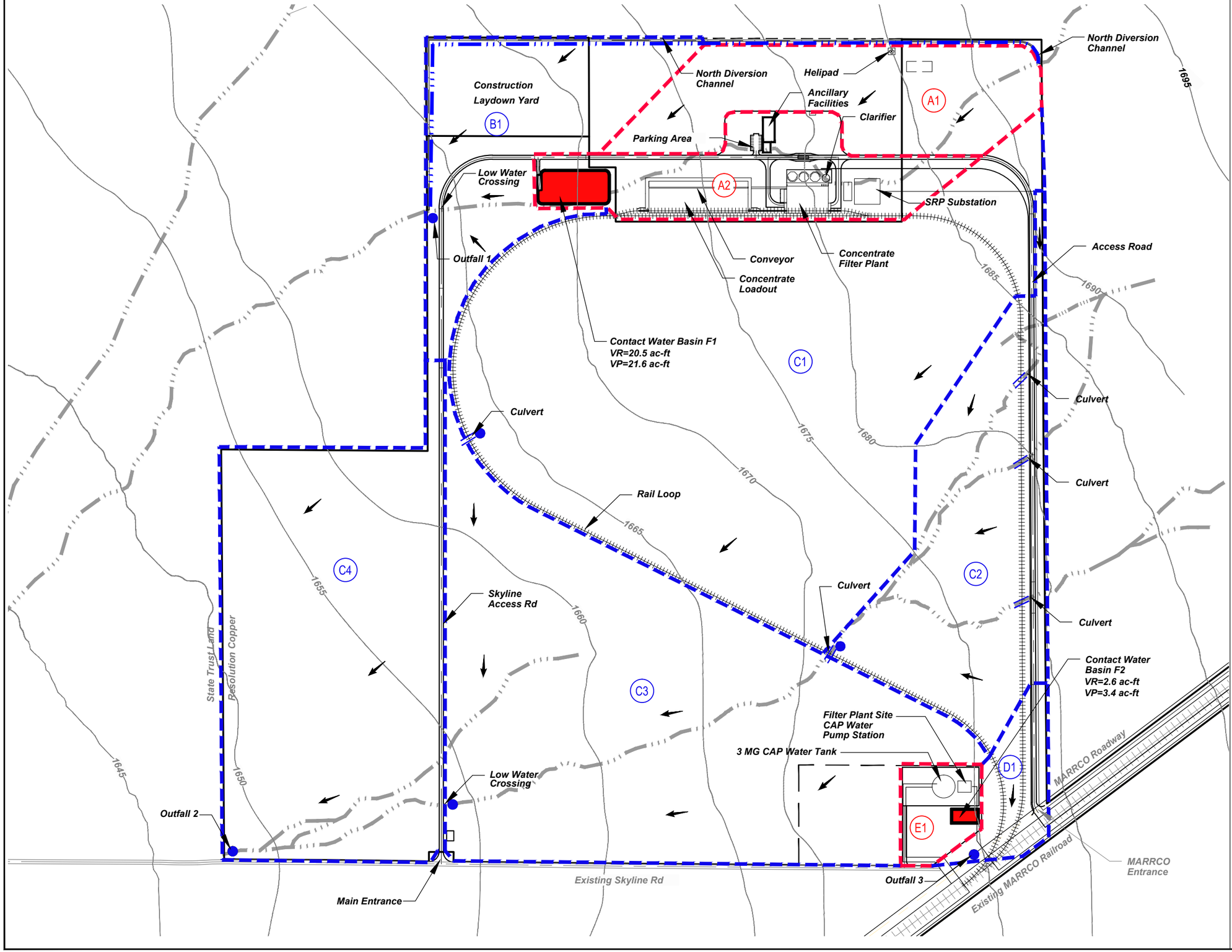



**Legend**

- Resolution Holdings
- Offsite Concentration Point
- A2 — Onsite Catchment
- A2 — Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Non-Contact Buried Culvert
- Non-Contact Water Channel/Drainage
- Existing Drainage
- VR = Volume Required
- VP= Volume Provided
- Direction of Surface Flow

N

0 300 600 Feet

0 100 200 Meters

Note:
Existing topography to be verified by current survey. All grades shown are subject to change.

Data Source:
Filter Plant and Loadout Facility
Provided by M3 Engineering
April, 2012

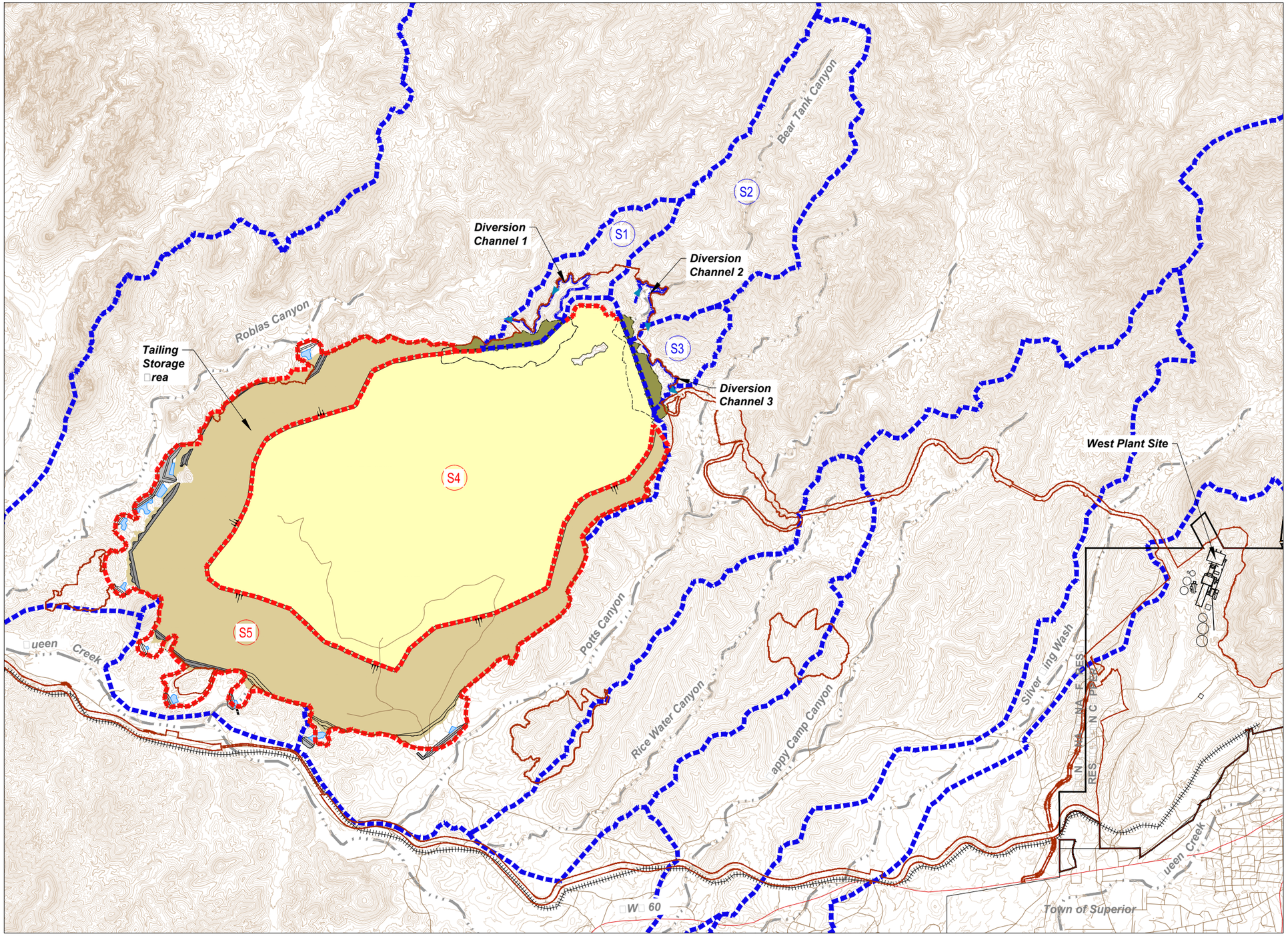
***Note: These preliminary SWPPP figures were created using the draft Stormwater Drainage Design Memorandum. Once a final alternative is selected, a map will be generated that complies with the industrial general permit at that time. The map is anticipated to identify, at a minimum, potential pollutant sources, Best Management Practices, and discharge outfalls as required by the current MSGP.***

PRELIMINARY

# RESOLUTION COPPER
## General Plan of Operations
## Stormwater Pollution Prevention Plan

FILTER PLANT AND LOADOUT FACILITY

Figure 7




**Legend**

- Resolution Holdings
- Project Area
- A2 Onsite Catchment
- A2 Offsite Catchment
- Onsite Watershed Boundary
- Offsite Watershed Boundary
- Existing Drainage
- Upstream Embankment Raise Fill
- Starter Dam
- Thickened Scavenger Tailings
- North Dams
- Seepage Collection Dam Pond

Topography Based on 1 Meter (3.3 Foot) Interval Contours Received From Resolution January, 2013.

N

0 1,500 3,000 Feet

0 500 1,000 Meters

***Note: These preliminary SWPPP figures were created using the draft Stormwater Drainage Design Memorandum. Once a final alternative is selected, a map will be generated that complies with the industrial general permit at that time. The map is anticipated to identify, at a minimum, potential pollutant sources, Best Management Practices, and discharge outfalls as required by the current MSGP.***

Klohn Crippen Berger

201

PRELIMINARY

# RESOLUTION COPPER

## General Plan of Operations
## Stormwater Pollution Prevention Plan

TAILINGS STORAGE FACILITY

Figure 8

# ATTACHMENTS

# *Attachment 1:*
# *Exploration and Construction Phase Activities [8.G.4]*

*Note: ADEQ recommends that requirements associated with exploration and construction phases of mining be kept as a separate chapter or appendix in the facility's SWPPP to distinguish from other mining operations.*

Clearing, grading, and excavation activities being conducted as part of the exploration and construction phases at mining sites are covered under MSGP-2010 (or may be covered under an alternate AZPDES stormwater permit such as the AZPDES General Permit for Discharge from Construction Activities (AZG2008-001)) if they disturb **one acre or more**. Clearing, grading, and excavation activities being conducted as part of the exploration and construction phases at mining sites and disturbing less than one acre do not require permit coverage unless they are integrally related to other exploration or construction activities that collectively disturb one acre or more.

The exploration phase "entails exploration and land disturbance activities to delineate the dimensions and financial viability of a metal mining site." The construction phase includes (1) the *initial* building of site access roads and *initial* removal of overburden and waste rock to expose mineable materials at a mining site and (2) any subsequent construction activity on undisturbed areas of an existing mine property if stormwater discharges from such activity are not managed by pre-existing or permanent control measures.

Once the areas subject to clearing, grading, and excavation activities being conducted as part of the exploration and construction phases at a mining site are stabilized or the area(s) become part of the mining operation, the control measures, inspections, monitoring, and other requirements in MSGP-2010 Part 8.G.4 is no longer required; however, the facility remains subject to Parts 1 through 7, Parts 8.G.5 through 8.G.9, and all other applicable provisions of this permit.

There are no portions of the Resolution Project that are currently in the construction or exploration phase and that discharge stormwater to downstream receiving waters. As such, this provision of the MSGP-2010 does not currently apply at the Resolution Project.

Permit No. AZMSG2010-003

ADEQ Arizona Department of Environmental Quality

**STATE OF ARIZONA**
**DEPARTMENT OF ENVIRONMENTAL QUALITY**
**WATER QUALITY DIVISION**
**PHOENIX, ARIZONA 85007**

# ARIZONA POLLUTANT DISCHARGE ELIMINATION SYSTEM GENERAL PERMIT FOR STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY – MINERAL INDUSTRY TO WATERS OF THE UNITED STATES

This permit provides authorization to discharge under the Arizona Pollutant Discharge Elimination System (AZPDES) program, in compliance with the provisions of the Arizona Revised Statutes, Title 49, Chapter 2, Article 3.1, the Arizona Administrative Code (A.C.C.), Title 18, Chapter 9, Articles 9 and Chapter 11, Article 1, and the Clean Water Act as amended (33 U.S.C. 1251 et seq.).

This general permit specifically authorizes stormwater discharges associated with category iii, Mineral Industry sites, pursuant to 40CFR 122.26(b)(14) in Arizona. All discharges authorized by this general permit shall be consistent with the terms and conditions of this general permit.

This general permit becomes effective on February 1, 2011.

This general permit and the authorization to discharge expire at midnight, January 31, 2016.

Signed this 20th day of December, 2010.

**ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY**

Michael A Fulton, Director
Water Quality Division

**AZPDES MULTI-SECTOR GENERAL PERMITS FOR STORMWATER DISCHARGES ASSOCIATED WITH INDUSTRIAL ACTIVITY – MINERAL INDUSTRY**

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## 1.0 Coverage under this Permit

### 1.1 Eligibility.

#### 1.1.1 Facilities Covered

This general permit authorizes stormwater discharges associated with "industrial activities" as defined in Appendix A from facilities having primary industrial activities included in Table 1-1. This permit is not authorized for use by facilities with stormwater discharges associated with industrial activities on any Indian Country lands in Arizona. USEPA Region 9 is the permitting authority for Indian lands in Arizona.

Permit eligibility is limited to discharges from facilities of industrial activity in Sectors G and J (i.e., the "mining sectors"), summarized in Table 1-1. These sector descriptions are based on Standard Industrial Classification (SIC) Codes and Industrial Activity Codes. References to "sectors" in this permit (e.g., sector-specific monitoring requirements) refer to these groupings.

**Table 1-1. Mining Sectors of Industrial Activity Covered by This Permit Derived from Category (iii) of 40 CFR 122.26(b)(14)**

| Subsector (May be subject to more than one sector/subsector) | SIC Code or Activity Code[1] | Activity Represented |
|---|---|---|
| **SECTOR G: METAL MINING (ORE MINING AND DRESSING)** | | |
| G1 | 1021 | Copper Ore and Mining Dressing Facilities |
| G2 | 1011 | Iron Ores |
| | 1021 | Copper Ores |
| | 1031 | Lead and Zinc Ores |
| | 1041, 1044 | Gold and Silver Ores |
| | 1061 | Ferroalloy Ores, Except Vanadium |
| | 1081 | Metal Mining Services |
| | 1094, 1099 | Miscellaneous Metal Ores |
| **SECTOR H: RESERVED (COAL MINES AND COAL MINING-RELATED FACILITIES)** | | |
| **SECTOR I: RESERVED (OIL AND GAS EXTRACTION)** | | |
| **SECTOR J: NON-METALLIC MINERAL MINING AND DRESSING** | | |
| J1 | 1442 | Construction Sand and Gravel |
| | 1446 | Industrial Sand |
| J2 | 1411 | Dimension Stone |
| | 1422-1429 | Crushed and Broken Stone, Including Rip Rap |
| | 1481 | Non-metallic Minerals Services, Except Fuels |
| | 1499 | Miscellaneous Non-metallic Minerals, Except Fuels |
| J3 | 1455, 1459 | Clay, Ceramic, and Refractory Materials |
| | 1474-1479 | Chemical and Fertilizer Mineral Mining |

[1] A complete list of SIC Codes (and conversions from the newer North American Industry Classification System" (NAICS) can be obtained from the Internet at **http://www.osha.gov/pls/imis/sicsearch.html** or in paper form from various locations in the document titled *Handbook of Standard Industrial Classifications*, Office of Management and Budget, 1987. Much of the information in the 1987 *Handbook* can be obtained from the Internet at **http://www.osha.gov/pls/imis/sic_manual.html**. Conversions from the NAICS can be obtained from the Internet at **www.census.gov/epcd/www/naics.html**

### 1.1.2 Allowable Stormwater Discharges.

Unless otherwise ineligible under Part 1.1.4, the following are eligible for discharge under this permit:

1. Stormwater discharges associated with industrial activity for any primary industrial activities and co-located industrial activities authorized under this permit, as defined in Appendix A;
2. Discharges designated by ADEQ as needing a stormwater permit as provided in Sector AD;
3. Discharges that are not otherwise required to obtain AZPDES permit authorization but are commingled with discharges that are authorized under this permit; and
4. Discharges subject to any of the effluent limitations guidelines listed in Table 1-2.

**Table 1-2. Stormwater Specific Effluent Limitations Guidelines**

| Regulated Discharge | 40 CFR Section | MSGP Sector |
|---|---|---|
| Mine dewatering discharges at crushed stone, construction sand and gravel, or industrial sand mining facilities | Part 436, Subparts B, C, and D | J |

### 1.1.3 Allowable Non-Stormwater Discharges.

Discharges from emergency fire-fighting activities are an allowable non-stormwater discharge activity without regard to the receiving water. The following non-stormwater discharges are allowed under this permit provided they are ancillary to the permitted use:

1. Fire fighting system testing and maintenance, including hydrant flushings;
2. Discharges related to installation and maintenance of potable water supply systems, including disinfection and flushing activities, discharges resulting from pressure releases or overflows, and discharges from wells approved by ADEQ for drinking water use;
3. Uncontaminated condensate from air conditioners, evaporative coolers, and other compressors and from the outside storage of refrigerated gases or liquids;
4. Irrigation drainage and irrigation line flushing;
5. Landscape watering provided all pesticides, herbicides, and fertilizer have been applied in accordance with the approved labeling;
6. Pavement wash waters where no detergents are used and no spills or leaks of toxic or hazardous materials have occurred (unless all spilled material has been removed);
7. Routine external building washdown that does not use detergents;
8. Water used to control dust, provided effluent or other wastewaters are not used;
9. Uncontaminated groundwater or spring water;
10. Foundation or footing drains where flows are not contaminated with process materials such as solvents;
11. Incidental windblown mist from cooling towers that collects on rooftops or adjacent portions of the facility, but not intentional discharges from the cooling tower (e.g., "piped" cooling tower blowdown or drains);

12. Hydrostatic testing of new pipes, tanks or vessels using potable water, surface water, or uncontaminated groundwater;
13. Discharges of water associated with drilling, rehabilitation and maintenance of potable or non-potable water wells and piezometers, or water supply or water quality evaluations including:
    a. Discharges from any borehole not fully developed;
    b. Well purging;
    c. Well/aquifer pump tests not associated with groundwater remediation activities;
    d. Backflushing of injection wells provided the discharge meets applicable water quality standards; and
14. Non-stormwater discharges subject to an effluent limitation guideline listed in Table 1-2.

### 1.1.4 Limitations on Coverage.

***1.1.4.1 Discharges Mixed with Non-Stormwater.*** Stormwater discharges that are mixed with non-stormwater, other than allowable non-stormwater discharges listed in Part 1.1.3 are not eligible for coverage under this permit.

***1.1.4.2 Stormwater Discharges Associated with Construction Activity.*** Stormwater discharges associated with construction activity are eligible for coverage under this permit, as specified in Sectors G and J of Part 8 of this permit.

***1.1.4.3 Discharges Currently or Previously Covered by another Permit.*** Unless the permittee receives written notification from ADEQ specifically allowing these discharges to be covered under this permit, the following are not eligible for coverage under this general permit:

1. Stormwater or non-stormwater discharges associated with industrial activity that is currently covered under an individual AZPDES permit or an alternative AZPDES general permit and has established numeric water quality-based limitations developed for the stormwater component of the discharge; or
2. Discharges for which any AZPDES permit has been or is in the process of being denied, terminated, or revoked by ADEQ (this does not apply to the routine reissuance of permits every five years).

***1.1.4.4 Stormwater Discharges Subject to Effluent Limitations Guidelines.*** For stormwater discharges subject to effluent limitation guidelines under 40 CFR, Subchapter N, only those discharges identified in Table 1-2 are eligible for coverage under this permit.

***1.1.4.5 New Dischargers to Water Quality Impaired Waters.*** A new discharger to an impaired water, as defined in Appendix A, is not automatically eligible for coverage under this permit.

1. To receive authorization under this permit, the applicant shall make one of the following demonstrations and retain such data and other technical information onsite with the stormwater pollution prevention plan (SWPPP):
    a. That the facility will employ measures to prevent all exposure to stormwater of the pollutant(s) for which the waterbody is impaired; or
    b. That the discharge from the site has no potential to contain the pollutants causing impairment; or
    c. That the discharge is not expected to cause or contribute to an exceedance of an applicable water quality standard. The applicant shall demonstrate either:
        i. The discharges are subject to stormwater control measures such that the discharges meet the applicable water quality standard, for the parameter causing the impairment, at the point of discharge into the waterbody; or

ii. The discharges are consistent with the provisions of the TMDL, including established TMDL allocations and implementation plans.

*Note:* Pursuant to A.A.C. R18-11-109(D)(2), if a receiving water is impaired for suspended solids, turbidity or sediment/ sedimentation, a operator seeking authorization to discharge under this permit may satisfy the requirement of Part 1.1.4.5(1)(c)(i) either by discharging only within the first 48 hours after a local storm event, or by demonstrating that any discharge after that time satisfies the requirements of Part 1.1.4.5(1)(c)(i).

2. The applicant shall submit:
   a. The NOI in accordance with Part 1.3.1;
   b. A copy of the SWPPP. The SWPPP shall describe how the permittee will monitor for pollutants of concern in the discharge in accordance with Part 6.2.3; and
   c. The necessary information or documentation related to the demonstration selected above.
3. If the proposed discharge is to an upstream tributary within 2.5 miles of a water or portion thereof classified as impaired, the applicant shall submit a copy of the SWPPP.
4. Within 32 business days of receipt of information required in Part 1.1.4.5 (2) or (3), ADEQ will notify the applicant in writing that:
   a. It is acceptable to proceed under the general permit;
   b. The SWPPP is incomplete or otherwise deficient and must be revised. The applicant shall submit to ADEQ for review the revised SWPPP that addresses the deficiencies as identified in the notification; or
   c. It is not eligible for coverage under this permit and must apply for an individual permit under Part 1.6.
5. A new discharger to an upstream tributary within 2.5 miles of an impaired water is not required to meet the eligibility requirements set forth above, but must submit a copy of the SWPPP with the NOI and is subject to the additional evaluation requirements set forth in Part 1.3.1(2)(c).

#### *1.1.4.6 Discharges to Outstanding Arizona Waters.*

1. No new or expanded discharges directly to a water or portion thereof classified as an outstanding Arizona water (OAW) (see A.A.C. R18-11-112) are authorized under this permit.
2. New or expanded discharges to tributaries upstream of a water or portion thereof classified as an OAW are not automatically eligible for coverage under this permit. To receive authorization for a new or expanded discharge to a tributary upstream of a water or portion thereof classified as an OAW, the applicant shall:
   a. Submit the NOI in accordance with Part 1.3.1;
   b. Prepare a SWPPP that demonstrates the discharge will not degrade existing water quality in the downstream OAW and retain documentation supporting this demonstration onsite with the SWPPP. Information relevant to this demonstration may include, but is not limited to, some or all of the following: (1) the distance between the discharge and the water or portion thereof that is OAW; (2) the estimated size (volume) and duration of the discharge; (3) the expected frequency of the discharge; (4) the expected characteristics of the discharge; and (5) the known or expected water quality of the water or portion thereof that is the OAW during storm events; and
   c. If the proposed discharge is to an upstream tributary within 2.5 miles of a water or portion thereof classified as an OAW, submit a copy of the SWPPP that includes a sampling and analysis plan to collect data appropriate to verify the demonstration in subsection b, above.

3. Within 32 business days of receipt of information required in Part 1.1.4.6 (2), ADEQ will notify the applicant in writing that:
   a. It is acceptable to proceed under the general permit;
   b. The SWPPP is incomplete or otherwise deficient and must be revised. The applicant shall submit to ADEQ for review the revised SWPPP, including any additional parameter identified in accordance with Part 6.2.4, that addresses the deficiencies as identified in the notification; or
   c. It is not eligible for coverage under this permit and must apply for an individual permit under Part 1.6.

### 1.2 Permit Compliance.

Any noncompliance with any of the requirements of this permit constitutes a violation of the Clean Water Act and A.R.S. Title 49, Chapter 2, Article 3.1.

### 1.3 Authorization under this Permit.

#### 1.3.1 Obtaining Authorization to Discharge.

1. Before obtaining authorization under this permit, the applicant shall:
   a. Ensure the facility is located in Arizona on land that is outside of Indian Country;
   b. Ensure that the facility meets the Part 1.1 eligibility requirements;
   c. Select, design, install, and implement control measures in accordance with Part 2.1;
   d. Develop a SWPPP according to the requirements in Part 5 of this permit. An applicant seeking authorization for a new discharge to or within 2.5 miles of an impaired water (see Part 1.1.4.5) or for a new or expanded discharge within 2.5 miles of an Outstanding Arizona Water (see Part 1.1.4.6) is required to submit a copy of the SWPPP, to the Department for review, along with the NOI in subsection (e);
   e. Submit to the Department a complete and accurate Notice of Intent (NOI) Form (either an original, or a photocopy/reproduction) in accordance with A.A.C. R18-9-C901(D) to the address listed in Part 7.6. Other NOI options (i.e., electronic submission) may also be used if ADEQ makes the information available on the Internet or by public notice.

      If the facility has the potential to discharge to a regulated municipal separate storm sewer system (MS4), the applicant must provide:
      - The name of the MS4 operator in Section E of the NOI; and
      - Name of closest surface water receiving the discharge.

      The NOI form is available at http://www.azdeq.gov/environ/water/permits/stormwater.html

2. Authorization to Discharge

   a. Routine Authorizations

      Unless otherwise notified, the applicant is authorized to discharge stormwater from an eligible facility upon either: receipt of the Authorization to Discharge; or 7 calendar days after a complete and accurate NOI is received by the Department, whichever is earlier. However, in order to rely on this 7 calendar day provision, the operator must submit the NOI in a manner that documents the date of ADEQ's receipt (i.e., certified mail, hand delivery, fax, etc.).

   b. Authorizations to Discharge for New Dischargers to Impaired Waters and New or Expanded Discharges to Tributaries of OAWs

      Unless otherwise notified, an applicant subject to Part 1.1.4.5 or 1.1.4.6 is authorized to discharge stormwater from an eligible facility upon receipt of the Authorization to

Discharge or 32 business days after a complete and accurate NOI is received by the Department, whichever is earlier.

c. NOIs Requiring Additional Evaluation.

ADEQ may inform an applicant that authorization to discharge will not occur for up to 32 business days in the event that screening of the NOI provides information requiring further evaluation. ADEQ's notification may be made either in writing, electronically, by fax or phone. The notification typically will be made within 7 calendar days after receipt of the NOI. Applicants who receive notice of a delay in coverage may discharge 32 business days after the date the NOI is received unless further notice is received from ADEQ during this timeframe. Such notice may confirm authorization to discharge, or request additional information to comply with the requirements of this permit.

d. Requirement to Obtain Alternate Coverage.

ADEQ may require the operator to submit an application for an individual AZPDES permit, as detailed in Part 1.6.1. In these instances, ADEQ will notify the operator in writing of: 1) the delay; or 2) the request for submission of an individual AZPDES permit application.

e. Discharges to a regulated MS4.

Permittees with discharges to a regulated MS4 shall submit to the MS4 operator a copy of the Department's Authorization to Discharge.

3. Incomplete NOI Submitted. If ADEQ notifies the applicant that an NOI is incomplete or incorrect, the applicant must resubmit an amended NOI if the applicant still intends to obtain (or retain) coverage under this permit.

4. The time frames for discharge authorization are presented in Table 1-3, below.

**Table 1-3. NOI Submittal Deadlines**

| Category | NOI Submission Deadline | Discharge Authorization Status |
|---|---|---|
| **Existing Dischargers –** authorized for coverage under MSGP 2000. | The operator shall revise SWPPP documents to conform with this permit and apply for coverage no later than *May 31, 2011.* | Coverage under the MSGP 2000 is administratively continued until ADEQ:<br>• Grants the applicant coverage under this permit (in accordance with Part 1.3.1(2)); or<br>• Issues or denies an alternative permit in accordance with Part 1.6.1. |
| **Other Eligible Dischargers –** in operation prior to the effective date of this permit, but did not obtain coverage under the MSGP 2000 or another AZPDES permit. | The operator shall develop SWPPP documents to conform with this permit and apply for coverage no later than *May 31, 2011.* | Coverage will begin upon ADEQ issuance of an Authorization to Discharge (in accordance with Part 1.3.1(2)). |
| **New Dischargers –** will commence discharging after the effective date of this permit | As soon as possible, and at least 32 business days before discharge is anticipated. | Coverage begins upon ADEQ's issuance of an Authorization to Discharge (in accordance with Part 1.3.1(2)). |

| Table 1-3. NOI Submittal Deadlines | | |
|---|---|---|
| **Category** | **NOI Submission Deadline** | **Discharge Authorization Status** |
| **Change of ownership** and/ or operation to a new owner/operator of an existing facility (discharger) whose discharge is authorized under this permit. | Permitted owner/ operator shall submit a NOT to ADEQ within 30 calendar days after the new owner/ operator assumes responsibility for the facility.<br>New owner/ operator shall submit a NOI to ADEQ 7 calendar days before taking over operational control or initiating activities at the facility. | New owner/ operator obtains coverage. |

### 1.3.2 Continuation of this Permit.

If this permit is not reissued or replaced prior to the expiration date, it will be administratively continued in accordance with A.A.C. R18-9-C903(A) and remain in force and effect. If the operator is authorized to discharge under this permit prior to the expiration date, any discharges authorized under this permit will automatically remain covered by this permit until the earliest of:

1. The operator submits a timely, complete, and accurate NOI requesting authorization to discharge under a renewal or revision of this permit and ADEQ issues an Authorization to Discharge; or
2. The operator submits a Notice of Termination; or
3. ADEQ denies coverage under this general permit or denies or issues coverage under an individual permit or other alternative permit for the facility's discharges; or
4. A formal permit decision is made by ADEQ not to reissue this general permit, at which time ADEQ will identify a reasonable time period for covered dischargers to seek coverage under an alternative general permit or an individual permit. Coverage under this permit will cease at the end of this time period.

## 1.4 Terminating Coverage.

To terminate permit coverage, the permittee shall submit a complete and accurate Notice of Termination (NOT) form to the address listed in Part 7.6. Other NOT options (i.e., electronic submission) may also be used if ADEQ makes the information available on the Internet of by public notice. The facility's authorization to discharge under this permit terminates at midnight of the day that a complete NOT form is received by the department. The permittee shall submit an NOT within 30 calendar days after a new owner or operator assumes ownership of or has taken over responsibility for the facility.

The permittee shall also submit an NOT when there are not or no longer will be discharges of stormwater associated with industrial activity from the facility.

The permittee is responsible for meeting the terms and conditions of this permit until the facility's authorization is terminated.

## 1.5 Inactive and Unstaffed Sites – Conditional Exemption from No Exposure Requirements.

Permit holders of inactive and unstaffed mining facilities may qualify for reduced inspections and monitoring provisions of the no exposure provisions of Parts 4.4 and 6.2.1.3, without certifying "there are no industrial materials or activities exposed to stormwater". This exemption is predicated on the following:

- To the extent practicable, the permittee shall implement the following control measures:
  - Industrial materials used in the operations will be removed, covered or kept in appropriate containers or within containment if applicable so as to minimize discharges of stormwater associated with industrial activity as outlined in the facility's SWPPP; and
  - Stockpiles, waste rock, tailings and other spoil or waste piles shall be protected from erosion and/ or downstream catchments shall be installed and maintained.
- If circumstances change and the facility becomes active and/or staffed, this exemption no longer applies and the permittee shall immediately begin complying with the inspection requirements as if the facility were in the first year of permit coverage, including the requirements for the routine quarterly inspections (Part 4.1), wet season visual assessments (Part 4.2), the annual comprehensive facility inspections (Part 4.3) and applicable general analytical monitoring requirements (Part 6.2.1).
- ADEQ retains the authority to revoke this exemption and/or the monitoring waiver where it is determined that the discharge causes, has a reasonable potential to cause, or contribute to an exceedance of an applicable water quality standard, including designated uses.

To invoke the exemption for an inactive, unstaffed site, the permittee shall do the following:

- Maintain a statement in the SWPPP as required in Part 5.1.5.3 indicating that the site is inactive and unstaffed, in accordance with the substantive requirements of this section. The statement must be signed and certified in accordance with Appendix B, Subsection 9.
- If, during the period of coverage under this permit, the facility becomes qualified for the inactive and unstaffed exemption, the permittee shall include the same signed and certified statement as above and retain it with the facility's records pursuant to Part 5.4.

Subject to the requirements above, if the facility is inactive and unstaffed, the permittee is waived from the requirement to conduct routine facility inspections, wet season visual assessments and general analytical monitoring. The permittee shall conduct one comprehensive facility inspection (CFI) each calendar year in accordance with Part 4.3. The permittee shall also inspect the site whenever there is a reasonable expectation that severe weather or other events may have damaged control measures or increased discharges.

### 1.6 Alternative Permits.

#### 1.6.1 ADEQ Requiring Coverage under an Alternative AZPDES Permit.

ADEQ may require an operator to obtain authorization to discharge under either an individual AZPDES permit or an alternative AZPDES general permit in accordance with A.A.C. R18-9-C902(A). If ADEQ requires an operator to apply for an individual permit, any applications shall be submitted within 120 calendar days, unless ADEQ provides an extended deadline. In addition, a discharger already authorized under this permit, will be notified of a deadline to file a permit application. Coverage under this permit will terminate immediately if the facility fails to submit an individual AZPDES permit application by the specified deadline. ADEQ may take appropriate enforcement action for any unpermitted discharge.

#### 1.6.2 Permittee Requesting Coverage under an Alternative Permit.

An applicant may elect to forego coverage under this general permit by applying for an individual permit. In such a case, the applicant must submit an individual permit application in accordance with the requirements of A.A.C. R18-9-B901(B)(2) to the Department at the address listed in Part 7.6 and include reasons supporting the request. The request may be granted by issuance of an individual permit or authorization of coverage under an alternative general permit if the Department finds that the reasons are adequate to support the request.

When an individual AZPDES permit is issued to the applicant or the applicant is authorized to discharge under an alternative AZPDES general permit, the authorization to discharge under this permit is terminated on the effective date of the individual permit or the date of authorization of coverage under

the alternative general permit.

### 2.0 Control Measures, Numeric Effluent Limitations and Water Quality Standards.

In Part 2.1 (Control Measures) and in Part 8 (Sector-Specific Requirements for Industrial Activity), the term "minimize" means reduce and/or eliminate to the extent achievable using control measures that are technologically available, economically practicable and achievable in consideration of best industry practice to meet any applicable numeric effluent limitations in Part 2.2.1 and the water-quality based requirements in Parts 2.2.2 and 2.2.3.

The requirement to implement control measures in accordance with Part 2.1 applies to all facilities. Part 8 contains additional control measures imposed on a sector-specific basis. In some cases, sector-specific provisions in Part 8 modify the terms of the general control measures set forth in Part 2.1.

### 2.1 Control Measures.

The permittee shall select, design, install, and implement control measures (including best management practices), as appropriate, to ensure the discharge meets the requirements of Part 2.2. The selection, design, installation, and implementation of these control measures must be in accordance with good engineering practices and manufacturer's specifications. If construction or a change in design, operation, or maintenance at the facility significantly changes the nature of pollutants discharged in stormwater, or significantly increases the quantity of pollutants discharged, the permittee shall review the selection, design, installation, and implementation of the facility's control measures to determine if modifications are necessary to meet the requirements of this permit. If the facility's control measures are not achieving their intended effect of minimizing pollutant discharges, the permittee shall modify these and/or add additional control measures to meet requirements of this permit. Regulated stormwater discharges from the facility include stormwater run-on that commingles with stormwater discharges associated with industrial activity at the facility.

The permittee shall consider all of the control measures listed below for implementation at the facility and select those that the permittee determines are appropriate, given the nature of the site, to meet the requirements set forth in Parts 2.1.1 and 2.2. The control measures listed below are not intended to be an exclusive list of acceptable control measures. In preparing the SWPPP in accordance with the requirements in Part 5 of this permit, the permittee shall explain the basis for the selection of the control measures to be utilized at the facility.

#### 2.1.1 Control Measure Selection and Design Considerations.

The permittee shall assess the type and quantity of pollutants likely to discharge in stormwater or allowable non-stormwater from the site when designing and implementing control measures. The permittee shall select and design control measures incorporating one or more of the following principles:

- Preventing stormwater from coming into contact with polluting materials is generally more effective, and less costly, than trying to remove pollutants from stormwater;
- Using control measures in combination is more effective than using control measures in isolation for minimizing pollutants in the facility's stormwater discharge;
- Attenuating high discharge flows with such control measures as using open vegetated swales and natural depressions to reduce in-stream impacts of erosive flows;
- Conserving and/or restoring of riparian buffers help protect streams from stormwater runoff and improve water quality; and
- Using containment to intercept stormwater flows before they leave the site, such as directing flows to non-discharging areas (pits), or installing runoff containment.

***2.1.1.1 Minimize Exposure.*** The permittee shall minimize the exposure of manufacturing, processing, and material storage areas (including loading and unloading, storage, disposal, cleaning, maintenance, and fueling operations) to rain, snow, snowmelt, and runoff by implementing measures such as the following:

- Locating industrial materials and activities inside or protect them with storm resistant coverings (although significant enlargement of impervious surface area is not recommended)
- Covering fueling area(s) or minimize stormwater run-on/runoff to fueling area(s);
- Using grading, berming, or curbing to prevent runoff of contaminated flows and divert run-on away from these areas;
- Locating materials, equipment, and activities so that leaks are contained in existing containment and diversion systems (confine the storage of leaky or leak-prone vehicles and equipment awaiting maintenance to protected areas);
- Using spill/overflow protection and cleanup equipment;
- Draining fluids from equipment and vehicles prior to on-site storage or disposal;
- Performing all cleaning operations indoors, under cover, or in bermed areas that prevent runoff and run-on and also that capture any overspray; and
- Ensuring that all washwater drains to a proper collection system (i.e., not the stormwater drainage system).

The discharge of vehicle and equipment washwater, including tank cleaning operations, is not authorized by this permit. These wastewaters must be covered under a separate AZPDES permit, discharged to a sanitary sewer in accordance with applicable industrial pretreatment requirements, or disposed of otherwise in accordance with applicable law.

***2.1.1.2 Good Housekeeping.*** The permittee shall implement good housekeeping measures for all exposed areas that are potential sources of pollutants. Such measures may include:

- Sweeping at regular intervals;
- Keeping materials orderly and labeled;
- Storing materials in appropriate containers;
- Cleaning up spills and leaks promptly using dry methods (e.g., absorbents) to prevent the discharge of pollutants;
- Using drip pans and absorbents under or around leaky vehicles and equipment or store indoors where feasible.

***2.1.1.3 Maintenance.*** The permittee shall regularly inspect, test, maintain, and repair all industrial equipment and systems that have the potential for exposure to stormwater to avoid situations that may result in leaks, spills, and other releases of pollutants to stormwater discharged from the site. The permittee shall maintain all control measures and equipment in effective operating condition. Nonstructural control measures must also be diligently maintained (e.g., spill response supplies available, personnel appropriately trained). If the permittee discovers control measures are not achieving the intended effect of minimizing pollutant discharges (i.e., control measures need repair or replacement), the permittee shall make any necessary changes within 14 calendar days following discovery, or before the next measurable storm event (see Part 6.1.2.2), whichever is sooner, to ensure compliance with the applicable numeric effluent limitations in Part 2.2.1 and water quality-based limitations in Parts 2.2.2 and 2.2.3 of this permit. If necessary changes cannot be implemented within the specified timeframe(s), the permittee shall document with the SWPPP the reasons for the delay, a schedule for completing the necessary changes, date completed and any back-up control measures in place to ensure compliance with the applicable numeric effluent limitations in Part 2.2.1 and water quality-based limitations in Parts 2.2.2 and 2.2.3 of this permit should a runoff event occur while a control measure is off-line (either in part or in whole).

***2.1.1.4 Spill Prevention and Response Procedures.*** The permittee shall minimize the potential for leaks, spills and other releases that may be exposed to stormwater and develop plans for timely and effective clean-up of spills if or when they occur by implementing measures such as:

- Procedures for plainly labeling containers (e.g., "Used Oil," "Spent Solvents," "Fertilizers and Pesticides," etc.) that could be susceptible to spillage or leakage to encourage proper handling and facilitate rapid response if spills or leaks occur;
- Preventative measures such as barriers between material storage and traffic areas, secondary containment provisions, and procedures for material storage and handling;
- Procedures for expeditiously stopping, containing, and cleaning up leaks, spills, and other releases. Employees who may cause or detect a spill or leak should be knowledgeable in the proper reporting procedures established by their facility. Employees who are responsible for spill response and/or cleanup, must be properly trained and have necessary spill response equipment available; and
- Procedures for notification of appropriate facility personnel and emergency response. Where a leak, spill, or other release occurs that contains a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117, or 40 CFR Part 302, the permittee shall notify ADEQ Emergency Response Duty Office at (602) 771-2330 or, toll free, at (800) 234-5677. Contact information must be in locations that are readily accessible and available.

***2.1.1.5 Erosion and Sediment Controls.*** The permittee shall minimize on-site erosion and sedimentation, and the resulting discharge of pollutants by using methods such as:

- Stabilizing exposed areas;
- Containing runoff using structural and/or non-structural control measures;
- Placing flow velocity dissipation devices at discharge locations and within outfall channels where necessary to reduce erosion and/or settle out pollutants.

[*Note*: In selecting, designing, installing, and implementing appropriate control measures, permittees are encouraged to consult EPA's internet-based resources relating to BMPs for erosion and sedimentation, including the sector-specific Industrial Stormwater Fact Sheet Series, (www.epa.gov/npdes/stormwater/msgp), National Menu of Stormwater BMPs (www.epa.gov/npdes/stormwater/menuofbmps), and National Management Measures to Control Nonpoint Source Pollution from Urban Areas (www.epa.gov/owow/nps/urbanmm/index.html).]

***2.1.1.6 Management of Runoff.*** The permittee shall reduce stormwater runoff to minimize the discharge of pollutants from the facility by implementing control measures such as:

- Diverting, infiltrating, reusing, containing runoff, or
- Treating and/or recycling stormwater runoff collected.

[*Note*: In selecting, designing, installing, and implementing appropriate control measures, permittees are encouraged to consult EPA's internet-based resources relating to runoff management, including the sector-specific Industrial Stormwater Fact Sheet Series, (www.epa.gov/npdes/stormwater/msgp), National Menu of Stormwater BMPs (www.epa.gov/npdes/stormwater/menuofbmps), and National Management Measures to Control Nonpoint Source Pollution from Urban Areas (www.epa.gov/owow/nps/urbanmm/index.html).]

***2.1.1.7 Salt Storage Piles or Piles Containing Salt.*** The permittee shall enclose or cover storage piles of salt, or piles containing salt, used for deicing or other commercial or industrial purposes, including maintenance of paved surfaces. The permittee shall implement appropriate measures (e.g., good housekeeping, diversions, containment) to minimize exposure resulting from adding to or removing materials from the pile. Piles do not need to be enclosed or covered if stormwater runoff from the piles is not discharged or if discharges from the piles are authorized under another AZPDES permit.

***2.1.1.8 Sector Specific Control Measures.*** The permittee shall implement any additional control measures in the relevant sector-specific section(s) of Part 8, as appropriate.

***2.1.1.9 Employee Training.*** The permittee shall train all employees who work in areas where

industrial materials or activities are exposed to stormwater, or who are responsible for implementing activities necessary to meet the conditions of this permit (e.g., inspectors, maintenance personnel), including all members of the facility's stormwater pollution prevention team (see Part 5.1.1). Training must cover both the specific control measures used to achieve the requirements in Part 2.2 and (for those who will be involved in these activities) the monitoring, inspection, planning, reporting, and documentation requirements in other parts of this permit. Training shall be conducted at least annually (or more often if circumstances warrant, such as high employee turnover).

***2.1.1.10 Non-Stormwater Discharges.*** The permittee shall not allow any non-stormwater discharges from the facility unless they are specifically authorized in Part 1.1.3.

***2.1.1.11 Litter, Garbage and Floatable Debris.*** The permittee shall ensure that litter, garbage, and floatable debris are not discharged to surface waters by keeping exposed areas free of such materials or by intercepting them before they leave the site.

***2.1.1.12 Dust Generation and Vehicle Tracking of Industrial Materials.*** The permittee shall minimize generation of dust and off-site tracking of raw, final, or waste materials.

## 2.2 Numeric Effluent Limitations and Water Quality Standards.

### 2.2.1 Numeric Effluent Limitations Based on Effluent Limitations Guidelines.

Table 2-1 below identifies specific regulated activities with effluent limitations guidelines and the locations of effluent limitations guidelines in this permit. Discharges from such activities must meet the specified effluent limitations guidelines. Compliance with these effluent limits is to be determined based on discharges from these regulated activities independent of commingling with any other discharges allowed under this permit.

**Table 2-1. Applicable Effluent Limitations Guidelines**

| Regulated Activity | 40 CFR Part/Subpart | Effluent Limit |
|---|---|---|
| Mine dewatering discharges at crushed stone, construction sand and gravel, or industrial sand mining facilities | Part 436, Subparts B, C, or D | See Part 8.J.9 |

### 2.2.2 Water Quality Standards.

The permittee shall control discharge from the facility as necessary to not cause or contribute to an exceedance of an applicable water quality standard. ADEQ expects that compliance with other conditions in this permit will control discharges as necessary to not cause or contribute to an exceedance of an applicable water quality standard (A.A.C.R18-11, Article 1). However, if at any time the permittee becomes aware, or ADEQ determines, that the facility's discharge causes or contributes to an exceedance of an applicable water quality standard, the permittee shall take corrective action as required in Part 3.1, document the corrective actions as required in Parts 3.3 and 5.4, and report the corrective actions to ADEQ as required in Part 7.2.

Additionally, ADEQ may impose additional water quality-based requirements on a site-specific basis, or require the operator to obtain coverage under an individual permit in accordance with Part 1.6.1, if information in the Notice of Intent (NOI), required reports, or from other sources indicates the discharges are not controlled as necessary to not cause or contribute to an exceedance of an applicable water quality standard.

### 2.2.3 Discharges to Water Quality Impaired Waters.

***2.2.3.1 Existing Discharges to an Impaired Water with an Approved TMDL***. If the discharge is to an impaired water with or is otherwise referenced in an approved TMDL, the Department may require, as a condition of authorization, additional limits, controls, or monitoring necessary to be consistent with the assumptions of any available wasteload allocation in the TMDL. Alternatively, ADEQ will advise the permittee if coverage under an individual permit is necessary in accordance with Part 1.6.

***2.2.3.2 Existing Discharges to an Impaired Water without an Approved TMDL.*** If the discharge is to an impaired water without an approved TMDL, the permittee shall comply with Part 2.2.2 and the monitoring requirements of Part 6.2.3. This subsection applies to discharges directly to impaired waters as well as to situations where ADEQ determines that the facility's discharge is not controlled as necessary to meet water quality standards in a downstream water segment, even if the discharge is to a receiving water that is not specifically identified on a Section 303(d) list.

***2.2.3.3 New Discharges to an Impaired Water.*** If the permittee's authorization to discharge under this permit relied on Part 1.1.4.5 for a discharge to an impaired water, the permittee shall implement and maintain any control measures or conditions on the facility that enabled it to become eligible under Part 1.1.4.5. The permittee shall modify such measures or conditions as necessary in accordance with any Part 3 corrective actions. In addition, the permittee shall comply with Part 2.2.2 and the monitoring requirements of Part 6.2.3.

## 3.0 Corrective Actions.

### 3.1 Corrective Action Triggers.

### 3.1.1 Conditions Requiring Review and Revision of Control Measures to Eliminate a Problem.

If any of the following conditions occur resulting in or from a failure of a control measure, the permittee shall review the selection, design, installation, and implementation of the facility's control measures and revise as necessary to ensure that the condition is eliminated:

- An unauthorized discharge (e.g., discharge of non-stormwater not authorized by this or another AZPDES permit) to a water of the U.S. or to a regulated MS4 occurs at the facility (Part 2.1);
- A discharge violates a numeric effluent limitation guideline (Table 2-1);
- The permittee becomes aware, or ADEQ determines, that the facility's discharge causes or contributes to an exceedance of applicable water quality standard(s) (Part 2.2.2) or an adopted waste load allocation (WLA) (Part 2.2.3); or
- ADEQ, or an operator of a regulated MS4, determines that modifications to the control measures are necessary to meet the requirements of Part 2.2.

### 3.1.2 Substantially Identical Outfalls.

If the event triggering corrective action is linked to an outfall that represents other substantially identical outfalls, the facility's review must assess the need for corrective action for each outfall represented by the outfall that triggered the review.

### 3.2 Corrective Action Deadlines.

The permittee shall document the discovery of any of the conditions listed in Part 3.1 within 72 hours of making such discovery. Within 14 calendar days of such discovery, the permittee shall document any corrective action(s) taken or to be taken to eliminate or further investigate the condition, or if no corrective action is needed, the basis for that determination. The specific documentation required within 72 hours and 14 calendar days is detailed in Part 3.3. When actions are determined necessary, the permittee shall make any necessary changes within 14 calendar days following discovery, or before the

next measurable storm event (see Part 6.1.2.2), whichever is sooner, to ensure compliance with the applicable numeric effluent limitations in Part 2.2.1 and water quality-based requirements in Parts 2.2.2 and 2.2.3 of this permit. If necessary changes cannot be implemented within the specified timeframe(s), the permittee shall document with the SWPPP the reasons for the delay, a schedule for completing the necessary changes, date completed and any back-up practices in place to ensure compliance with the applicable numeric effluent limitations in Part 2.2.1 and water quality-based requirements in Parts 2.2.2 and 2.2.3 of this permit should a runoff event occur while a control measure is off-line.

### 3.3 Corrective Action Report.

1. Within 72 hours of discovery of any condition listed in Part 3.1, the permittee shall document the following information, which shall be maintained with the SWPPP:
   a. Identification of the condition triggering the need for corrective action review;
   b. Description of the problem identified; and
   c. Date the problem was identified.
2. Within 14 calendar days of discovery of any condition listed in Part 3.1, the permittee shall document and maintain with the SWPPP the following information:
   a. Summary of corrective action taken or to be taken;
   b. Whether SWPPP modifications are required as a result of this discovery or corrective action;
   c. Date corrective action initiated or will be initiated; and
   d. Date corrective action completed or expected to be completed.
3. When any condition listed in Part 3.1 occurs, a permittee that operates a facility that discharges to an impaired water or OAW shall submit this documentation in an annual report as required in Part 7.2 and retain a copy of the corrective action report onsite with the SWPPP as required in Part 5.4.

## 4.0 Inspections.

The permittee shall conduct inspections in accordance with Parts 4.1, 4.2, and 4.3 of this permit at the facility. If, during any quarterly routine facility inspection, visual assessment, or comprehensive facility inspection, or any other time, the facility's control measures are found to be inadequate or otherwise not be properly operated and / or maintained, the permittee shall review the selection, design, installation, and implementation of the control measures to determine if maintenance and/or modifications are necessary to meet the applicable numeric effluent limitations in Part 2.2.1 and water quality-based requirements in Parts 2.2.2 and 2.2.3 of this permit, in accordance with the requirements of Part 2.1.1.3. Such modifications shall be documented in the SWPPP and implemented as expeditiously as practicable.

Additional sector-specific inspection requirements may be described in Part 8 of this permit. If a conflict exists between the two, the requirements of Part 8 shall prevail.

### 4.1 Routine Facility Inspections.

#### 4.1.1 Routine Facility Inspection Procedures.

The permittee shall conduct routine inspections of all areas of the facility where industrial materials or activities are exposed to stormwater with the potential to discharge from the facility, and of all stormwater control measures used to comply with this permit. Such routine inspections shall be conducted at least once each calendar quarter beginning with the first full calendar quarter after the facility becomes covered under this permit (see Part 1.3.1(2) and Table 1-3). More frequent inspections (e.g., monthly) may be appropriate for some types of equipment, processes, and control measures or areas of the facility with significant activities and materials exposed to stormwater. The permittee shall specify the relevant inspection schedules in the SWPPP document as required in Part 5.1.5.

A qualified person or persons (see definition in Appendix A) shall conduct routine facility

inspections. A member of the stormwater pollution prevention team (see Part 5.1.1) shall conduct or participate in the inspections. Inspections shall be performed during periods when the facility is in operation (i.e., is not inactive and unstaffed in accordance with the requirements of Part 1.5). The permittee shall initiate at least one of the routine facility inspections each calendar year while a stormwater discharge is occurring at one or more outfalls, but in no case later than 24 hours or the first business day (whichever comes later) following the end of the measurable storm event.

If there is no measurable storm event(s) during a calendar year, the permittee shall document the inability to perform an inspection during a measurable storm event as described in Part 5.4. In any case, the permittee must still complete routine quarterly inspections.

#### 4.1.2 Routine Facility Inspection Documentation.

The permittee shall document the findings of each routine facility inspection performed and maintain this documentation with the SWPPP as required in Part 5.4. Inspection findings do not need to be submitted to ADEQ, unless specifically requested. At a minimum, the documentation for each routine facility inspection must include:

- The inspection date and time;
- The name(s) and signature(s) of the inspector(s);
- Weather information and a description of any discharges occurring at the time of the inspection;
- Evidence demonstrating that previously unidentified discharges of pollutants have occurred from the site;
- Any control measures needing maintenance or repairs;
- Any failed control measures that need replacement;
- Any other evidence of deviations from the permit or SWPPP observed; and
- Any additional control measures needed to comply with the permit requirements.

### 4.2 Visual Assessment of Stormwater Discharges.

The permittee shall perform two visual assessments during the summer wet season and two visual assessments during the winter wet season when the facility is discharging.

Wet seasons, for the purposes of visual assessments, are defined as follows:

- Summer wet season: June 1 – October 31
- Winter wet season: November 1 – May 31

The term ‘wet season’ applies statewide and includes areas of the state where freezing conditions exist that prevent runoff from occurring for extended periods. In areas where freezing conditions exist, the four visual assessments may be distributed during seasons when precipitation runoff occurs.

Visual assessment monitoring requirements in this permit begin immediately after authorization to discharge is received by the permittee unless authorization is received 90 calendar days or more after a wet season has begun, in which case visual assessment monitoring shall commence with the start of the next wet season.

#### 4.2.1 Visual Assessment Procedures.

Visual assessment samples are not required to be collected consistent with 40 CFR Part 136 procedures.

The visual assessment shall be made:

- Of a sample in a clean, clear glass, or plastic container, and examined in a well-lit area;

- On samples collected within the first 30 minutes of an actual discharge from a storm event. If it is not possible to collect the sample within the first 30 minutes of discharge, the sample must be collected as soon as practicable after the first 30 minutes and the permittee shall document why it was not possible to take samples within the first 30 minutes. In the case of snowmelt, samples shall be taken during a period with a measurable discharge from the facility (see also Part 6.1.2.3); and
- On discharges that occur at least 72 hours (3 calendar days) from a previous discharge (see also Part 6.1.2.2).

The permittee shall visually inspect the sample for the following water quality characteristics:

- Color;
- Odor;
- Clarity;
- Floating solids;
- Settled solids;
- Suspended solids;
- Foam;
- Oil sheen; and
- Other obvious indicators of stormwater pollution.

### 4.2.2 Visual Assessment Documentation.

The permittee shall document the results of the visual assessments and maintain this documentation with the SWPPP as required in Part 5.4. The visual assessment findings need not be submitted to ADEQ, unless specifically requested by the Department. At a minimum, the documentation of the visual assessment shall include:

- Sample location(s);
- Sample collection date and time, and visual assessment date and time for each sample;
- Personnel collecting the sample and performing visual assessment, and their signatures;
- Nature of the discharge (i.e., runoff or snowmelt);
- Results of observations of the stormwater discharge;
- Probable sources of any observed stormwater contamination; and
- If applicable, why it was not possible to take samples within the first 30 minutes.

### 4.2.3 Exceptions to Visual Assessments.

*Absence of Discharge:* If no storm event results in a discharge from the facility or outfall(s) during a wet season, the permittee is excused from visual assessment for the facility or outfall(s) for that season provided the permittee documents in the monitoring records and retains with the SWPPP why a sample could not be collected.

*Adverse Conditions*: Adverse conditions are those that are dangerous or create inaccessibility for personnel, such as local flooding, high winds, or electrical storms, or situations that otherwise make sampling unsafe.

When adverse conditions prevent the collection of either visual assessment sample in a given wet season, the permittee shall document those conditions with the SWPPP and resume visual assessment monitoring in the subsequent wet season.

*Substantially identical outfalls*: If the facility has two or more outfalls that discharge substantially identical pollutants, as documented in Part 5.1.5.2, the permittee may conduct visual assessments of the discharge at just one of the outfalls and report that the results also apply to the substantially identical outfall(s). If possible, visual assessments of each substantially identical outfall shall be performed on a rotating basis throughout the period of coverage under this permit.

If a visual assessment performed on a sample collected at a substantially identical outfall demonstrates that control measures are not functioning as intended, the permittee shall assess and modify the control measures as appropriate for that outfall and, if necessary, other outfalls represented by the monitored outfall.

### 4.3 Comprehensive Facility Inspections.

#### 4.3.1 Comprehensive Facility Inspection Procedures.

The permittee shall conduct annual comprehensive facility inspections while covered under this permit. Annual, as defined in this Part, means once per calendar year, but not within 6 months of the previous inspection for the facility throughout the duration of permit coverage.

If the facility's coverage is administratively continued after the expiration date of this permit, the permittee shall continue to perform inspections annually until no longer covered by this permit.

A qualified person or persons shall conduct comprehensive facility inspections (CFI). A member of the facility's stormwater pollution prevention team shall conduct or participate in the inspection. CFIs must cover all areas of the facility affected by the requirements in this permit, including areas identified in the SWPPP as potential pollutant sources (see Part 5.1.3) where industrial materials or activities are exposed to stormwater with the potential to discharge from the facility, any areas where control measures are used to comply with the permit, and areas where significant spills (or spills that would contribute to the discharge of pollutants in stormwater) and leaks have occurred in the past 3 years. CFIs must also include a review of monitoring data collected in accordance with Part 6.2.

Inspectors must evaluate the results of the past year's visual assessments and analytical monitoring when planning and conducting inspections to determine potential areas of concern for stormwater pollution. Inspectors shall look for the following:

- Industrial materials, residue, or trash that may have or could come into contact with stormwater;
- Leaks or spills from industrial equipment, drums, tanks, and other containers;
- Offsite tracking of industrial or waste materials, or sediment where vehicles enter or exit the site;
- Tracking or blowing of raw, final, or waste materials from areas of no exposure to exposed areas; and
- Control measures needing replacement, maintenance, or repair.

Inspectors shall examine all stormwater control measures required by this permit to ensure that they are functioning correctly. If discharge locations are inaccessible, nearby downstream locations shall be inspected.

The facility's annual CFI may also be used as one of the routine inspections required by Part 4.1, provided that all components of both types of inspections are included.

#### 4.3.2 Comprehensive Facility Inspection Documentation.

All permittees shall document the findings of each CFI and maintain this documentation with the SWPPP. At a minimum, the following information shall be included:

- The date of the inspection;
- The name(s) and title(s) of the personnel making the inspection;
- Findings from the examination of areas of the facility identified in Part 4.3.1;
- All observations relating to the implementation of the control measures including:
  - Previously unidentified discharges from the site,
  - Previously unidentified pollutants in existing discharges,
  - Evidence of, or the potential for, pollutants entering the drainage system that are not contemplated in the SWPPP;

  - Evidence of pollutants discharging to surface waters from any facility outfall(s) in a manner inconsistent with the SWPPP, and the condition of and around the outfall, including the condition of flow dissipation measures (if present) designed to prevent scouring, and
  - Additional control measures needed to address any conditions requiring corrective action identified during the inspection.
- Any required revisions to the SWPPP resulting from the inspection;
- Any incidents of noncompliance observed or a certification stating the facility is in compliance with this permit (if there is no noncompliance); and
- A statement signed and certified in accordance with Appendix B, Subsection 9 of this permit.

In addition, permittees that operate facilities that discharge directly to an impaired water or OAW or to an upstream tributary within 2.5 miles of an impaired water or OAW shall submit the CFI findings with the annual report as required in Part 7.2.

### 4.4 Exceptions for Inspection Requirements for Inactive and Unstaffed Mining Sites

Each calendar year, a permit holder of an inactive and unstaffed mining facility shall conduct one comprehensive facility inspection in accordance with the requirements of Part 4.3. The permittee shall also inspect the site whenever there is a reasonable expectation that severe weather or other events may have damaged control measures or increased discharges. The permittee is waived from general analytical monitoring, routine facility inspections and visual assessments inspection requirements in accordance with Part 1.5.

Although stormwater monitoring is not waived for inactive and unstaffed mining sites that discharge to impaired waters, the monitoring frequency is reduced in accordance with Part 6.2.3.3.

## 5.0 Stormwater Pollution Prevention Plan (SWPPP)

The permittee shall prepare a SWPPP for the facility, or review and update an existing one, as appropriate, before submitting the Notice of Intent (NOI) for permit coverage. The SWPPP shall document the basis for selection, design, and installation of control measures utilized at the facility. The additional documentation requirements (see Part 5.4) are intended to document the implementation (including inspection, maintenance, monitoring, and corrective action) of the permit requirements. Additional sector-specific SWPPP requirements may be described in Part 8 of this permit. If a conflict exists between the two, the requirements of Part 8 shall prevail.

### 5.1 Contents of the SWPPP.

The SWPPP shall contain all of the following elements:

- Identification of the stormwater pollution prevention team (see Part 5.1.1);
- Site description (see Part 5.1.2);
- Summary of potential pollutant sources (see Part 5.1.3);
- Description of control measures (see Part 5.1.4);
- Schedules and procedures (see Part 5.1.5);
- Signature requirements (see Part 5.1.6);
- Identify each outfall authorized by this permit and describe the rationale for any substantially identical outfall determinations; and
- Sampling and analysis plan (SAP) (see Part 6.1.3).

Where the SWPPP refers to procedures in other facility documents, such as other environmental permits, a Spill Prevention, Control and Countermeasure (SPCC) Plan or an Environmental Management System (EMS) developed for an Environmental Performance Track facility, copies of the relevant portions of those documents must be kept with the SWPPP.

### 5.1.1 Stormwater Pollution Prevention Team.

The permittee shall identify the members (by name or title) that comprise the facility's stormwater pollution prevention team as well as their individual responsibilities. The team may include members who are not employed by the facility (such as third party consultants). The stormwater pollution prevention team is responsible for assisting the facility manager in developing and revising the SWPPP as well as maintaining control measures and taking corrective actions where required. Each member of the stormwater pollution prevention team must have access to either an electronic or paper copy of applicable portions of this permit and the SWPPP.

### 5.1.2 Site Description.

The SWPPP shall include all of the following:

1. *Activities at the Facility*. Provide a description of the nature of the industrial activities at the facility.
2. *General location map*. Provide a general location map (e.g., U.S. Geological Survey (USGS) quadrangle map) with enough detail to identify the location of the facility and surface waters receiving stormwater discharges from the facility.
3. *Site map*. Provide a legible site map (or maps) completed to scale, that identifies at a minimum the:
   - Size of the property in acres;
   - Location of significant structures;
   - Directions of stormwater flow (e.g., use arrows);
   - Locations of stormwater conveyances (e.g., ditches, pipes, and swales);
   - Locations of all existing structural control measures;
   - Locations of surface waters receiving the facility's discharges and any impaired waters or OAWs within 2.5 miles downstream of the facility;
   - Locations where the facility's stormwater discharges to a regulated MS4 (where applicable);
   - Locations of potential pollutant sources identified under Part 5.1.3.2;
   - Locations where significant spills or leaks identified under Part 5.1.3.3 have occurred;
   - Locations of all stormwater monitoring points;
   - Locations of stormwater outfalls, with a unique identification code for each outfall (e.g., Outfall No. 1, No. 2, etc), indicating whether one or more outfalls are being treated as "substantially identical" under Parts 4.2.3, 5.1.5.2, and 6.1.1.1 and an approximate outline of the areas draining to each outfall;
   - Identification of all outfalls having the potential to contain allowable non-stormwater discharges under Part 1.1.3 and the corresponding type(s) of discharges;
   - Location of on-site drywell(s); include a list of the on-site drywells and their registration number(s);
   - Locations of the following activities where such activities are exposed to stormwater with potential to discharge from the facility:
     - fueling stations;
     - vehicle and equipment maintenance and/or cleaning areas;
     - loading/unloading areas;
     - locations used for the treatment, storage, or disposal of wastes;
     - liquid storage tanks;
     - processing and storage areas;
     - immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility;
     - transfer areas for substances in bulk; and

o machinery; and

- Locations and sources of run-on to the facility from adjacent property that contains significant quantities of pollutants.

### 5.1.3 Summary of Potential Pollutant Sources.

The permittee shall describe in the SWPPP areas at the facility where industrial materials or activities are exposed to stormwater with the potential to discharge and from which allowable non-stormwater discharges are released. Industrial materials or activities include, but are not limited to: material handling equipment or activities; industrial machinery; raw materials; industrial production and processes; and intermediate products, by-products, final products, and waste products. Material handling activities include, but are not limited to: the storage, loading and unloading, transportation, disposal, or conveyance of any raw material, intermediate product, final product or waste product. For each area identified, the description must include:

***5.1.3.1 Activities in the area*** A list of the industrial activities exposed to stormwater (e.g., material storage; equipment fueling, maintenance, and cleaning; cutting steel beams).

***5.1.3.2 Pollutants*** A list of the pollutant(s) or pollutant constituents (e.g., crankcase oil, zinc, sulfuric acid, and cleaning solvents) associated with each identified activity. The pollutant list must include all significant materials that are handled, treated, stored, or disposed, and that have been exposed to stormwater including any past activities or incidents that may impact present stormwater discharges (see Note in Part 5.1.3.3).

***5.1.3.3 Spills and Leaks*** The permittee shall document where significant spills and leaks could occur that could contribute pollutants to stormwater discharges, and the corresponding outfall(s) that would be impacted by stormwater in contact with such spills and leaks. The permittee shall also document all significant spills and leaks of oil or toxic or hazardous pollutants that actually occurred at exposed areas, or that drained to a stormwater conveyance, in the 3 years prior to the date that the SWPPP was prepared or amended.

*Note:* Significant spills and leaks include, but are not limited to, releases of oil or hazardous substances in excess of quantities that are reportable under CWA Section 311 (see 40 CFR 110.6 and 40 CFR 117.21) or Section 102 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 USC §9602. This permit does not relieve the permittee of the reporting requirements of 40 CFR 110, 40 CFR 117, and 40 CFR 302 relating to spills or other releases of oils or hazardous substances.

***5.1.3.4 Unauthorized Non-Stormwater Discharges*** Unauthorized non-stormwater discharges are those not specifically allowed under Part 1.1.3. The permittee shall identify and evaluate all unauthorized non-stormwater discharges. Documentation of this evaluation shall include:

- The date of the evaluation;
- A description of the evaluation criteria used;
- A list of the outfalls and/ or upgradient drainage locations that were directly observed during the evaluation;
- The different types of unauthorized non-stormwater discharge(s) and source locations; and
- The action(s) taken, such as a list of control measures used to eliminate unauthorized non-stormwater discharge(s), if any were identified or obtaining an AZPDES permit for the discharge. For example, a floor drain was sealed, a sink drain was re-routed to the sanitary sewer, or an AZPDES permit application was submitted for an unauthorized cooling water discharge.

***5.1.3.5 Salt Storage*** The permittee shall document the location of any storage piles containing salt used for deicing or other commercial or industrial purposes.

***5.1.3.6 Sampling Data*** The permittee shall summarize all stormwater discharge sampling data collected at the facility during the previous permit term.

**5.1.4 Description of Control Measures.**

The permittee shall describe in the SWPPP the location and type of control measures installed and implemented at the site to comply with Parts 2 and 8 of this permit. This documentation must describe how the control measures at the site address both the pollutant sources identified in Part 5.1.3 and any stormwater run-on that commingles with any discharges covered under this permit.

**5.1.5 Schedules and Procedures.**

***5.1.5.1 Control Measures.***

The following must be described in the SWPPP:

- Good Housekeeping measures, procedures and related schedules (See Part 2.1.1.2);
- Maintenance measures, procedures and related schedules (See Part 2.1.1.3) – Preventative maintenance procedures, including regular inspections, testing, maintenance, and repair of all industrial equipment and systems exposed to stormwater with the potential to discharge, and associated control measures, to avoid situations that may result in leaks, spills, and other releases that affect the quality of stormwater discharges; and
- Spill Prevention and Response Procedures (See Part 2.1.1.4) – Procedures for preventing and responding to spills and leaks. The permittee may reference the existence of other plans, such as the Spill Prevention Control and Countermeasure (SPCC) plan developed for the facility under Section 311 of the CWA or BMP programs otherwise required by an AZPDES permit or an aquifer protection permit for the facility, provided that a copy of that other plan is kept with the SWPPP consistent with Part 5.3; and
- Employee Training (Part 2.1.1.9) – A schedule for all types of necessary training in accordance with the sector-specific requirements described in Part 8.

***5.1.5.2 Monitoring and Inspection***

*Monitoring:* The permittee shall describe in the SWPPP the procedures for conducting the four types of analytical monitoring specified by this permit, when and where applicable. The four types of analytical monitoring are:

- General analytical monitoring (see Part 6.2.1);
- Effluent limitations guidelines monitoring (see Part 6.2.2);
- Impaired waters monitoring (see Part 6.2.3); and
- Additional monitoring as required by ADEQ (see Part 6.2.4).

For the required monitoring, the SWPPP shall contain a SAP either as a separate section or as an appendix to the SWPPP. The contents of the SAP are outlined in Part 6.1.3.

*Inspection:* The permittee shall describe in the SWPPP the procedures for performing, as appropriate, the three types of inspections specified by this permit, including:

- Routine facility inspections (see Part 4.1);
- Visual assessment of stormwater discharges (see Part 4.2); and
- Comprehensive facility inspections (see Part 4.3).

For each type of inspection performed, the SWPPP shall identify:

- Person(s) or positions of person(s) responsible for inspection;
- Schedules for conducting inspections; and

- Specific items to be covered by the inspection.

*Substantially Identical Outfalls:* The permittee shall describe the following in the SWPPP when using the substantially identical outfall exception for the visual assessment requirements in Part 4.2 or the facility's general analytical monitoring requirements in Part 6.2.1:

- Location of each of the substantially identical outfalls;
- Description of the general industrial activities conducted in the drainage area of each outfall;
- Description of the control measures implemented in the drainage area of each outfall;
- Description of the exposed materials located in the drainage area of each outfall that are likely to be significant contributors of pollutants to stormwater discharges;
- An estimate of the runoff coefficient of the drainage areas (low = under 40%; medium = 40 to 65%; high = above 65%); and
- Why the outfalls are expected to discharge substantially identical effluents.

***5.1.5.3 Inactive and Unstaffed Sites.*** When the permittee declares that the site has become inactive and unstaffed, the SWPPP shall include the information that supports this claim as required by Parts 1.5 and 6.2.1.4.

### 5.1.6 Signature Requirements.

The permittee shall sign the SWPPP in accordance with Appendix B, Subsection 9, including the date of signature.

### 5.2 Required SWPPP Modifications.

The permittee shall modify the SWPPP whenever necessary to address any of the triggering conditions for corrective action in Part 3.1. Changes to the SWPPP to reflect corrective actions shall be made in accordance with the corrective action deadlines in Parts 3.2 and 3.3, and signed and dated in accordance with Appendix B, Subsection 9.

In addition, the permittee shall modify the SWPPP to reflect new or modified control measures (see Parts 2.1 and 4.0), including measures implemented at active mining operations as mining activities expand into previously undisturbed areas (see Part 8.G.5.2).

### 5.3 SWPPP Availability.

The permittee shall retain a copy of the current SWPPP at the facility, and it shall be made immediately available to ADEQ, EPA, or another Federal, State or local agency having stormwater program authority, or the operator of a regulated MS4 receiving discharges from the facility (where applicable) at the time of an onsite inspection or upon request. If otherwise requested by ADEQ, the permittee shall submit copies of the SWPPP documents within 14 calendar days of request.

*Inactive and Unstaffed Sites:* Permittees with facilities that meet the requirements for inactive and unstaffed are not required to maintain the SWPPP on-site. However, the SWPPP must be locally available (i.e., in Arizona) and must be on-site when conducting the inspections required by Part 4. For the purpose of a regulatory inspection, the SWPPP shall be made available to ADEQ, EPA, or other Federal, State or local authority having stormwater program authority, within 48 hours of request. If otherwise requested by ADEQ, the permittee shall submit copies of these documents within 14 calendar days of request.

### 5.4 Documentation Requirements.

The permittee shall keep the following inspection, monitoring, and certification records complete and up-to-date. Retaining these records with the SWPPP (unless otherwise specified below) is necessary to demonstrate compliance with the conditions of this permit.

- A copy of the NOI submitted to ADEQ, including: any correspondence exchanged between the operator and ADEQ specific to coverage under this permit and the permit authorization number assigned by ADEQ;
- A copy of this permit (an electronic copy easily available to SWPPP personnel is also acceptable);
- Descriptions and dates of any incidences of significant spills, leaks, or other releases that resulted in discharges of pollutants in stormwater to a regulated MS4 or to waters of the U.S., the circumstances leading to the release and actions taken in response to the release and measures taken to prevent the recurrence of such releases (see Part 2.1.1.4 and 5.1.3.3);
- Records of employee training, including date training received. Training records need not be maintained with the SWPPP but shall be made available to ADEQ, EPA, or another Federal, State or local agency upon request (see Part 2.1.1.9);
- Documentation of repairs of structural control measures, including the date(s) of discovery of areas in need of repair/replacement, date(s) that the structural control measure(s) returned to full function, and the justification for any extended repair schedules (see Part 2.1.1.3). Documentation of maintenance of industrial equipment and systems in accordance with part 2.1.1.3 need not be maintained with the SWPPP but shall be made available to ADEQ, EPA, or another Federal, State or local agency upon request. The maintenance records shall include the date(s) of regular maintenance. However, the justification for any extended maintenance schedules shall be maintained with the SWPPP (see Part 2.1.1.3);
- All inspection reports, including the Routine Facility Inspection Reports (see Part 4.1), the Visual Assessment Reports (see Part 4.2), and the Comprehensive Facility Inspection Reports (see Part 4.3);
- Description of and rationale for any deviations from the schedule for visual assessments and/or monitoring, and the reason for the deviations (e.g., adverse weather or it was impracticable to collect samples within the first 30 minutes of a measurable storm event) (see Parts 4.1.1, 4.2.1, 6.1.2.3, and 6.2.1);
- Description of any corrective action taken at the site, including triggering event and dates when problems were discovered and modifications occurred; and
- Documentation to support the permittee's claim that the facility has changed its status from active to inactive and unstaffed with respect to the requirements to conduct routine facility inspections (see Part 4.1.3), visual assessments (see Part 4.2.3), and/or general analytical monitoring (see Part 6.2.1.4).

## 6.0 Analytical Monitoring Program.

In addition to visual assessments required in Part 4 of this permit, the permittee shall collect and analyze stormwater samples and document monitoring activities consistent with the procedures described in Part 6 and Appendix B, Subsections 9, 11 and 12 and any sector-specific requirements in Part 8. Refer to Part 7 for additional reporting and recordkeeping requirements.

## 6.1 Analytical Monitoring Procedures.

### 6.1.1 Analytical Monitoring Locations.

#### *6.1.1.1 Monitored Outfalls.*

Applicable monitoring requirements apply to each outfall authorized by this permit. If the facility has two or more outfalls believed to discharge substantially identical stormwater and/or allowable non-stormwater, based on the similarities of the general industrial activities and control measures, exposed materials that may significantly contribute pollutants to stormwater, and runoff coefficients of their drainage areas, the permittee may monitor the discharge at just one of the outfalls and report that the results also apply to the substantially identical outfall(s). The allowance for monitoring only one of the

substantially identical outfalls is not applicable to any outfalls with numeric effluent limitations set forth in Part 2.2.1. The permittee is required to monitor each outfall covered by a numeric effluent limitation as identified in Part 6.2.2.

#### *6.1.1.2 Commingled Discharges.*

If discharges authorized by this permit commingle with discharges not authorized under this permit, any required sampling of the authorized discharges must be performed at a point before they mix with other unauthorized discharges to the extent practicable.

#### *6.1.1.3 Monitoring for Allowable Non-Stormwater Discharges*

Unless otherwise specified by ADEQ, permittees are required to monitor allowable non-stormwater discharges (as delineated in Part 1.1.3) only when they are commingled with stormwater discharges associated with industrial activity.

### 6.1.2 Monitoring Events.

#### *6.1.2.1 Monitoring Periods.*

Monitoring requirements in this permit begin within 90 calendar days of receiving the Department's authorization to discharge. The required monitoring events may be distributed during seasons when precipitation occurs, or when snowmelt results in a measurable discharge from the site.

Wet seasons, for the purposes of analytical monitoring, apply statewide and are defined as follows:

Summer wet season: June 1 – October 31

Winter wet season: November 1 – May 31

The term 'wet season' includes areas of the state where freezing conditions exist that prevent runoff from occurring for extended periods. In areas where freezing conditions exist, the required monitoring and sample collection may be distributed during seasons when precipitation runoff, either as melting snow or rain mixed with melting snow, occurs.

#### *6.1.2.2 Measurable Storm Events.*

All required monitoring must be performed on a storm event that results in a discharge from the facility ("measurable storm event") that follows the preceding measurable storm event by at least 72 hours (3 calendar days). The 72 hour (3 day) storm interval does not apply if the permittee is able to document that less than a 72 hour interval is representative for local storm events during the sampling period. In the case of snowmelt, the monitoring must be performed at a time when a measurable discharge occurs at the site.

For each monitoring event, except snowmelt monitoring, the permittee shall identify the person performing the monitoring, the date and estimated duration (in hours) of the rainfall event, estimated rainfall total (in inches) for that rainfall event, and time (in days) since the previous measurable storm event. For snowmelt monitoring, the permittee shall identify the sample as 'snowmelt' and the date of the sampling event.

#### *6.1.2.3 Sample Type.*

The permittee shall take a minimum of one grab sample from a discharge resulting from a measurable storm event that produces a sufficient volume to allow collection of a sample. With the exception of samples to be analyzed for Suspended Sediment Concentration (SSC), samples must be collected within the first 30 minutes of a measurable storm event. If it is not possible to collect the sample within the first 30 minutes of a measurable storm event, the sample must be collected as soon as practicable after the first 30 minutes and documentation must be kept with the SWPPP explaining why it was not possible to take samples within the first 30 minutes. Samples for SSC shall be collected 48 hours

after the storm event that resulted in a measureable discharge. In the case of snowmelt, samples must be taken during a period with a measurable discharge.

#### *6.1.2.4 Adverse Conditions.*

When adverse conditions as described in Part 4.2.3 prevent the collection of the analytical sample(s) required in a given wet season, the permittee shall document those conditions with the SWPPP and resume analytical monitoring in the subsequent wet season. Adverse conditions do not exempt the permittee from the requirement to file a discharge monitoring report (DMR) in accordance with the facility's sampling schedule. The permittee shall report any failure to monitor as specified in Part 7.1 indicating the basis for not sampling during the usual reporting period.

### 6.1.3 Sampling and Analysis Plan.

The permittee shall develop a written SAP covering all analytical monitoring required by this permit. The SAP shall be a part of the SWPPP as either an appendix or a separate SWPPP section. The SAP shall include the following:

#### *6.1.3.1 Sample Collection, Preservation, Tracking, and Handling Information*

- Designate and train personnel to collect, maintain, and handle samples in accordance with the appropriate sample protocols.
- Identify water quality parameters/pollutants to be sampled including any pollutant(s) of concern in accordance with Parts 6.2.3 and 6.2.4;
- Identify the required sample analyses and associated analytical methods (analytical laboratory and field analyses).
- Written procedures for:
  - Sample collection (equipment and containers, calibration procedures, document site conditions during sampling, field notes and conditions under which the sample was taken),
  - Preservation (sample preparation to meet holding times),
  - Tracking (including chain-of-custody procedures), and
  - Handling (packing, transporting and shipping procedures to maximize sample integrity).

#### *6.1.3.2 Calibration and Maintenance of Monitoring Equipment.*

All monitoring instruments and equipment (including permittee's field instruments for measuring pH and turbidity) shall be calibrated and maintained in accordance with manufacturer's recommendations.

#### *6.1.3.3 Analytical Methods and Laboratories.*

Other than parameters required to be sampled at the time of sample collection (e.g., field parameters), all samples shall be analyzed by a laboratory that is licensed by the Arizona Department of Health Service (ADHS) Office of Laboratory Licensure and Certification. Identification of the analytical methods and related limits of detection (if applicable) for each parameter is required. The samples shall be analyzed using analytical methods with a limit of quantitation (LOQ) that is at or below the applicable surface water quality standards, ELGs or other criteria specified in this permit. If all methods have LOQs higher than the specific criteria, the samples shall be analyzed using the analytical method with the lowest LOQ.

All laboratory analyses shall be conducted according to test procedures specified in 40 CFR 136, unless other test procedures have been specified in this general permit. This requirement does not apply to parameters that require analysis at the time of sample collection as long as the testing methods used are approved by ADHS. The permittee may conduct field analysis of turbidity if the permittee has sufficient capability (qualified and trained employees, properly calibrated and maintained field instruments, etc.) to properly perform the field analysis.

#### *6.1.3.4 Records.*

The permittee shall retain records of all stormwater monitoring information and reports with the SWPPP in accordance with Part 7.5 and any additional requirements in Appendix B, Subsection 11 of this permit.

### 6.2 Required Monitoring.

This permit includes four types of required analytical monitoring, one or more of which may apply to the facility's discharge:

- General analytical monitoring (see Part 6.2.1)
- Effluent limitations monitoring (see Part 6.2.2);
- Impaired waters monitoring (see Part 6.2.3); and
- Additional monitoring as required by ADEQ (see Part 6.2.4).

When more than one type of monitoring for the same parameter at the same outfall applies (e.g., total suspended solids once per year for an effluent limitation and twice per wet season for general analytical monitoring at a given outfall), a single sample may be used to satisfy both monitoring requirements.

### 6.2.1 General Analytical Monitoring.

This permit requires mining Sectors G and J to conduct general analytical monitoring as outlined in Part 8.

#### *6.2.1.1 Applicability of General Analytical Monitoring.*

The permittee shall monitor stormwater discharges for parameters specified in Part 8 for the primary industrial activity, and any co-located industrial activities authorized under this permit. If any of the parameters are hardness-dependent, the permittee must also characterize for hardness. The results of the general analytical monitoring, including hardness, shall be submitted to ADEQ in accordance with Part 7. For discharges to:

- Perennial or intermittent waters, the hardness shall be of the surface water receiving the discharge.
- Ephemeral waters, the hardness shall be of the discharge leaving the facility.

#### *6.2.1.2 Exception for Stormwater Discharges to Ephemeral Waters.*

Facilities that discharge to ephemeral surface waters are not required to monitor for Total Suspended Solids (TSS) and turbidity as part of the general analytical monitoring requirements specified in Part 8.

#### *6.2.1.3 Exception for Inactive and Unstaffed Sites.*

The requirement for general analytical monitoring does not apply at a facility that is inactive and unstaffed if the requirements of Part 1.5 are met.

### 6.2.2 Effluent Limitations Monitoring.

#### *6.2.2.1 Monitoring Based on Effluent Limitations Guidelines.*

Table 6-1 identifies the stormwater discharges subject to effluent limitation guidelines that are authorized for coverage under this permit. Commencing with the first wet season of permit coverage (in accordance with Section 6.1.2.1), the permittee shall monitor once per year at each outfall containing the discharges identified in Table 6-1 for the parameters specified in the sector-specific section of Part 8.

| Table 6-1. Required Monitoring for Effluent Limitations Based on Effluent Limitations Guidelines | | | |
|---|---|---|---|
| **Regulated Activity** | **Effluent Limit** | **Monitoring Frequency** | **Sample Type** |
| Mine dewatering discharges at crushed stone, construction sand and gravel, or industrial sand mining facilities | See Part 8.J.9 | 1/year | Grab |

#### *6.2.2.2 Substantially Identical Outfalls.*

The permittee shall monitor each outfall discharging runoff from any regulated activity identified in Table 6-1. The substantially identical outfall monitoring provisions are not available for numeric effluent limitations monitoring.

### 6.2.3 Impaired Waters Monitoring.

#### *6.2.3.1 Permittees Required to Monitor Discharges to Impaired Waters.*

If a facility discharges to an impaired water, the permittee shall develop a monitoring program in accordance with Part 6.1.3 and monitor for all pollutants for which the waterbody is impaired (except as provided in Part 6.2.3.2) and for which a standard analytical method exists (see 40 CFR Part 136).

If the waterbody is impaired for suspended solids, turbidity or sediment/ sedimentation and the discharge occurs for more than 48 hours after the storm event, the permittee shall monitor for SSC. If the pollutant for which the waterbody is impaired is expressed in the form of an indicator or surrogate pollutant, the permittee shall monitor for that indicator or surrogate pollutant. No monitoring is required when a waterbody's biological communities are impaired but no pollutant, including indicator or surrogate pollutants, is specified as causing the impairment, or when a waterbody's impairment is related to hydrologic modifications, impaired hydrology, or temperature.

#### *6.2.3.2 Impaired Waters Monitoring Schedule.*

***Discharges to impaired waters without an approved TMDL*.**

Beginning in the first wet season following the permittee's discharge authorization, the permittee shall monitor twice per wet season at each outfall discharging stormwater to an impaired water without an approved TMDL. Once the four (4) samples have been collected, if the pollutant for which the water is impaired is not detected above applicable water quality standards, the permittee may discontinue further monitoring for that pollutant, under this section. The permittee shall keep records of this finding with the SWPPP. If the pollutant for which the water is impaired is found in the discharge above applicable water quality standards for any of the samples collected in the first year of sampling, the permittee shall continue monitoring twice during each wet season.

Further, this monitoring requirement does not apply after one year if the pollutant for which the waterbody is impaired is not detected above natural background levels in the discharge, and the permittee documents, as required in Part 5.4, that this pollutant is not expected to be present above natural background levels in the discharge.

If the pollutant for which the water is impaired is not present and not expected to be present in the facility's discharge, or it is present but it has been determined using a methodology approved by ADEQ that the presence is caused solely by natural background sources, the permittee shall include a notification to this effect in the first monitoring report, after which annual monitoring under this subsection may be discontinued. To support this determination, the following documentation must be submitted with the first monitoring report and kept with the SWPPP records:

- An explanation of why the presence of the pollutant causing the impairment in your discharge is not related to the activities at the facility; and
- Data and/or studies that tie the presence of the pollutant causing the impairment in the discharge to natural background sources in the watershed.

***Discharges to impaired waters with an ADEQ approved TMDL*.**

For stormwater discharges assigned a WLA in an approved TMDL, the facility shall monitor for the pollutant for which the TMDL was written. Beginning in the first wet season following the facility's date of discharge authorization, the permittee shall monitor twice per wet season at each outfall discharging stormwater to the impaired water with an approved TMDL. ADEQ's authorization to discharge will include specifications on any additional pollutant(s) to monitor.

If the pollutant for which the water is impaired is not detected above the applicable WLA in the TMDL after the four samples have been collected, the permittee may discontinue further monitoring, under this section. The permittee shall keep records of this finding onsite with the SWPPP.

If the pollutant for which the water is impaired is found above the applicable WLA in the TMDL in the discharge for any of the samples collected in the first year of sampling, the permittee shall continue monitoring twice during each wet season. Attainment of the WLA for SSC will be based on the median of four samples collected from four different measureable storm events.

#### *6.2.3.3 Exception for Inactive and Unstaffed Mine Sites.*

The requirement for impaired waters monitoring at a facility that is inactive and unstaffed is reduced to once per year, if the requirements of Part 1.5 are met.

### 6.2.4 Additional Monitoring Required by ADEQ.

ADEQ may notify the permittee, in writing, of additional discharge monitoring required to ensure protection of receiving water quality in cases where there is evidence that a pollutant is being discharged that is not being monitored for by the permittee and that the pollutant may be causing or contributing to exceedances of a water quality standard. Any such notice will provide an explanation of the reasons for the monitoring, locations, and parameters to be monitored, frequency and period of monitoring, sample types, and reporting requirements.

## 6.3 Follow-up Actions if Discharge Exceeds a Numeric Effluent Limit or a Water Quality Standard.

The permittee shall conduct follow-up monitoring within 30 calendar days (or during the next qualifying runoff event, should none occur within the 30 days) of implementing corrective action(s) taken in accordance with Part 3 in response to an exceedance of a numeric effluent limit or water quality standard contained in this permit as described in Part 2.2.1 and 2.2.2. Monitoring must be performed for any pollutant(s) that exceeds the effluent limit or water quality standard. If this follow-up monitoring exceeds the applicable effluent limit or water quality standard, the permittee shall comply with both Parts 6.3.1 and 6.3.2.

### 6.3.1 Submit an Exceedance Report.

The permittee shall submit an Exceedance Report consistent with Part 7.3.

### 6.3.2 Continue to Monitor.

The permittee shall continue to monitor, at least twice per wet season, until the discharge is in compliance with the effluent limit or water quality standard or until ADEQ waives the requirement for additional monitoring.

## 7.0 Reporting and Recordkeeping.

### 7.1 Reporting Monitoring Data to ADEQ.

**7.1.1** The permittee shall submit monitoring data collected in accordance with Parts 4.2, 6.2, 6.3, and 6.4 to ADEQ at the address in Part 7.6.

**7.1.2** Permittees shall use the MSGP discharge monitoring report (DMR) form available at http://www.azdeq.gov/environ/water/permits/stormwater.html .

**7.1.3** The permittee shall compile all sampling results for the previous two wet seasons onto DMR form(s). Except as provided in Part 7.2 below, the permittee shall submit the DMRs to ADEQ not later than July 15 of each year of permit coverage.

### 7.2 Annual Report.

All facilities shall prepare an Annual Report on a form provided by the Department and retain a copy of the report with the SWPPP. The Annual Report for the reporting period June 1 to May 31 shall be completed by July 15 and include, at a minimum:

- The findings from the facility's Part 4.3 comprehensive facility inspection;
- Any corrective action documentation as required in Part 3.3;
- The DMR form(s) as required in Part 7.1 for the preceding two wet seasons; and
- The results of any monitoring required in Part 6.2 for those facilities that discharge to a water (or within 2.5 miles of a water if required by ADEQ) or portion thereof, classified as an OAW or an impaired water, or
- The results of any monitoring required in Part 6.2 if notified by the Department in accordance with Part 1.3.1(2)(c).

Permittees with facilities that discharge to a water (or within 2.5 miles of a water if required by ADEQ, or is otherwise referenced within an approved TMDL) or portion thereof, classified as an OAW or an impaired water shall submit the annual report to ADEQ on or before July 15 (postmark date).

### 7.3 Exceedance Report for Numeric Effluent Limitations or Water Quality Standards.

If follow-up monitoring pursuant to Part 6.3 exceeds a numeric effluent limit or water quality standard, the permittee shall submit an Exceedance Report to ADEQ no later than 30 calendar days after receiving the facility's lab results. The facility's Exceedance Report shall include the following:

- Facility name, physical address and location;
- AZPDES permit tracking number;
- Name of receiving water;
- Monitoring data from this and the preceding monitoring event(s);
- An explanation of the situation; including what actions the permittee has completed or intends to complete (if corrective actions are not yet complete) to correct the violation; and
- Contact person name, title, and phone number.

### 7.4 Other Reporting.

The permittee is subject to the reporting requirements stipulated in Part 7, in addition to the standard permit reporting provisions of Appendix B, Subsection 12.

- 24-hour reporting (see Appendix B, Subsection 12.d);
- 5-day follow-up reporting to the 24 hour reporting (see Appendix B, Subsection 12.d.(ii));

- Reportable quantity spills (verbal report only; see Part 2.1.1.4).
- Planned changes (see Appendix B, Subsection 12.a);
- Anticipated noncompliance (see Appendix B, Subsection 12.c);
- Transfer of ownership and/or operation – (see Table 1-2);
- Other noncompliance (see Appendix B, Subsection 12.e); and
- Other information (see Appendix B, Subsection 12.f).

Where a written report is required, the permittee shall submit these reports to the Department's address listed in Part 7.6. If the facility discharges to a regulated MS4, the permittee shall also submit these reports to the MS4 operator (in accordance with Part 5.1.2).

### 7.5 Recordkeeping.

The permittee shall retain copies of the SWPPP (including any modifications made during the term of this permit), additional documentation requirements pursuant to Part 5.4 (including documentation related to corrective actions taken pursuant to Part 3), all reports and certifications required by this permit, monitoring data, and records of all data used to complete the NOI to be covered by this permit, for a period of at least 3 years from the date that the facility's coverage under this permit expires or is terminated.

### 7.6 Addresses for Reports.

Signed copies of monitoring data and any other reports required, shall be submitted to the address below. Other options (i.e., electronic submission) may also be used if ADEQ makes the information available on the Internet or by public notice. Notices of Intent and Notices of Termination (or a photocopy/reproduction) shall be signed and dated in accordance with Appendix B, Subsection 9 of this permit and submitted to ADEQ at the address below. DMR forms and paper copies of any reports required in Parts 6 and 7 shall be sent to the address below. All other written correspondence concerning discharges covered under this permit shall likewise be sent to the address listed below:

Arizona Department of Environmental Quality
Surface Water Section, Stormwater Permits Unit—MSGP Monitoring
1110 W. Washington Street, Mail Code 5415 A-1
Phoenix, AZ 85007
Fax: 602/ 771 – 4528

Reports of non-compliance shall be reported to:

Arizona Department of Environmental Quality
Water Quality Compliance Section
1110 W. Washington Street, Mail Code 5515 B-1
Phoenix, AZ 85007
Office: 602-771 – 2330; Fax 602/ 771 – 4505

## Part 8 – Sector-Specific Requirements for Industrial Activity

### Subpart G – Sector G – Metal Mining.

The permittee shall comply with Part 8 sector-specific requirements associated with the facility's primary industrial activity and any co-located industrial activities authorized under this permit, as defined in Appendix A. The sector-specific requirements apply to those areas of the facility where those sector-specific activities occur. These sector-specific requirements are in addition to any requirements specified elsewhere in this permit. In some cases, these sector-specific requirements modify more general requirements set forth in Parts 1-7 of this permit (e.g., Part 8.G.9. below).

### 8.G.1 Covered Stormwater Discharges.

The requirements in Subpart G apply to stormwater discharges associated with industrial activity from Metal Mining facilities, including mines abandoned on Federal lands, as identified by the SIC Codes specified under Sector G in Table 1-1 of this permit. Coverage is required only for mining operations that discharge stormwater contaminated by contact with, or that has come into contact with, any overburden, raw material, intermediate product, finished product, byproduct, or waste product located on the site of the operation.

8.G.1.1 *Covered Discharges from Active Facilities*. Only the stormwater discharges from the areas described in Table 8.G.1.1 and the allowable non-stormwater discharges identified in Part 1.1.3 are covered:

TABLE 8.G.1.1—APPLICABILITY OF THE AZPDES MULTI-SECTOR GENERAL PERMIT TO STORMWATER RUNOFF FROM ACTIVE ORE (METAL) MINING AND DRESSING SITES

| Discharge/source of discharge | AZPDES General Permit Applicability |
|---|---|
| **Piles** | |
| Waste rock/overburden<br>Topsoil piles | Discharge under GP must be composed entirely of stormwater and not combined with mine drainage. See Note below. |
| **Roads constructed of waste rock or spent ore** | |
| Onsite haul roads and haul/access roads used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility. | Discharge under the GP must be composed entirely of stormwater and not combined with mine drainage. See Note below. |
| **Roads not constructed of waste rock or spent ore** | |
| Onsite haul roads and haul/access roads used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility. | Discharge acceptable under GP except if ''mine drainage'' is used for dust control. |
| **Milling/concentrating** | |
| Runoff from tailings dams/dikes when constructed of waste rock/tailings..... | Discharges must be composed entirely of stormwater and not combined with mine drainage; not applicable if process fluids are present. See Note below. |
| Runoff from tailings dams/dikes when not constructed of waste rock/tailings..... | Discharge acceptable under GP except if process fluids are present. |
| Concentration building..... | Discharge acceptable under GP if discharge is stormwater only and there is no contact with concentrate piles. |
| Mill site..... | Discharge acceptable under GP if discharge is stormwater only and there is no contact with concentrate piles. |

| Discharge/source of discharge | AZPDES General Permit Applicability |
|---|---|
| **Ancillary areas** | |
| Office/administrative building and housing..... | Discharge acceptable under GP if mixed with stormwater from the industrial area. (*Note:* coverage is unnecessary if drainage from these areas is not mixed with stormwater from industrial areas.) |
| Chemical storage area & Docking facility..... | Discharge under GP must be composed entirely of stormwater and not combined with mine drainage. |
| Explosive storage<br>Fuel storage (oil tanks/coal piles)<br>Vehicle/equipment maintenance area/building<br>Parking areas…… | Discharge acceptable under GP (*Note:* coverage is unnecessary for drainage exclusively from employee and visitor-type parking areas.) |
| Power plant<br>Truck wash area…..... | Discharge under GP must be composed entirely of stormwater and not combined with mine drainage. |
| **Reclamation-related areas** | |
| Any disturbed area (unreclaimed).....<br>Reclaimed areas released from reclamation bonds prior to Dec. 17 1990. .....<br>Partially/inadequately reclaimed areas or areas not released from reclamation bond. ..... | Discharge acceptable under GP only if not in active mining area. |

*Note:* Stormwater runoff from these sources is subject to the AZPDES program for stormwater unless mixed with discharges subject to 40 CFR Part 440 that are regulated by another permit prior to mixing. Non-stormwater discharges from these sources are subject to AZPDES permitting and may be subject to the effluent limitation guidelines under 40 CFR Part 440.

Discharges from overburden/waste rock and overburden/waste rock-related areas are not subject to 40 CFR Part 440 unless they: (1) drain naturally (or are intentionally diverted) to a point source; and (2) combine with "mine drainage" that is otherwise regulated under the Part 440 regulations. For such sources, coverage under this permit is available if the discharge composed entirely of stormwater does not combine with other sources of mine drainage that are subject to 40 CFR Part 440, and that meets other eligibility criteria contained in Part 1.1 of this permit. Permit applicants bear the initial responsibility for determining the applicable technology-based standard for such discharges.

8.G.1.2 *Covered Discharges from Inactive Facilities.* All stormwater discharges.

8.G.1.3 *Covered Discharges from Exploration and Construction of Metal Mining and/or Ore Dressing Facilities.* All stormwater discharges.

8.G.1.4 *Covered Discharges from Facilities Undergoing Reclamation.* All stormwater discharges.

**8.G.2 Limitations on Coverage.**

8.G.2.1 *Prohibition of Stormwater Discharges.* Stormwater discharges not authorized by this permit: discharges from active metal mining facilities that are subject to effluent limitation guidelines for the Ore Mining and Dressing Point Source Category (40 CFR Part 440).

8.G.2.2 *Prohibition of Non-Stormwater Discharges*. The following discharges are not authorized by this permit: adit drainage, and contaminated springs or seeps discharging from waste rock dumps that do not directly result from precipitation events (see also the standard Limitations on Coverage in Part 1.1.4).

### 8.G.3 Definitions.

The following definitions are not intended to supersede the definitions of active and inactive mining facilities established by 40 CFR 122.26(b)(14)(iii).

8.G.3.1 *Mining operation* - Consists of active, inactive, reclamation phases and the exploration and construction phases.

8.G.3.2 *Exploration phase* - Entails exploration and land disturbance activities to delineate the dimensions and financial viability of a metal mining site.

8.G.3.3 *Construction phase* - Includes the initial building of site access roads and initial removal of overburden and waste rock to expose mineable minerals at a mining site. In addition, any subsequent construction activity on undisturbed areas of an existing mine property is also considered part of the construction phase if stormwater discharges are not managed by pre-existing or permanent control measures.

8.G.3.4 *Active phase* - Activities including the extraction, removal or recovery of metal ore. For surface mines, this definition does not include any land where grading has returned the earth to a desired contour and reclamation has begun. This definition is derived from the definition of "active mining area" found at 40 CFR 440.132(a). The active phase is considered part of "mining operations."

*Note:* The following definitions are not intended to supersede the definitions of active and inactive mining facilities established by 40 CFR 122.26(b)(14)(iii).

8.G.3.5 *Active metal mining facility* - A place where work or other activity related to the extraction, removal, or recovery of metal ore is being conducted. For surface mines, this definition does not include any land where grading has returned the earth to a desired contour and reclamation has begun. This definition is derived from the definition of "active mining area" found at 40 CFR 440.132(a).

8.G.3.6 *Inactive metal mining facility* - A site or portion of a site where metal mining and/or milling occurred in the past but is not an active facility as defined above. An inactive metal mining facility has an identifiable owner / operator. Sites where mining claims are being maintained prior to disturbances associated with the extraction, beneficiation, or processing of mined materials and sites where minimal activities are undertaken for the sole purpose of maintaining a mining claim are not considered either active or inactive mining facilities and do not require an AZPDES industrial stormwater permit.

8.G.3.7 *Reclamation phase* - Activities undertaken following the cessation of the "exploration phase" or the "active phase" at a site or a portion of a site, intended to return the land to an appropriate post-mining land use in order to meet applicable Federal and State reclamation requirements or the requirements of Part 8.G.9.1 at a site or portion of a site not subject to Federal and State reclamation requirements. The reclamation phase is considered part of "mining operations."

8.G.3.8 *Stabilization* - A site or portion of a site is "stabilized" when it has implemented all applicable Federal and State reclamation requirements.

### 8.G.4 Stormwater Discharges Associated with the Exploration and Construction Phases of Mining (Clearing, Grading, and Excavation Activities).

Clearing, grading, and excavation activities being conducted as part of the exploration and construction phases at mining sites are covered under this permit (or may be covered under an alternate AZPDES stormwater permit such as the AZPDES General Permit for Discharge from Construction Activities (AZG2008-001)) if they disturb one acre or more. Exploration and construction activities disturbing less than one acre do not require permit coverage unless they are integrally related to other exploration or construction activities that collectively disturb one acre or more.

For all areas affected by exploration and construction activities that will occur at an active site or previously mined site, the permittee shall select, design, install, and implement the following control measures or their equivalents, as necessary to minimize the discharge of pollutants to stormwater. The control measures selected shall be documented in the SWPPP.

Once the areas subject to construction and exploration activities are stabilized or the area(s) become part of the mining operation, the control measures, inspections, monitoring, and other requirements in Parts 8.G.4 are no longer required; however, the facility remains subject to Parts 1 through 7, Parts 8.G.5 through 8.G.9, and all other applicable provisions of this permit.

8.G.4.1 *Additional Control Measures*.

The permittee shall implement, as applicable, control measures for erosion control, sediment control, perimeter control, good housekeeping, material storage, fueling and maintenance, concrete washouts, and non-stormwater discharges. In the SWPPP, identify and describe all temporary and/or permanent control measures to be implemented during the exploration and construction phases.

8.G.4.1.1 *Erosion and Sediment Controls.* Design and implement a combination of erosion and/ or sediment control BMPs to keep sediment in place and/ or to capture sediment to the extent practicable before it leaves the site. At a minimum, such controls must be designed, installed and maintained to:

a. Control stormwater volume and velocity within the site to minimize soil erosion;
b. Control stormwater discharges by minimizing both peak flow rates and total stormwater volume, to minimize erosion;
c. Phase or sequence exploration and construction activities, as practicable, to minimize the area of disturbance at any one time;
d. Minimize sediment discharges from the site;
e. Where practicable, increase sediment removal and maximize stormwater infiltration and / or reuse; and
f. Where practicable, minimize soil compaction and preserve topsoil.

8.G.4.1.2 *Maintenance of control measures*. The permittee shall maintain all control measures identified in the SWPPP in effective operating condition. Repairs or modifications of control measures shall be accomplished in accordance with Part 2.1.1.3.

8.G.4.1.3 *Dewatering*. The permittee shall ensure all discharges from dewatering or basin draining activities, including discharges from dewatering of trenches and excavations, are discharged in a manner that do not cause nuisance conditions, including erosion in receiving channels or on surrounding properties.

8.G.4.1.4 *Pollution Prevention Measures*. Design, install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, such measures must be designed, installed, implemented and maintained to:

a. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;
b. Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater; and
c. Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

8.G.4.1.5 *Prohibited Discharges*. The following discharges are prohibited:

a. Wastewater from washout of concrete, unless managed by an appropriate control;

b. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials. If concrete washout is conducted at the facility, appropriate control measures must be implemented to prevent discharge of pollutants;

c. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and

d. Soaps or solvents used in vehicle and equipment washing.

8.G.4.1.6 *Surface Outlets*. When culverts or other surface outlets are present on the site, the permittee shall include measures to sufficiently minimize the threat of erosion at surface outlet locations that prevent the formation of rills and gullies.

8.G.4.1.7 *Good Housekeeping.* (See also Part 2.1.1.2) The permittee shall implement practices to ensure litter, debris, and chemicals are prevented from contact with stormwater discharges. These procedures shall include storage practices to minimize exposure of the materials to stormwater, and spill prevention and response practices.

8.G.4.1.8 *Soil Stabilization.* After construction has ceased and until stabilization is achieved or active mining commences at the site, the permittee shall maintain the control measures, in accordance with Part 8.G.4.2, and conduct site inspections at least quarterly.

8.G.4.2 *Additional SWPPP Requirements.*

The requirements in Part 8.G.4.2 are applicable to exploration and construction activities.

*Note:* ADEQ recommends activities associated with the exploration and construction activities be kept as a separate chapter or appendix in the facility's SWPPP to distinguish from other mining operations.

8.G.4.2.1 *Nature of Exploration and Construction Activities.* (See also Part 5.1.2) Document in the facility's SWPPP the exploration and construction activities that can potentially affect the stormwater discharges covered by this permit.

8.G.4.2.2 The SWPPP shall describe the nature of the construction and exploration activities, including: a description of the exploration and construction phases on the mining property; and an estimate of the total area of the site (in acres) to be disturbed.

8.G.4.3 *Inspections*. (See also Part 4) Except as provided in Part 8.G.4.1.8, the permittee shall conduct inspections as indicated below to ensure BMPs are functional and that the SWPPP is being properly implemented.

8.G.4.3.1 Inspection Schedule.

a. Inspections shall be conducted once every 30 calendar days and within 24 hours of the end of each measurable storm event.

b. *Inspection Schedule for Sites within 2.5 miles of an Impaired or Outstanding Arizona Water.* If any discharge point from the construction site is within 2.5 miles of an impaired or outstanding Arizona water, the permittee shall inspect the site at least once every 7 calendar days.

*Note:* If the inspection day falls on a Saturday or holiday, the inspection may be conducted on the preceding workday. If the inspection day falls on a Sunday, the inspection shall be conducted on the following Monday.

8.G.4.3.2 Location of Inspections. Inspections must include all areas of the site disturbed by clearing, grading, and/or excavation activities and areas used for storage of materials

that are exposed to precipitation. Sedimentation and erosion control measures implemented must be observed to ensure proper operation. Discharge locations must be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to waters of the United States, where accessible. Where discharge locations are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site must be inspected for evidence of significant off-site sediment tracking.

8.G.4.3.3 Inspection Reports. (See also Part 4.1) For each inspection required above, the permittee shall document the findings of the inspections in accordance with Part 4.1, and maintain this documentation with the SWPPP. In addition to the information required in Part 4.1, the inspection report shall include:

a. Location(s) of discharges of sediment or other pollutants from the site;

b. For inspections occurring during or after a measurable storm event, a description of stormwater that is discharging from the site (presence of suspended sediment, turbid water, discoloration, and/or oil sheen, as applicable), when present;

c. Identification of all sources of non-stormwater discharges occurring at the site and associated BMPs in place;

d. Identification of material storage areas and, evidence of or potential for, pollutant discharge from such areas.

8.G.4.4 *Monitoring and Reporting Requirements for Discharges to Impaired and Outstanding Arizona Waters.* The permittee shall conduct monitoring and reporting as required in Part 8.G.4.3.1.b for stormwater discharges resulting from exploration and construction activities that are within 2.5 miles of an impaired water or outstanding Arizona water. The visual assessment and analytical monitoring requirements in this subpart are in addition to those required in Part 4.2, Part 6, Part 8.G.8 and Part 8.G.9, but may be combined where appropriate.

In accordance with Part 4.2.3 and Part 6.1.2.4, the permittee is not required to conduct visual assessments or analytical monitoring during adverse conditions.

**8.G.5 Additional Control Measures for the Active and Inactive Mining Phases.**

8.G.5.1 *Additional Stormwater Controls to be Evaluated.* The permittee shall evaluate whether some or all of the following control measures are necessary in order to meet the requirements of Part 2.2 and implement if necessary. These control measures must be evaluated in addition to those measures identified in Part 2.1.1. The potential pollutants identified in Part 8.G.6.3 shall determine the priority and appropriateness of the control measures selected.

8.G.5.1.1 *Stormwater Diversions*: Consider diversion of stormwater away from potential pollutant sources using one or more of the following measures: interceptor or diversion controls (e.g., dikes, swales, curbs, or berms); pipe slope drains; subsurface drains; conveyance systems (e.g., channels or gutters, open-top box culverts, and waterbars; rolling dips and road sloping; roadway surface water deflector and culverts); or their equivalents.

8.G.5.1.2 *Capping*: Consider capping potential pollutant sources. When capping is utilized to minimize pollutant discharges in stormwater, identify the source being capped and the material used to construct the cap.

8.G.5.1.3 *Treatment*: If treatment of stormwater (e.g., chemical or physical systems, oil and water separators, artificial wetlands) is determined to be necessary to meet the requirements of Part 2.2, describe the type and location of stormwater runoff is encouraged where practicable. Treated runoff may be discharged as a stormwater source regulated under this permit provided the discharge is not combined with

discharges subject to effluent limitation guidelines for the Ore Mining and Dressing Point Source Category (40 CFR Part 440).

8.G.5.2 *Sediment and Erosion Control*. At sites where the active phase has commenced, in addition to measures evaluated pursuant to Part 2.1.1.5, the permittee shall implement appropriate erosion and/ or sediment controls, in accordance with Part 8.G.4, when clearing, grading or excavation activities occur in previously undisturbed areas where discharges are not controlled by pre-existing or permanent control measures. The purpose of these sediment and/or control measures is to minimize the discharge of sediment from the newly disturbed areas. Where structural control measures are used for sediment control, such measures shall be installed prior to major land disturbance activities commencing.

8.G.5.3 *Certification of Discharge Testing.* (See also Part 5.1.3.4) Test or evaluate all outfalls covered under this permit for the presence of specific mining-related non-stormwater discharges such as seeps or adit discharges, or discharges subject to effluent limitations guidelines (e.g., 40 CFR Part 440), such as mine drainage or process water. The certification may be kept with the facility's SWPPP consistent with Part 8.G.6.6.

### 8.G.6 Additional SWPPP Requirements for Mining Operations.

The requirements in Part 8.G.6 are applicable to all mining operations, except inactive and unstaffed sites.

8.G.6.1 *Nature of Industrial Activities*. (See also Part 5.1.2) Briefly document in the facility's SWPPP the mining and associated activities that can potentially affect the stormwater discharges covered by this permit.

8.G.6.2 *Site Map.* (See also Part 5.1.2) Document the following in the SWPPP (as appropriate):

- Location of the site relative to major transportation routes and communities;
- Site boundaries of co-located facilities;
- Temporary control measures that may be utilized during the exploration or construction phase.
- Access and haul roads;
- Outline of the drainage areas of each stormwater outfall within the facility with indications of the types of discharges from the drainage areas;
- Location(s) of all permitted discharges covered under an individual AZPDES permit,
- The locations of the following, if they are located such that they will contribute to discharge from a stormwater outfall covered by this permit:
  - Mining or milling site boundaries; immediate access roads and haul roads;
  - Overburden, materials, soils, or waste storage areas;
  - Outdoor equipment storage, fueling, and maintenance areas;
  - Materials handling areas;
  - Outdoor manufacturing, outdoor storage, and material disposal areas;
  - Outdoor chemicals and explosives storage areas;
  - Reclaimed areas;
- Location of mine drainage, dewatering or other process water;
- Off-site points of discharge for mine dewatering and process water; and
- Boundary of areas that contribute discharges subject to effluent limitations guidelines.

8.G.6.3 *Potential Pollutant Sources.* (See also Part 5.1.3) For each area of the mine or mill site where stormwater discharges associated with industrial activities occur, document in the SWPPP the types of pollutants (e.g., heavy metals, sediment) likely to be present in significant amounts. To identify potential pollutants, evaluate these factors: the mineralogy of the ore and waste rock

(e.g., acid generating); toxicity and quantity of chemicals used, produced, or discharged; the likelihood of contact with stormwater; vegetation of site (if any); and history of significant leaks or spills of toxic or hazardous pollutants. Also include a summary of any existing ore or waste rock or overburden characterization data and test results for potential generation of acid rock drainage. If any new data is acquired due to changes in ore type being mined, update the SWPPP with this information.

8.G.6.4 *Documentation of Control Measures.* All control measures implemented at the site shall be documented in the SWPPP, in accordance with Part 8.G.5.1 and Part 5.1.4. If control measures are implemented or planned but are not listed in Part 8.G.5.1 (e.g., substituting a less toxic chemical for a more toxic one), include descriptions of them in the SWPPP.

8.G.6.5 *Employee Training.* All employee training conducted in accordance with Part 2.1.1.9 shall be documented with the SWPPP.

8.G.6.6 *Certification of Permit Coverage for Commingled Non-Stormwater Discharges:* If the permittee is able to certify, consistent with Part 8.G.5.2 above, that a particular discharge composed of commingled stormwater and non-stormwater is covered under a separate AZPDES permit, and that permit subjects the non-stormwater portion to effluent limitations prior to any commingling, such certification shall be retained with the SWPPP. This certification must identify the non-stormwater discharges, the applicable AZPDES permit(s), the effluent limitations placed on the non-stormwater discharge by the permit(s), and the points at which the limitations are applied.

### 8.G.7 Additional Inspection Requirements for the Active Mining Phase. (See also Part 4.1)

As required by Part 4.1, the permittee shall conduct routine facility inspections at active mine sites at least quarterly unless adverse weather conditions make the site inaccessible. Inspections are only required to cover areas where industrial activities occur that are exposed to precipitation and that contribute to stormwater discharges from the site covered under this permit.

Unless otherwise approved by ADEQ, active sites which discharge to waters designated as OAWs or waters which are impaired for sediment must be inspected monthly. The permittee may submit a request to the Department to reduce the inspection frequency to quarterly at one or more outfalls to an OAW or a water impaired for sediment. The request must be based on the frequencies of discharges and the performance of the control measure(s).

### 8.G.8 Monitoring and Reporting Requirements. (See also Part 6.)

*Note:* There are no Part 8.G.8 monitoring and reporting requirements for inactive and unstaffed sites.

8.G.8.1 *General Analytical Monitoring for Active Copper Ore Mining and Dressing Facilities.* Active copper ore mining and dressing facilities shall sample and analyze stormwater discharges for the pollutants listed in Table 8.G-8.1. Permittees discharging to perennial or intermittent waters must sample and analyze stormwater discharges, on an annual basis, alternating wet seasons each year, beginning in year one of permit coverage. Permittees discharging to ephemeral waters are not required to sample under this subsection.

**Table 8.G-8.1**

| Subsector (Facility discharges may be subject to requirements for more than one sector/subsector) | Parameter |
|---|---|
| **Subsector G1**. Active Copper Ore Mining and Dressing Facilities (SIC 1021) | Total Suspended Solids (TSS) |
| | Chemical Oxygen Demand (COD) |

8.G.8.2 *Monitoring Requirements for Discharges from Waste Rock and Overburden Piles at Active Metal Mining Facilities*

8.G.8.2.1 *General Analytical Monitoring.*

For discharges from waste rock and overburden piles, the permittee shall sample and analyze stormwater discharges for the parameters listed in Table 8.G-8.2. The permittee shall retain all report, monitoring data and methodologies in accordance with Part 7.5 of the permit.

Permittees discharging to perennial or intermittent waters: the permittee shall sample and analyze, on a semi-annual basis, once each wet season, beginning in year one of permit coverage. In addition to analyzing the stormwater discharge for hardness, the permittee shall characterize the hardness of the receiving water. Such characterization may include analysis of samples from the surface water receiving the discharge or surface water data collected by a third party provided the data is credible, scientifically defensible and is representative of current conditions. The data and the methodology for determining the hardness values must be submitted to ADEQ in the first year of permit coverage.

For permittees discharging to ephemeral waters: the permittee shall sample and analyze, on an annual basis in alternating wet seasons, beginning in year one of permit coverage. Permittees discharging to ephemeral waters are not required to sample TSS or turbidity, in accordance with Part 6.2.1.2.

**Table 8.G-8.2**

| **Subsector (Discharges may be subject to requirements for more than one sector/subsector)** | **Parameter** |
|---|---|
| **Subsector G2**. Iron Ores; Copper Ores; Lead and Zinc Ores; Gold and Silver Ores; Ferroalloy Ores, Except Vanadium; and Miscellaneous Metal Ores (SIC Codes 1011, 1021, 1031, 1041, 1044, 1061, 1081, 1094, 1099) | Total Suspended Solids (TSS) |
| | Turbidity |
| | pH |
| | Hardness (as $CaCO_3$; calc. from Ca, Mg)[1] |
| | Antimony |
| | Arsenic |
| | Beryllium |
| | Cadmium, total & dissolved[1] |
| | Copper, total & dissolved [1] |
| | Iron, total & dissolved |
| | Lead, total & dissolved [1] |
| | Mercury, total & dissolved |
| | Nickel, total & dissolved [1] |
| | Selenium |
| | Silver, total & dissolved [1] |
| | Zinc, total & dissolved [1] |

[1] These metals are hardness-dependent and require sampling for water hardness. Note: when analyzing hardness for a suite of metals, it is more cost effective to add analysis of calcium and magnesium, and have hardness calculated than to require separate hardness analysis.

8.G.8.2.2 *Additional Analytical Monitoring For Uranium, Vanadium or Radium Ores Mining Facilities.* These permittees shall also conduct additional monitoring for the parameters in Table 8.G-8.3 at the same frequencies required in Part 8.G.8.2.1.

**Table 8.G-8.3**

| **Subsector (Discharges may be subject to requirements for more than one sector/subsector)** | **Parameter** |
|---|---|
| **Subsector G2:** Uranium-Vanadium-Radium Ore Mining (SIC Code 1094) | Radium, total and dissolved |
| | Uranium |
| | Chemical Oxygen Demand (COD) |

8.G.8.2.3 *Additional Monitoring.* The Director may require the permittee to perform additional monitoring to accurately characterize the quality and quantity of pollutants discharged from waste rock and overburden piles in accordance with Part 6.2.4.

### 8.G.9 Termination of Permit Coverage

8.G.9.1 *Termination of Permit Coverage for Sites Reclaimed After December 17, 1990.* A site (or a portion of a site) that was released from applicable state or federal reclamation requirements after December 17, 1990, is not required to maintain coverage under this permit.

If the site or portion of a site reclaimed after December 17, 1990, was not subject to reclamation requirements, the site or portion of the site is not required to maintain coverage under this permit if the site or portion of the site has been reclaimed as defined in Part 8.G.9.2.

8.G.9.2 *Termination of Permit Coverage for Sites Reclaimed Before December 17, 1990.* A site or portion of a site that was released from applicable state or federal reclamation requirements before December 17, 1990, or that was otherwise reclaimed before December 17, 1990, is no longer required to maintain coverage under this permit if the site or portion of the site has been reclaimed. A site or portion of a site is considered to have been reclaimed if:

(1) Stormwater runoff that comes into contact with raw materials, intermediate byproducts, finished products, and waste products does not have the potential to cause or contribute to violations of state water quality standards,

(2) Soil disturbing activities related to mining at the sites or portion of the site have been completed;

(3) The site or portion of the site has been stabilized as necessary to minimize soil erosion; and

(4) As appropriate depending on location, size, and the potential to contribute pollutants to stormwater discharges, the site or portion of the site has been revegetated, will be amenable to natural revegetation, or will be left in a condition consistent with the post-mining land use.

**Part 8 – Sector-Specific Requirements for Industrial Activity**

**Subpart H – Sector H – Coal Mines and Coal Mining-Related Facilities.**
**RESERVED**

**Part 8 – Sector-Specific Requirements for Industrial Activity**

**Subpart I – Sector I – Oil and Gas Extraction.**
**RESERVED**

**Part 8 – Sector-Specific Requirements for Industrial Activity**

**Subpart J – Sector J – Non-Metallic Mineral Mining and Dressing.**

The permittee shall comply with Part 8 sector-specific requirements associated with the facility's primary industrial activity and any co-located industrial activities authorized under this permit, as defined in Appendix A. The sector-specific requirements apply to those areas of the facility where those sector-specific activities occur. These sector-specific requirements are in addition to any requirements specified elsewhere in this permit.

### 8.J.1 Covered Stormwater Discharges.

The requirements in Subpart J apply to stormwater discharges associated with industrial activity from Active and Inactive Non-Metallic Mineral Mining and Dressing facilities as identified by the SIC Codes specified under Sector J in Table 1-1 of this permit.

8.J.1.1 *Covered Discharges from Active Non-Metallic Mineral Mining Facilities.* All stormwater discharges, except for most stormwater discharges subject to the existing effluent limitation guideline at 40 CFR Part 436. Mine dewatering discharges composed entirely of stormwater or uncontaminated groundwater seepage from: construction sand and gravel, industrial sand, and crushed stone mining facilities are covered by this permit.

8.J.1.2 *Covered Discharges from Inactive Facilities.* All stormwater discharges.

8.J.1.3 *Covered Discharges from Exploration and Construction of Non-Metallic Mineral Mining Facilities.* All stormwater discharges.

8.J.1.4 *Covered Discharges from Sites Undergoing Reclamation.* All stormwater discharges.

### 8.J.2 Limitations on Coverage.

Most stormwater discharges subject to an existing effluent limitation guideline at 40 CFR Part 436 are not authorized by this permit. An exception to this is mine dewatering discharges composed entirely of stormwater or uncontaminated groundwater seepage from construction sand and gravel, industrial sand, and crushed stone mining facilities, which are covered under this permit.

### 8.J.3 Definitions.

The following definitions are not intended to supersede the definitions of active and inactive mining facilities established by 40 CFR 122.26(b)(14)(iii).

8.J.3.1 *Mining operation* - Consists of active, inactive, reclamation phases and the exploration and construction phases.

8.J.3.2 *Explo ration phase* - Entails exploration and land disturbance activities to delineate the dimensions and financial viability of a non-metallic mineral mining site.

8.J.3.3 *Construction phase* - Includes the initial building of site access roads and initial removal of overburden and waste rock to expose mineable minerals at a mining site. In addition, any subsequent construction activity on undisturbed areas of an existing mine property is also considered part of the construction phase if stormwater discharges are not managed by pre-existing or permanent control measures.

8.J.3.4 *Active phase* - Activities including the extraction, removal or recovery of minerals. For surface mines, this definition does not include any land where grading has returned the earth to a desired contour and reclamation has begun. This definition is derived from the definition of

"active mining area" found at 40 CFR 440.132(a). The active phase is considered part of "mining operations."

*Note:* The following definitions are not intended to supersede the definitions of active and inactive mining facilities established by 40 CFR 122.26(b)(14)(iii).

8.J.3.5 *Active Mineral Mining Facility* - A site or portion of a site where work or other activity related to the extraction, removal, or recovery of non-metallic minerals is being conducted. For surface mines, this definition does not include any land where grading has returned the earth to a desired contour and reclamation has begun. This definition is derived from the definition of "active mining area" found at 40 CFR 440.132(a).

8.J.3.6 *Inactive Mineral Mining Facility* - A site or portion of a site where non-metallic mineral mining and/or milling occurred in the past but is not an active facility as defined above. An inactive mineral mining facility has an identifiable owner / operator. Sites where mining claims are being maintained prior to disturbances associated with the extraction, beneficiation, or processing of mined materials, and sites where minimal activities are undertaken for the sole purpose of maintaining a mining claim are not considered either active or inactive mining facilities and do not require an AZPDES industrial stormwater permit.

8.J.3.7 *Reclamation phase* - Activities undertaken, following the cessation of the exploration phase or the "active phase" at a site or a portion of a site, intended to return the land to an appropriate post-mining land use in order to meet applicable Federal and State reclamation requirements or the requirements of Part 8.J.10.1 at a site or portion of a site not subject to Federal and State reclamation requirements. The reclamation phase is considered part of "mining operations".

8.J.3.8 *Stabilization* - a site or portion of a site is "stabilized" when it has implemented all applicable Federal and State reclamation requirements.

8.J.3.9 *Uncontaminated* - Free from the presence of pollutants attributable to industrial activity.

### 8.J.4 Stormwater Discharges Associated with the Exploration and Construction Phases of Mining (Clearing, Grading, and Excavation Activities).

Clearing, grading, and excavation activities being conducted as part of the exploration and construction phases at mining sites are covered under this permit (or may be covered under an alternate AZPDES stormwater permit such as the AZPDES General Permit for Discharge from Construction Activities (AZG2008-001)) if they disturb one acre or more. Exploration and construction activities disturbing less than one acre do not require permit coverage unless they are integrally related to other exploration or construction activities that collectively disturb one acre or more.

For all areas affected by exploration and construction activities that will occur at an active site or previously mined site, the permittee shall select, design, install, and implement the following control measures or their equivalents, as necessary to minimize the discharge of pollutants to stormwater. The control measures selected shall be documented in the SWPPP.

Once the areas subject to construction and exploration activities are stabilized or the area(s) become part of the mining operation, the control measures, inspections, monitoring, and other requirements in Parts 8.J.4 are no longer required; however, the facility is still subject to Parts 1 through 7 and all other applicable provisions of this permit.

8.J.4.1 *Additional control measures.* The permittee shall implement, as applicable, control measures for erosion control, sediment control, perimeter control, good housekeeping, material storage, fueling and maintenance, concrete washouts, and non-stormwater discharges. In the SWPPP, identify and describe all temporary and/or permanent control measures to be implemented during the exploration and construction phases.

8.J.4.1.1 *Erosion and Sediment Controls.* The permittee shall design and implement a combination of erosion and/ or sediment control BMPs to keep sediment in place and/ or to capture sediment to the extent practicable before it leaves the site. At a minimum, such controls must be designed, installed and maintained to:

a. Control stormwater volume and velocity within the site to minimize soil erosion;

b. Control stormwater discharges by minimizing both peak flow rates and total stormwater volume to control erosion;

c. Phase or sequence exploration and construction activities, as practicable, to minimize the area of disturbance at any one time;

d. Minimize sediment discharges from the site;

e. Where practicable, increase sediment removal and maximize stormwater infiltration and / or reuse; and

f. Where practicable, minimize soil compaction and preserve topsoil.

8.J.4.1.2 *Maintenance of control measures*. The permittee shall maintain all control measures identified in the SWPPP in effective operating condition. Repairs or modifications of control measures shall be accomplished in accordance with Part 2.1.1.3.

8.J.4.1.3 *Dewatering*. The permittee shall ensure all discharges from dewatering or basin draining activities, including discharges from dewatering of trenches and excavations, are discharged in a manner that do not cause nuisance conditions, including erosion in receiving channels or on surrounding properties.

8.J.4.1.4 *Pollution Prevention Measures*. The permittee shall design, install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants. At a minimum, such measures must be designed, installed, implemented and maintained to:

a. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Wash waters must be treated in a sediment basin or alternative control that provides equivalent or better treatment prior to discharge;

b. Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste and other materials present on the site to precipitation and to stormwater; and

c. Minimize the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

8.J.4.1.5 *Prohibited Discharges*. The following discharges are prohibited:

a. Wastewater from washout of concrete, unless managed by an appropriate control;

b. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds and other construction materials. If concrete washout is conducted at the facility, appropriate control measures must be implemented to prevent discharge of pollutants;

c. Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance; and

d. Soaps or solvents used in vehicle and equipment washing.

8.J.4.1.6 *Surface Outlets*. When culverts or other surface outlets are present on the site, the permittee shall include measures to sufficiently minimize the threat of erosion at surface outlet locations that prevent the formation of rills and gullies.

8.J.4.1.7 *Good Housekeeping.* (See also Part 2.1.1.2) The permittee shall implement practices to ensure litter, debris, and chemicals are prevented from contact with stormwater discharges. These procedures shall include storage practices to minimize exposure of the materials to stormwater, and spill prevention and response practices.

8.J.4.1.8 *Soil Stabilization.* After construction has ceased and until stabilization is achieved or active mining commences at the site, the permittee shall maintain the control measures, in accordance with Part 8.J.4.2, and conduct site inspections at least quarterly.

8.J.4.2 *Additional SWPPP Requirements.*

The requirements in Part 8.J.4.2 are applicable to exploration and construction activities.

*Note:* ADEQ recommends activities associated with the exploration and construction activities be kept as a separate chapter or appendix in the facility's SWPPP to distinguish from mining operations.

8.J.4.2.1 *Nature of Exploration and Construction Activities.* (See also Part 5.1.2) Document in the facility's SWPPP the exploration and construction activities that can potentially affect the stormwater discharges covered by this permit.

8.J.4.2.2 The SWPPP shall describe the nature of the construction and exploration activities, including: a description of the exploration and construction phases on the mining property; and an estimate of the total area of the site (in acres) to be disturbed.

8.J.4.3 *Inspections*. (See also Part 4) Except as provided in Part 8.J.4.1.8, the permittee shall conduct inspections as indicated below to ensure BMPs are functional and that the SWPPP is being properly implemented.

8.J.4.3.1 Inspection Schedule.

a. Inspections shall be conducted once every 30 calendar days and within 24 hours of the end of each measurable storm event.

b. *Inspection Schedule for Sites within 2.5 miles of an Impaired or Outstanding Arizona Water.* If any discharge point from the construction site is within 2.5 miles of an impaired or outstanding Arizona water, the permittee shall inspect the site at least once every 7 calendar days.

*Note:* If the inspection day falls on a Saturday or holiday, the inspection may be conducted on the preceding workday. If the inspection day falls on a Sunday, the inspection shall be conducted on the following Monday.

8.J.4.3.2 Location of Inspections. Inspections must include all areas of the site disturbed by clearing, grading, and/or excavation activities and areas used for storage of materials that are exposed to precipitation. Sedimentation and erosion control measures implemented must be observed to ensure proper operation. Discharge locations must be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to waters of the United States, where accessible. Where discharge locations are inaccessible, nearby downstream locations must be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site must be inspected for evidence of significant off-site sediment tracking.

8.J.4.3.3 Inspection Reports. (See also Part 4.1) For each inspection required above, the permittee shall document the findings of the inspections in accordance with Part 4.1, and maintain this documentation with the SWPPP. In addition to the information required in Part 4.1, the inspection report shall include:

a. Location(s) of discharges of sediment or other pollutants from the site;

b. For inspections occurring during or after a measurable storm event, a description of stormwater that is discharging from the site (presence of suspended sediment, turbid water, discoloration, and/or oil sheen, as applicable), when present;

c. Identification of all sources of non-stormwater discharges occurring at the site and associated BMPs in place;

d. Identification of material storage areas and, evidence of or potential for, pollutant discharge from such areas.

8.J.4.4 *Monitoring and Reporting Requirements for Discharges to Impaired and Outstanding Arizona Waters.* The permittee shall conduct monitoring and reporting as required in Part 8.J.4.3.1.b for stormwater discharges resulting from exploration and construction activities that are within 2.5 miles of an impaired water or outstanding Arizona water. The visual assessment and analytical monitoring requirements in this subpart are in addition to those required in Part 4.2, Part 6, Part 8.J.8 and Part 8.J.9, but may be combined where appropriate.

In accordance with Parts 4.2.3 and 6.1.2.4, the permittee is not required to conduct visual assessments or analytical monitoring during adverse conditions.

**8.J.5 Additional Control Measures for Active and Inactive Mining Phases.**

8.J.5.1 *Additional Stormwater Controls.* The permittee shall evaluate whether some or all of the following control measures are necessary, and implement as appropriate, in order to meet the requirements of Part 2. These control measures are apart from, or in addition to, the control measures implemented by the permittee to meet the Part 2 effluent limits. The potential pollutants identified in Part 8.J.6.3 shall determine the priority and appropriateness of the control measures selected.

8.J.5.1.1 *Stormwater Diversions*: As necessary, divert stormwater away from potential pollutant sources using one or more of the following measures: interceptor or diversion controls (e.g., dikes, swales, curbs, or berms); pipe slope drains; subsurface drains; conveyance systems (e.g., channels or gutters, open-top box culverts, and waterbars; rolling dips and road sloping; roadway surface water deflector and culverts); or their equivalents.

8.J.5.1.2 *Treatment:* If treatment of stormwater (e.g., chemical or physical systems, oil and water separators, artificial wetlands) is determined to be necessary to meet the requirements of Part 2.2, describe the type and location of treatment used. Passive and/or active treatment of stormwater runoff is encouraged. Treated runoff may be discharged as a stormwater source regulated under this permit provided the discharge is not combined with discharges subject to effluent limitation guidelines for the Mineral Mining and Processing Point Source Category (40 CFR Part 436), except as those subparts identified in Table 2-1 of this permit.

8.J.5.2 *Sediment and Erosion Control*. At sites where the active phase has commenced, in addition to measures evaluated pursuant to Part 2.1.1.5, the permittee shall implement appropriate erosion and/ or sediment controls, in accordance with Part 8.J.4, when clearing, grading or excavation activities occur in previously undisturbed areas where discharges are not controlled by pre-existing or permanent control measures. The purpose of these sediment and/or control measures is to minimize the discharge of sediment from the newly disturbed areas. Where structural control measures are used for sediment control, such measures shall be installed prior to major land disturbance activities commencing.

8.J.5.3 *Certification of Discharge Testing:* (See also Part 5.1.4.4) Test or evaluate all outfalls covered under this permit for the presence of specific mining-related non-stormwater discharges such as

discharges subject to effluent limitations guidelines (e.g., 40 CFR Part 436). The certification may be kept with the facility's SWPPP consistent with Part 8.J.6.6.

**8.J.6 Additional SWPPP Requirements for Mining Operations.**

The requirements in Part 8.J.6 are applicable to all mining operations, except inactive and unstaffed sites.

8.J.6.1 *Nature of Industrial Activities*. (See also Part 5.1.2) Document in the facility's SWPPP the mining and associated activities that can potentially affect the stormwater discharges covered by this permit.

8.J.6.2 *Site Map.* (See also Part 5.1.2) Document the following in the SWPPP (as appropriate):

- Location of the site relative to major transportation routes and communities;
- Site boundaries of co-located facilities;
- Temporary control measures that may be utilized during the exploration or construction phase.
- Access and haul roads;
- Outline of the drainage areas of each stormwater outfall within the facility with indications of the types of discharges from the drainage areas;
- Location(s) of all permitted discharges covered under an individual AZPDES permit,
- The locations of the following, if they are located such that they will contribute to discharge from a stormwater outfall covered by this permit:
  - Mining or milling site boundaries; immediate access roads and haul roads;
  - Overburden, materials, soils, or waste storage areas;
  - Outdoor equipment storage, fueling, and maintenance areas;
  - Materials handling areas;
  - Outdoor manufacturing, outdoor storage, and material disposal areas;
  - Outdoor chemicals and explosives storage areas;
  - Re claimed areas;
- Location of mine drainage, dewatering or other process water;
- Off-site points of discharge for mine dewatering and process water; and
- Boundary of areas that contribute discharges subject to effluent limitations guidelines.

8.J.6.3 *Potential Pollutant Sources.* (See also Part 5.1.3) For each area of the mine site where stormwater discharges associated with industrial activities occur, document in the SWPPP the types of pollutants (e.g., oil, sediment) likely to be present in significant amounts. To identify potential pollutants, evaluate these factors: toxicity and quantity of chemicals used, produced, or discharged; the likelihood of contact with stormwater; vegetation of site (if any); and history of significant leaks or spills of toxic or hazardous pollutants. If applicable include in the SWPPP a summary of any existing waste rock or overburden characterization data and test results for potential generation of acid rock drainage.

8.J.6.4 *Documentation of Control Measures.* To the extent that any of the control measures in Part 8.J.5.1 are used, the permittee shall document them in the facility's SWPPP pursuant to Part 5.1.4. If control measures are implemented or planned but are not listed in Part 8.J.5.1 (e.g., substituting a less toxic chemical for a more toxic one), include descriptions of them in the SWPPP.

8.J.6.5 *Employee Training.* All employee training conducted in accordance with Part 2.1.1.9 shall be documented with the SWPPP.

8.J.6.5 *Certification of Permit Coverage for Commingled Non-Stormwater Discharges.* If the permittee is able to certify, consistent with Part 8.J.5.2 above, that a particular discharge composed of commingled stormwater and non-stormwater is covered under a separate AZPDES permit, and that permit subjects the non-stormwater portion to effluent limitations prior to any commingling, such certification shall be retained with the SWPPP. This certification must identify the non-stormwater discharges, the applicable AZDPES permit(s), the effluent limitations placed on the non-stormwater discharge by the permit(s), and the points at which the limitations are applied.

### 8.J.7 Additional Inspection Requirements for the Active Mining Phase. (See also Part 4.1)

As required by Part 4.1, the permittee shall conduct routine facility inspections at active mining sites at least quarterly unless adverse weather conditions make the site inaccessible. Inspections are only required to cover areas where industrial activities occur that are exposed to precipitation and that contribute to stormwater discharges from the site covered under this permit.

Unless otherwise approved by ADEQ, active sites which discharge to waters designated as OAWs or waters which are impaired for sediment must be inspected monthly. The permittee may submit a request to the Department to reduce the inspection frequency to quarterly at one or more outfalls to an OAW or a water impaired for sediment. The request must be based on the frequencies of discharges and the performance of the control measure(s).

### 8.J.8 Monitoring and Reporting Requirements. (See also Part 6)

*Note:* There are no Part 8.J.8 monitoring and reporting requirements for inactive and unstaffed sites.

Table 8.J-1 identifies general analytical monitoring that applies to the specific subsectors of Sector J. These monitoring requirements apply to both the facility's primary industrial activity and any co-located industrial activities authorized under this permit, which describe the site's activities. Permittees discharging to perennial or intermittent waters must sample and analyze stormwater discharges for the pollutants listed in Table 8.J-8.1, on a semi-annual basis, once each wet season, beginning in year one of permit coverage. Permittees discharging to ephemeral waters are not required to sample TSS, in accordance with Part 6.2.1.2.

**Table 8.J-8.1**

| Subsector (Facility discharges may be subject to requirements for more than one sector/subsector) | Parameter |
|---|---|
| **Subsector J1.** Sand and Gravel Mining (SIC 1442, 1446) | Total Suspended Solids (TSS) |
| **Subsector J2**. Dimension and Crushed Stone and Non-metallic Minerals (except fuels) (SIC 1411, 1422-1429, 1481, 1499) | Total Suspended Solids (TSS) |

### 8.J.9 Effluent Limitations Based on Effluent Limitations Guidelines (See also Part 6.2.2.1.)

Table 8.J-2 identifies effluent limits that apply to the industrial activities described below. Compliance with these effluent limits is to be determined based on discharges from these industrial activities independent of commingling with any other discharges that may be allowed under this permit.

| Table 8.J-2 | | |
|---|---|---|
| **Industrial Activity** | **Parameter** | **Effluent Limitation[1]** |
| Mine dewatering discharges at crushed stone mining facilities (SIC 1422 - 1429) | pH | 6.0 – 9.0 s.u. |
| Mine dewatering discharges at construction sand and gravel mining facilities (SIC 1442) | pH | 6.0 – 9.0 s.u. |
| Mine dewatering discharges at industrial sand mining facilities (SIC 1446) | Total Suspended Solids (TSS) | 25 mg/L, monthly avg. |
| | | 45 mg/L, daily maximum |
| | pH | 6.0 – 9.0 s.u. |

[1]Monitor annually.

### 8.J.10 Termination of Permit Coverage

8.J.10.1 *Termination of Permit Coverage for Sites Reclaimed After December 17, 1990.* A site or a portion of a site that has been released from applicable state or federal reclamation requirements after December 17, 1990, is not required to maintain coverage under this permit.

If the site or portion of a site reclaimed after December 17, 1990, was not subject to reclamation requirements, the site or portion of the site is not required to maintain coverage under this permit if the site or portion of the site has been reclaimed as defined in Part 8.J.10.2.

8.J.10.2 *Termination of Permit Coverage for Sites Reclaimed Before December 17, 1990.* A site or portion of a site that was released from applicable state or federal reclamation requirements before December 17, 1990, or that was otherwise reclaimed before December 17, 1990, is no longer required to maintain coverage under this permit if the site or portion of the site has been reclaimed. A site or portion of a site is considered to have been reclaimed if:

(1) Stormwater runoff that comes into contact with raw materials, intermediate byproducts, finished products, and waste products does not have the potential to cause or contribute to violations of state water quality standards;

(2) Soil disturbing activities related to mining at the sites or portion of the site have been completed;

(3) The site or portion of the site has been stabilized as necessary to minimize soil erosion; and

(4) As appropriate depending on location, size, and the potential to contribute pollutants to stormwater discharges, the site or portion of the site has been revegetated, will be amenable to natural revegetation, or will be left in a condition consistent with the post-mining land use.

# Appendix A

## Definitions, Abbreviations and Acronyms

## Appendix A. Definitions, Abbreviations, and Acronyms (for the purposes of this permit).

**Approved Total Maximum Daily Loads (TMDLs)** –Approved TMDLs are those that are developed by the Arizona Department of Environmental Quality and approved by EPA.

**Best Management Practices (BMPs)** – schedules of activities, practices (and prohibitions of practices), structures, vegetation, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. See 40 CFR 122.2.

**Co-located Industrial Activities** – Any industrial activities, excluding primary industrial activity(ies), located on-site that are defined by the stormwater regulations at 122.26(b)(14)(i)-(ix) and (xi). An activity at a facility is not considered co-located if the activity, when considered separately, does not meet the description of a category of industrial activity covered by the stormwater regulations or identified by the SIC code list in Appendix D.

**Control Measure** – refers to any BMP or other method (including effluent limitations) used to prevent or reduce the discharge of pollutants to waters of the United States.

**Director** – a means the Director of the Arizona Department of Environmental Quality or an authorized representative.

**Discharge** – when used without qualification, means the "discharge of a pollutant." See 40 CFR 122.2.

**Discharge of a pollutant** – any addition of any “pollutant” or combination of pollutants to “waters of the United States” from any “point source,” or any addition of any pollutant or combination of pollutants to the waters of the “contiguous zone” or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation. This includes additions of pollutants into waters of the United States from: surface runoff which is collected or channeled by man; discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works. See 40 CFR 122.2.

**Existing Discharger** – an operator applying for coverage under this permit for discharges authorized previously under an AZPDES general or individual permit.

**Facility or Activity** – any AZPDES “point source” (including land or appurtenances thereto) that is subject to regulation under the AZPDES program. See 40 CFR 122.2.

**Federal Facility** – any buildings, installations, structures, land, public works, equipment, aircraft, vessels, and other vehicles and property, owned by, or constructed or manufactured for the purpose of leasing to, the federal government.

**Impaired water** – waters that have been assessed by ADEQ, under the CWA, Section 303(d), as not attaining a water quality standard for at least one designated use, and are listed in Arizona’s 2006 – 2008 §303(d) and Other Impaired Waters List.

**Indian Country** – (a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and including rights-of-way running through the reservation; (b) all dependent Indian communities within the borders of the United States, whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a State, and (c) all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same. This definition includes all land held in trust for an Indian tribe. (18 U.S.C. 1151)

**Industrial Activity** – the 10 categories of industrial activities included in the definition of “stormwater discharges associated with industrial activity” as defined in 40 CFR 122.26(b)(14)(i)-(ix) and (xi).

**Industrial Stormwater** – stormwater runoff from industrial activity.

**Municipal Separate Storm Sewer** – a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;

(ii) Designed or used for collecting or conveying stormwater;

(iii) Which is not a combined sewer; and

(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2. See 40 CFR 122.26(b)(4) and (b)(7).

**New Discharger** – a facility from which there is a discharge, that did not commence the discharge at a particular site prior to August 13, 1979, which is not a new source, and which has never received a finally effective AZPDES permit for discharges at that site. See 40 CFR 122.2.

**New Source** – any building, structure, facility, or installation from which there is or may be a "discharge of pollutants," the construction of which commenced:

- After promulgation of standards of performance under section 306 of the CWA which are applicable to such source, or
- After proposal of standards of performance in accordance with section 306 of the CWA which are applicable to such source, but only if the standards are promulgated in accordance with section 306 within 120 days of their proposal. See 40 CFR 122.2.

**New Source Performance Standards (NSPS)** – technology-based standards for facilities that qualify as new sources under 40 CFR 122.2 and 40 CFR 122.29.

**No exposure** – all industrial materials or activities are protected by a storm-resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff. See 40 CFR 122.26(g).

**Operator** – any entity with a stormwater discharge associated with industrial activity that meets either of the following two criteria:

(i) The entity has operational control over industrial activities, including the ability to modify those activities; or

(ii) The entity has day-to-day operational control of activities at a facility necessary to ensure compliance with the permit (e.g., the entity is authorized to direct workers at a facility to carry out activities required by the permit).

**Outstanding Arizona Water** – a surface water that has been designated by ADEQ as an outstanding state resource under A.A.C. R18-11-112.

**Person** – an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof. See 40 CFR 122.2.

**Point source** – any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft from which pollutants are or

may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff. See 40 CFR 122.2.

**Pollutant** – dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal and agricultural waste discharged into water. See 40 CFR 122.2.

**Pollutant of concern** – A pollutant which causes or contributes to a violation of a water quality standard, including a pollutant which is identified as causing an impairment in a state's 303(d) list.

**Primary industrial activity** – includes any activities performed on-site which are (1) identified by the facility's primary SIC code; or (2) included in the narrative descriptions of 122.26(b)(14)(i), (iv), (v), or (vii), and (ix). [For co-located activities covered by multiple SIC codes, it is recommended that the primary industrial determination be based on the value of receipts or revenues or, if such information is not available for a particular facility, the number of employees or production rate for each process may be compared. The operation that generates the most revenue or employs the most personnel is the operation in which the facility is primarily engaged. In situations where the vast majority of on-site activity falls within one SIC code, that activity may be the primary industrial activity.] Narrative descriptions in 40 CFR 122.26(b)(14) identified above include: (i) activities subject to stormwater effluent limitations guidelines, new source performance standards, or toxic pollutant effluent standards; (iv) hazardous waste treatment storage, or disposal facilities including those that are operating under interim status or a permit under subtitle C of the Resource Conservation and Recovery Act (RCRA); (v) landfills, land application sites and open dumps that receive or have received industrial wastes; (vii) steam electric power generating facilities; and (ix) sewage treatment works with a design flow of 1.0 mgd or more.

**Qualified Personnel** – Qualified personnel are those (either the permittee's employees or outside consultants) who possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at the facility, and who can also evaluate the effectiveness of control measures.

**Reportable Quantity Release** – a release of a hazardous substance at or above the established legal threshold that requires emergency notification. Refer to 40 CFR Parts 110, 117, and 302 for complete definitions and reportable quantities for which notification is required.

**Runoff coefficient** – the fraction of total rainfall that will appear at the conveyance as runoff. See 40 CFR 122.26(b)(11).

**Significant materials** – includes, but is not limited to: raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under section 101(14) of CERCLA; any chemical the facility is required to report pursuant to section 313 of Title III of SARA; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with stormwater discharges. See 40 CFR 122.26(b)(12).

**Stormwater** – stormwater runoff, snow melt runoff, and surface runoff and drainage. See 40 CFR 122.26(b)(13).

**Stormwater Discharges Associated with Construction Activity** – a discharge of pollutants in stormwater runoff from areas where soil disturbing activities (e.g., clearing, grading, or excavating), construction materials, or equipment storage or maintenance (e.g., fill piles, borrow areas, concrete truck washout, fueling), or other industrial stormwater directly related to the construction process (e.g., concrete or asphalt batch plants) are located. See 40 CFR 122.26(b)(14)(x) and 40 CFR 122.26(b)(15).

**Stormwater Discharges Associated with Industrial Activity** – the discharge from any conveyance that is used for collecting and conveying stormwater and that is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities

or activities excluded from the AZPDES program under Part 122. For the categories of industries identified in this section, the term includes, but is not limited to, stormwater discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined at part 401 of this chapter); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and final products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater. For the purposes of this paragraph, material handling activities include storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product, by-product or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with stormwater drained from the above described areas. Industrial facilities include those that are federally, State, or municipally owned or operated that meet the description of the facilities listed in 40 CFR 122.26(b)(14). The term also includes those facilities designated under the provisions of 40 CFR 122.26(a)(1)(v). See 40 CFR 122.26(b)(14).

**Total Maximum Daily Loads (TMDLs)** – A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL includes wasteload allocations (WLAs) for point source discharges; load allocations for nonpoint sources and/or natural background, and must include a margin of safety (MOS) and account for seasonal variations. (See section 303(d) of the Clean Water Act and 40 CFR 130.2 and 130.7).

**Water Quality Standards** – A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States and EPA adopt water quality standards to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (See CWA sections 101(a)2 and 303(c)). Water quality standards also include an antidegradation policy. See P.U.D. o. 1 of Jefferson County et al v. Wash Dept of Ecology et al, 511 US 701, 705 (1994).

## A.2. ABBREVIATIONS AND ACRONYMS

ADHS – Arizona Department of Health Service

$BOD_5$ – Biochemical Oxygen Demand (5-day test)

BMP – Best Management Practice

CERCLA – Comprehensive Environmental Response, Compensation and Liability Act

COD – Chemical Oxygen Demand

CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 *et seq*)

DMR – Discharge Monitoring Report

EPA – Environmental Protection Agency

MDMR – MSGP Discharge Monitoring Report

MS4 – Municipal Separate Storm Sewer System

MSGP – Multi-Sector General Permit

NAICS – North American Industry Classification System

NOI – Notice of Intent

NOT – Notice of Termination

OAW – outstanding Arizona water

SIC – Standard Industrial Classification

SPCC – Spill Prevention, Control, and Countermeasures

SSC – Suspended Sediment Concentration

SWPPP – Stormwater Pollution Prevention Plan

TMDL – Total Maximum Daily Load

TSS – Total Suspended Solids

WLA – Wasteload Allocation

WQS – Water Quality Standard

# Appendix B
# Standard Permit Conditions

## Appendix B. Standard Permit Conditions.

Standard permit conditions in Appendix B are consistent with the general permit provisions required under 40 CFR 122.41 and A.A.C. R-18-9-A905(A)(3).

1. **Duty to Comply.** [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(a)(1) and A.R.S. §§ 49-261, 262, 263.01, and 263.02.]

   a. The permittee shall comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act; A.R.S. Title 49, Chapter 2, Article 3.1; and A.A.C. Title 18, Chapter 9, Articles 9 and 10, and is grounds for enforcement action, permit termination, revocation and reissuance, or modification, or denial of a permit renewal application.
   b. The issuance of this permit does not waive any federal, state, county, or local regulations or permit requirements with which a person discharging under this permit is required to comply.

2. **Duty to Reapply / Continuation of the Expired General Permit.** [A.A.C. R18-9-A905 which incorporates 40 CFR 122.41(b)]

   a. Upon reissuance of the general permit, the permittee shall file an NOI, within the timeframe specified in the new general permit, and shall obtain new written authorization to discharge from the Director.
   b. If the Director does not reissue the general permit before the expiration date, the current general permit will be administratively continued and remain in force and effect until the general permit is reissued.
   c. Any permittee granted authorization to discharge under the general permit before the expiration date automatically remains covered by the continued general permit until the earlier of:

      i. Reissuance or replacement of the general permit, at which time the permittee shall comply with the NOI conditions of the new general permit to maintain authorization to discharge; or
      ii. The date the permittee has submitted a Notice of Termination; or
      iii. The date the Director has issued an individual permit for the discharge; or
      iv. The date the Director has issued a formal permit decision not to reissue the general permit, at which time the permittee shall seek coverage under an alternative general permit or an individual permit, or cease discharge.

3. **Need To Halt or Reduce Activity Not a Defense.** [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(c)]

   It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

4. **Duty to Mitigate.** [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(d)]
   The permittee shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment.

5. **Proper Operation and Maintenance.** [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(e)]
   The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems that are

installed by a permittee only when the operation is necessary to achieve compliance with the conditions of this permit.

6. **Permit Actions.** [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(f)]
This permit may be modified, revoked and reissued, or terminated for cause. Filing a request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

7. **Property Rights.** [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(g)]
This permit does not convey any property rights of any sort, or any exclusive privileges, nor does it authorize any injury to private property or invasion of personal rights, nor any infringement of federal, state, Indian tribe, or local laws or regulations.

8. **Duty to Provide Information.** [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(h)]
The permittee must furnish to ADEQ, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to ADEQ upon request, copies of records required to be kept by this permit.

9. **Signatory Requirements.** [A.A.C. R18-9-A905(A)(3)(a), which incorporates 40 CFR 122.41(k) and (l); A.A.C. R18-9-A905(A)(1)(c), which incorporates 40 CFR 122.22]
All Notices of Intent (NOI) and Notices of Termination (NOT), must be signed as follows:

   a. NOIs and NOTs:

      i. For a corporation*:* By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means: a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

      ii. For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or

      iii. For a municipality, State, Federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal (or state) agency includes: (1) The chief executive officer (or director) of the agency, or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

   b. All reports required by this permit and other information requested by ADEQ as follows:

      i. A person described in Section 9.a or by a duly authorized representative of that person. A person is a duly authorized representative only if the authorization is made in writing by a person described in Section 9.a and contained in the SWPPP.

      ii. The authorization must specify either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of manager, operator, superintendent, or position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position).

c. All reports, including SWPPPs, inspection reports, annual reports, monitoring reports, reports on training and other information required by this permit must be signed by a person described in Appendix B, Subsection 9.a above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

i. The authorization is made in writing by a person described in Part 9.a;

ii. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may be either a named individual or any individual occupying a named position); and

iii. The signed and dated written authorization is included in the SWPPP. A copy must be submitted to ADEQ, upon request.

d. Changes to Authorization. If the information on the NOI filed for permit coverage is no longer accurate because a different owner / operator has responsibility for the overall operation of the facility, a new NOI satisfying the requirements of Part 1.3.1 must be submitted to ADEQ prior to or together with any reports, information, or applications to be signed in accordance with Appendix B, Subsection 9.c above. The change in authorization must be submitted within the time frame specified in Table A.3, and sent to the address specified in Part 7.6.

e. Certification. Any person signing documents under the terms of this permit must make the following certification:

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations*.

**10. Inspection and Entry.** [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(i)]

a. The permittee must allow ADEQ or an authorized representative to:

i. Enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records are kept under the conditions of this permit;

ii. Have access to and copy at reasonable times, any records that are kept under the conditions of this general permit; and

iii. Inspect at reasonable times any facility or equipment (including monitoring and control equipment), practices or operations regulated or required under this permit;

iv. Sample or monitor at reasonable times any substances or parameters at any location, for the purposes of assuring permit compliance or as otherwise authorized by A.R.S. Title 49, Chapter 2, Article 3.1, and 18 A.A.C. 9, Articles 9 and 10; and

b. If the facility discharges to an MS4, the permittee must allow representatives of the municipal operator or the separate storm sewer receiving the discharge to inspect the site and obtain copy of records pertaining to the discharge or the conditions of this permit.

**11. Monitoring and Records.**

a. Representative Samples/Measurements. Samples and measurements taken for the purpose of monitoring must be representative of the volume and nature of the monitored activity.

b. Retention of Records. The permittee must retain records of all monitoring information,

including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for at least three (3) years from the date this permit expires This period may be extended by request of the Director at any time. Permittees must submit any such records to ADEQ upon request. The permittee must retain the SWPPP developed in accordance with Part 5 of this permit, for at least three (3) years after the last modification or amendment is made to the plan.

c. Records Contents. Records of monitoring information must include:

i. The date, exact place, and time of sampling or measurements;
ii. The initials or name(s) of the individual(s) who performed the sampling or measurements;
iii. The date(s) analyses were performed;
iv. The time(s) analyses were initiated;
v. The initials or name(s) of the individual(s) who performed the analyses;
vi. References and written procedures, when available, for the analytical techniques or methods used;
vii. The analytical techniques or methods used; and
viii. The results of such analyses.

d. Approved Monitoring Methods. Monitoring must be conducted according to test procedures approved under 40 CFR 136, unless specific test procedures have been otherwise specified in this permit.

e. Any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained in this permit is subject to the enforcement actions established under A.R.S. Title 49, Chapter 2, Article 4, which includes the possibility of fines and/or imprisonment.

**12. Reporting Requirements.** [A.A.C. R18-9-A905(A)(3)(a) which incorporates 40 CFR 122.41(l)]

a. Planned changes. The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

i. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR 122.29(b) (incorporated by reference at A.A.C. R18-9-A905(A)(1)(e)); or
ii. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR 122.42(a)(1) (incorporated by reference at A.A.C. R18-9-A905(A)(3)(b)).

b. Monitoring reports. Monitoring results must be reported at the intervals specified elsewhere in this permit.

i. Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms (paper or electronic) provided or specified by ADEQ. Pursuant to Part 7.1, all monitoring data collected pursuant to Part 6.2 and 6.3 must be submitted to the Department using the MSGP Discharge Monitoring Report (MDMR) form, available at http://www.azdeq.gov/environ/water/permits/stormwater.html .
ii. If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR.
iii. Calculations for all limitations which require averaging of measurements must use an arithmetic mean and non-detected results must be incorporated in calculations as the

limit of quantitation for the analysis.

c. Anticipated noncompliance. The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

d. Twenty-four hour reporting.

i. The permittee shall report to ADEQ any noncompliance with this permit which may endanger human health or the environment. The permittee shall orally notify the office listed below within 24 hours:

Arizona Department of Environmental Quality – Water Quality Compliance
1110 W. Washington Street, Mail Code 5515 B-1
Phoenix, AZ 85007
Office: 602-771 – 2330; Fax 602-771 – 4505

ii. A written submission shall also be provided to the office identified above within five (5) days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

iii. The following shall be included as information which must be reported within 24 hours under this paragraph.

1) Any upset which exceeds any effluent limitation in the permit.

2) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit to be reported within 24 hours. (See 40 CFR 122.44(g) which is incorporated by reference at A.A.C. R18-9-A905(A)(3)(d)).

iv. ADEQ may waive the written report on a case-by-case basis for reports under this subsection if the oral report has been received within 24 hours.

e. Other noncompliance. The permittee shall report all instances of noncompliance not otherwise required to be reported under this subsection, at the time monitoring reports are submitted. The reports shall contain the information listed in subsection 12(d).

f. Other information. When the permittee becomes aware that he or she failed to submit any relevant facts or submitted incorrect information in the Notice of Intent or in any other report to the Department, the permittee shall promptly submit the facts or information to ADEQ at the address listed in Part 7.6.

**13. Reopener Clause.** [A.A.C. R18-9-A905(A)(3)(d) which incorporates 40 CFR 122.44(c)] The Department may elect to modify the permit prior to its expiration (rather than waiting for the new permit cycle) to comply with any new statutory or regulatory requirements, such as for effluent limitation guidelines, which may be promulgated in the course of the current permit cycle.

**14. Other Environmental Laws.** No condition of this general permit releases the permittee from any responsibility or requirements under other environmental statutes or regulations. For example, this permit does not authorize the "taking" of endangered or threatened species as prohibited by Section 9 of the Endangered Species Act, 16 U.S.C. 1538. Information regarding the location of endangered and threatened species and guidance on what activities constitute a "taking" are available from the U.S. Fish and Wildlife Service. The permittee must also comply with applicable State and Federal laws, including Spill Prevention Control and Countermeasures (SPCC).

**15. State or Tribal Law.** [Pursuant to A.A.C. R18-9-A904(C)] Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State or Tribal law or regulation under authority preserved by Section 510 of the Clean Water Act.

16. **Severability.** The provisions of this general permit are severable, and if any provision of this general permit, or the application of any provision of this general permit to any circumstance, is held invalid, the application of the provision to other circumstances, and the remainder of this general permit shall not be affected.

17. **Requiring Coverage under an Individual Permit or an Alternative General Permit.**

a. The Director may require a person authorized by this permit to apply for and/or obtain either an individual AZPDES permit or an alternative AZPDES general permit. Any interested person may petition the Department to take action under this section. The Department may require a permittee authorized to discharge under this permit to apply for an individual permit in any of the following cases:

i. A change occurs in the availability of demonstrated technology or practices for the control or abatement of pollutants applicable to the point source;

ii. Effluent limitation guidelines are promulgated for point sources covered by the general permit;

iii. An Arizona Water Quality Management Plan containing requirements applicable to the point sources is approved;

iv. Circumstances change after the time of the request to be covered so that the discharger is no longer appropriately controlled under the general permit, or either a temporary or permanent reduction or elimination of the authorized discharge is necessary;

v. If the Director determines that the discharge is a significant contributor of pollutants. When making this determination, the Director shall consider:

1) The location of the discharge with respect to waters of the United States,

2) The size of the discharge,

3) The quantity and nature of the pollutants discharged to waters of the U.S., and

4) Any other relevant factor.

b. If an individual permit is required, the Director shall notify the discharger in writing of the decision. The notice shall include:

i. A brief statement of the reasons for the decision;

ii. An application form;

iii. A statement setting a deadline to file the application;

iv. A statement that on the effective date of issuance or denial of the individual permit, coverage under the general permit will automatically terminate;

v. The applicant's right to appeal the individual permit requirement with the Water Quality Appeals Board under A.R.S. § 49-323, the number of days the applicant has to file a protest challenging the individual permit requirement, and the name and telephone number of the Department contact person who can answer questions regarding the appeals process; and

vi. The applicant's right to request an informal settlement conference under A.R.S. 41-1092.03(A) and 41-1092.06.

c. The discharger shall apply for an individual permit within 90 days of receipt of the notice, unless the Director grants a later date. In no case shall the deadline be more than 180 days after the date of the notice.

d. If the discharger fails to submit the individual permit application within the time period established in Appendix B.17.c the applicability of the general permit to the discharger is automatically terminated at the end of the day specified by the Director for application submittal.

e. Coverage under the general permit shall continue until an individual permit is issued or denied unless the general permit coverage is terminated under Appendix B. Subsection 17.d.

**18. Request for an Individual Permit.**

a. A permittee may request an exclusion from coverage of a general permit by applying for an individual permit.

i. The permittee shall submit an individual permit application under R18-9-B901(B) and include the reasons supporting the request no later than 90 days after publication of the general permit.

ii. The Director shall grant the request if the reasons cited by the permittee are adequate to support the request.

b. If an individual permit is issued to a person otherwise subject to a general permit, the applicability of the general permit to the discharge is automatically terminated on the effective date of the individual permit.

**19. Transfer of Coverage**

a. Transfer of coverage from one operator to a different operator (*e.g.,* facility sold to a new company): the new owner/ operator must complete and file a Notice of Intent in accordance with Part 1.3.1 at least 5 days prior to taking over operational control of the facility. The old owner/ operator must file a Notice of Termination within thirty (30) days after the new owner/ operator has assumed responsibility for the facility.

b. Simple name changes of the permittee (*e.g.,* Company "A" changes name to "ABC, Inc.") may be done by filing an amended Notice of Intent referencing the facility's assigned permit number and requesting a simple name change.

**20. Bypass**

a. Definitions.

1 Bypass means the intentional diversion of waste streams from any portion of a treatment facility

2 Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Bypass not exceeding limitations. The permittee may allow any bypass to occur that does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions Appendix B, Subsections 20.c and 20.d.

c. Notice

1 Anticipated bypass. If the permittee knows in advance of the need for a bypass, prior notice shall be submitted at least ten days before the date of the bypass.

2 Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Appendix B, Subsection 12.d.

d. Prohibition of bypass.

1. Bypass is prohibited, and ADEQ may take enforcement action against the permittee for bypass, unless:

i. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

ii. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering

judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

iii. The permittee submitted notices as required under Appendix B, Subsection 20.c.

2. ADEQ may approve an anticipated bypass, after considering its adverse effects, if the Department determines that it will meet the three conditions listed above in this Appendix B, Subsection 20.d.

**21. Upset**

a. Definition. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond your reasonable control. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Appendix B, Subsection 21.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1 An upset occurred and that the permittee can identify the cause(s) of the upset;

2 The permitted facility was at the time being properly operated;

3 The permittee submitted notice of the upset as required in Appendix B, Subsection 12.d (iii); and

4 The permittee complied with any remedial measures required under Appendix B, Subsection 4.

d. Burden of proof. In any enforcement proceeding, the permittee, who is seeking to establish the occurrence of an upset, has the burden of proof.

## G. Penalties for Violations of Permit Conditions.

Any permit noncompliance constitutes a violation and is grounds for an enforcement action, permit termination, revocation and reissuance, modification, or denial of a permit renewal application.

1. **Civil Penalties.** A.R.S. § 49-262 provides that any person who violates any provision of A.R.S. Title 49, Chapter 2, Article 2, 3 or 3.1 or a rule, permit, discharge limitation or order issued or adopted under A.R.S. Title 49, Chapter 2, Article 3.1 is subject to a civil penalty not to exceed $25,000 per day per violation.

2. **Criminal Penalties.** Any a person who violates a condition of this general permit, or violates a provision under A.R.S. Title 49, Chapter 2, Article 3.1, or A.A.C. Title 18, Chapter 2, Articles 9 and 10 is subject to the enforcement actions established under A.R.S. Title 49, Chapter 2, Article 4, which may include the possibility of fines and/or imprisonment.

## *Attachment 4. Potential Pollutants*

| Pollutant Source (Material or Activity) | Potential Pollutant | Outfall Location |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

***Attachment 6. Summary of Significant Leaks and Spills***

| Date and Time | Location | Description | Quantity Released | Measures to Prevent Recurrence | Agency Contact | Reporting Party |
|---|---|---|---|---|---|---|
| None at this time | | | | | | |
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## *Attachment 7: Non-Stormwater Discharge Certification Evaluation Data*

Inspector's Name: _____

Date of Evaluation: _____

Weather Conditions: _____

**Testing Method/Evaluation Criteria:** Visual observation of outfalls for signs of dry weather discharge

**Outfalls observed (check all that apply):**

**Were non-stormwater discharges observed (check one)?** ☐ Yes ☐ No

**If yes, describe (outfall, source of discharge, etc.):**

| Outfall | Source of discharge | Allowable non-stormwater? (Y or N) |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |

**What actions were taken to eliminate the non-stormwater discharge?**

| Outfall | Actions taken |
|---|---|
| | |
| | |
| | |
| | |
| | |

**File completed form in appropriate environmental file.** **Retain for life of permit plus three (3) years.**

## *Attachment 7: Non-Stormwater Discharge Certification Evaluation Data*

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

| | |
|---|---|
| Authorized Signature | Title |
| Name of Authorized Representative | Date |

***Attachment 9. Control Measures (including Best Management Practices)***

| **Pollutant Source (Material or Activity)** | **Potential Pollutant** | **Control Measures** | |
|---|---|---|---|
| | | **Type** | **Description** |
| | | | |
| | | | |
| | | | |
| | | | |

## *Attachment 10: Training Record*

**TRAINING DATE & TIME:**

**INSTRUCTOR(S):**

**NOTES:**

| PRINT NAME | TITLE | SIGNATURE |
|---|---|---|
| | | |
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**File completed forms in Attachment 10.** **Retain for life of permit plus three (3) years.**

## *Attachment 10: Training Record*

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

| | |
|---|---|
| Authorized Signature | Title |
| Name of Authorized Representative | Date |

## *Attachment 11A: Routine Facility Inspection Report*

Date and Time of Inspection: _____

Weather Conditions: _____

Inspector Names: _____

Description of Discharge (if any): _____

Inspector Signatures: _____

| Observation | Y | N | Comments/Actions to be Taken | Date When Action Was Completed |
|---|---|---|---|---|
| Are industrial materials and control measures consistent with those described in the SWPPP? | | | | |
| Is there any evidence demonstrating that previously unidentified discharges of pollutants have occurred from the facility? | | | | |
| Do any control measures need maintenance or repairs? | | | | |
| Do any control measures need replacement? | | | | |
| Are any additional control measures needed to comply with the permit requirements? | | | | |
| Was there any evidence of deviations from the permit or SWPPP observed during the inspection? | | | | |

**Comments:**

*I certify under penalty of law that this document and all attachments were prepared under my direction and supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

Authorized Signature

Title

Name of Authorized Representative

Date

**File completed forms in appropriate environmental file.** **Retain for life of permit plus three (3) years.**

## *Attachment 11B: Representative Outfall Evaluation*

| Outfall & Location | Industrial Activity | Significant/ Industrial Material (Attachment 4) | Control Measures (Attachment 9) | Drainage Area (feet$^2$) | Runoff Coefficient * | Representative Outfall |
|---|---|---|---|---|---|---|
| | | | | | | |

* Values are estimated runoff coefficients of the drainage areas (Low: under 40 percent; Medium: 40 to 65 percent; High: above 65 percent)

## *Attachment 11C: Visual Assessment Monitoring Form*

| | | | |
|---|---|---|---|
| Sampler/Assessor Names: | | Assessment Time and Date | |
| Sampler/Assessor Signatures | | Nature of Discharge (i.e., runoff or snowmelt) | |
| Sampling Time and Date | | | |
| Estimated Discharge Start Time | | Time Since Previous Measurable Discharge | (days) |

**Outfall locations for sample and assessment (complete one form for each):**

| Observation Results | Yes | No | Comments |
|---|---|---|---|
| Color | | | |
| Odor | | | |
| Clarity | | | |
| Floating solids | | | |
| Settled solids | | | |
| Suspended solids | | | |
| Foam | | | |
| Oil sheen | | | |
| Other obvious indicators of stormwater pollution | | | |

**Other Pertinent Data** (i.e., probable sources of any observed stormwater contamination)**:**

Note: Monitoring must occur within the first 30 minutes (or as soon thereafter as practicable) of when runoff begins discharging **and** occurs at least 72 hours from the previously measurable event. If not practicable, describe above (i.e., because the preceding storm did not yield discharge, or less than a 72-hour interval is representative during the sample period). If a visual assessment is not conducted for a given wet season, document the reason above.

## *Attachment 11C: Visual Assessment Monitoring Form*

*I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.*

| | |
|---|---|
| Authorized Signature | Title |
| Name of Authorized Representative | Date |

**File completed forms in appropriate files.** **Retain for life of permit plus three (3) years.**

***This attachment is currently not applicable to the Resolution Project.***

ADEQ Arizona Department of Environmental Quality

# ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

## MSGP INDUSTRIAL DISCHARGE MONITORING REPORT (DMR)

Reason(s) for Submitting DMR (Check all that apply):

- ☐ Reporting monitoring data (Fill in all Sections).
- ☐ Reporting no discharge for all outfalls for this monitoring period (Fill in Sections A, B, C.1, D, and F).
- ☐ Reporting that your site status has changed to inactive and unstaffed (Fill in Sections A, B, F and include date of status change in comment field in Section E.4).
- ☐ Reporting that your site status has changed to active (Fill in all Sections and include date of status change in comment field in Section E.4).
- ☐ **Non-mining MSGP only:** Reporting that no further pollutant reductions are achievable for all outfalls and for all pollutants in accordance with Part 6.2.1.3 of the permit (Fill in Sections A, B and F).

**A. Permit Authorization Number:** AZMSG – _____ **Note: Read instructions before completing this Form.**

**B. Facility Information**

1. Facility Name:
2. Facility Location:
   a. Street:
   b. City: c. State: d. Zip Code: -
3. Additional Facility Information:
   Contact Name: E-mail:
   Phone: - - Ext.
4. DMR Preparer (Complete if DMR was prepared by someone other than the person signing the certification in Section F)
   Prepared by:
   Organization:
   E-mail:
   Phone: - - Ext. _____ Date of inactive / unstaffed status change (if applicable): _____

**C. Discharge Information**

1. Identify monitoring period (two samples per winter wet season and two samples per summer wet season): ☐ Check here if discharging to an ephemeral water

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ☐ 1 Winter (November 1 – May 31) | ☐ Winter 1: | From | / | To | / | | | |
| ☐ 2 Winter (November 1 – May 31) | ☐ Winter 2: | From | / | To | / | | | |
| ☐ 3 Summer (June 1 – October 31) | ☐ Summer 3: | From | / | To | / | | | |
| ☐ 4 Summer (June 1 – October 31) | ☐ Summer 4: | From | / | To | / | | | |

2. Are you required to monitor for cadmium, copper, chromium, lead, nickel, silver, or zinc? ☐ Yes (Complete line item 3) ☐ No (Skip to Section D)
3. What is the hardness level of the receiving water? mg/L

**D. Outfall Information**

1. How many outfall(s) are identified in your SWPPP? List name of outfall(s) required to be monitored in table below.
2. Do any of your outfalls discharge substantially identical effluents? ☐ YES ☐ NO
3. If yes, for each monitored outfall, indicate outfall names that are substantially identical in table below.

| 4.A. Monitored Outfall Name* | 4.B. Substantially Identical Outfalls [List name(s) of outfall(s) substantially identical to outfall in 4.A. (if applicable)] | 4.C. No Discharge? |
|---|---|---|
| | | ☐ |
| | | ☐ |
| | | ☐ |
| | | ☐ |
| | | ☐ |

*Reference attachment if additional space is needed to complete the table.

ADEQ Arizona Department of Environmental Quality

# ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

## MSGP INDUSTRIAL DISCHARGE MONITORING REPORT (DMR)

**E. Monitoring Information** **Note: Make additional copies of this form as necessary.**

1. Permit Authorization Number: ☐☐☐☐☐☐☐☐☐

2. Nature of Discharge: ☐ Rainfall (Complete line items 2.a., 2.b., & 2.c.) ☐ Snowmelt

2.a. Duration of the rainfall event (hours): ☐☐ 2.b. Rainfall amount (inches): ☐☐.☐ 2.c. Time since previous measurable storm event (days): ☐☐☐

| 3.a. Outfall Name | 3.b. Monitoring Type (BM, ELG, I, O)* | 3.c. Parameter | 3.d. Quality or Concentration | 3.e. Units | 3.f. Results Description | 3.g. Collection Date | 3.h. Exceedance due to natural background pollutant levels | 3.i. No further pollutant reductions achievable? |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |
| | | | | | | | ☐ | ☐ |

* (BM) - Benchmark monitoring; (ELG) - Annual effluent limitations guidelines monitoring; (I) - Impaired waters monitoring; (O) - Other monitoring as required by ADEQ

4. Comment and/or Explanation of Any Violations (Reference all attachments here)

**F. Certification**

| | | | |
|---|---|---|---|
| | I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. | | |
| Typed or Printed Name/Title of Principal Executive Officer or Authorized Agent | | Signature of Principal Executive Officer or Authorized Agent | Date |

E-mail of Principal Executive Officer or Authorized Agent: ☐☐☐☐☐☐☐☐☐

## Instructions for Completing the MSGP Industrial Discharge Monitoring Report (DMR)

**Who Must Submit A Discharge Monitoring Report to ADEQ?**

Facilities covered under the Multi-Sector General Permit (MSGP or permit) that are required to monitor pursuant to Parts 6.2, 6.3, and 8 of the permit must submit the MSGP Discharge Monitoring Report (DMR) consistent with the reporting requirements specified in Part 7.1 of the permit.

**Where to File the DMR Form**

Monitoring data collected pursuant to Parts 6.2, 6.3, and 8 of the permit must be submitted on the paper DMR form and sent to the following address:

Notice of Intent forms sent by regular or overnight / express mail:

Arizona Department of Environmental Quality
Surface Water Section / Stormwater Program
1110 West Washington, 5415A-1
Phoenix, Arizona 85007

Phone number: 602– 771– 4508

**Completing the DMR Form**

To complete this form, type or print in uppercase letters in the appropriate areas only. Be sure that you complete all applicable questions. Photocopy your DMR form for your records before you send the completed original form to the address above. Use ink when you sign and mail the original document – ADEQ will not accept photocopies.

**Reasons for Submitting DMR form**

Indicate your reason(s) for submitting this DMR by checking all boxes that apply. The reasons for submitting are defined as follows:

- *Submitting monitoring data*: For each storm event sampled, submit one DMR form with data for all outfalls sampled. Select this reason even if you only have monitoring data for some of your outfalls (i.e., some outfalls did not discharge). If you select this reason you are required to complete all Sections of the form.
- *Reporting no discharge for all outfalls for this monitoring period*: Indicates that there were no discharges from all outfalls during this monitoring period. If you select this reason you are only required to complete Sections A, B, C.1, D, and F.
- *Reporting that your site status has changed to inactive and unstaffed*: Indicates that your facility is currently inactive and unstaffed (See Part 6.2.1.4 of the Non-mining MSGP and Part 6.2.1.3 of the Mining MSGP and for more information). If you select this reason you are only required to complete Sections A, B, and F and include date of status change in the comment field in Section E.4.
- *Reporting that your site status has changed from inactive to active*: Indicates that your facility is currently active. If you select this reason you are required to complete all Sections of the form and include date of status change in the comment field in Section E.4.
- **Non-mining MSGP only:** *Reporting that no further reductions are achievable for all outfalls and for all pollutants*: Indicates that your facility has determined that no further pollutant reductions are technologically and economically practicable in consideration of best industry practice to meet the water-quality-based effluent limitations in Part 2 of the permit (See Part 6.2.1.3 for more information). If you select this reason you are required to complete Sections A, B and F. However, if you can make this finding for some outfalls and pollutants, but not for others, you cannot select this reason; instead you must identify which outfalls and which pollutants you can make this finding for in Section E.

**Section A. Permit Authorization Number**

Enter ADEQ's Authorization Number. The Authorization Number begins with "AZMSG – " and was sent to you in ADEQ's Authorization to Discharge letter.

**Section B. Facility Information**

1. Enter the facility's name as required in box C of the NOI. Unless the name of your facility has changed, please use the same name provided on your NOI.

2.a-d. Enter the street address, including city, state, and zip code of the actual physical location of the facility. Do not use a P.O. Box.

3. Identify the name, telephone number, and e-mail address of the person who will serve as a contact for ADEQ on issues related to monitoring at your facility. This person should be able to answer questions related to stormwater discharges and monitoring or have immediate access to individuals with that knowledge. This person does not have to be the facility operator, but should have intimate knowledge of monitoring activities at the facility.

4. If the form was prepared by someone other than the person who is signing the certification statement in Section F (for example, if the DMR was prepared by a member of the facility's stormwater pollution prevention team or a consultant for the certifier's signature), include the name, organization, phone number and e-mail address of the DMR preparer.

**Section C. Discharge Information**

1. Indicate the appropriate monitoring period (summer or winter wet season) covered by the DMR. The dates should be displayed as month (Mo) / day (Day). See Part 6.1.2.1 of either permit for more information.

*Facilities that discharge to an ephemeral water:*

2. If you are submitting benchmark monitoring data, identify if your facility is required to collect benchmark samples for one or more hardness-dependent metals (i.e., cadmium, copper, lead, nickel, silver, and zinc). If "yes" to this question, you must also complete Question 3. If "no" to this question, skip to Section D.

3 If "yes" to Question 2 under Section C, then you are required to submit to ADEQ with your first benchmark report a hardness level, established consistent with the procedures in Appendix D of the Non-mining MSGP, which is representative of your receiving water. Mining MSGP permit holders are also required to report hardness; refer to the Stormwater Monitoring Guidance Document for the Mineral Industry for instructions. If the facility's outfalls discharge to more than one receiving water, as reported in your NOI form, you should report hardness for the receiving water with the lowest hardness values. Hardness values must be reported in milligrams per liter (mg/L).

**Section D. Outfall Information**

1. Enter the total number of outfalls identified in your stormwater pollution prevention plan (SWPPP). Outfalls are locations where stormwater exits the facility, including pipes, ditches, swales, and other structures used to remove stormwater from the facility.

2. Indicate if your facility has two or more outfalls that you believe discharge substantially identical effluents (i.e., stormwater), based on the similarities of the general industrial activities and control measures, exposed materials that may significantly contribute pollutants to stormwater, and runoff coefficients of their drainage areas. See Parts 5.1.5.2 and 6.1.1.1 of either permit for more information on substantially identical outfalls.

3. If "yes" to Question 2 under Section D, then you must list the outfall name(s) in Column 4.B. that you expect to be substantially identical to the corresponding outfall in Column 4.A.

4.A. *Monitored Outfall Name:* List name(s) of outfall(s) you are required to monitor in Column 4.A.

4.B. *Substantially Identical Outfalls:* List name(s) of outfall(s) substantially identical to "*Monitored Outfall*" in Column 4.A. (if applicable)].

4.C *No Discharge:* Check box if you are reporting "No Discharge" for the monitored outfall for the reporting period identified in Section C.1.

Example:

| 4.A<br>Monitored Outfall Name | 4.B<br>Substantially Identical Outfall | 4.C<br>No Discharge |
|---|---|---|
| Outfall A | Outfall B; Outfall C | ☐ |
| Outfall D | | ☒ |

Reference attachment if additional space is needed to complete the Table Section D.

**Section E. Monitoring Information**

1. Enter ADEQ's Authorization Number for the facility reported in Section A.

2. For the reported monitoring event indicate whether the discharge was from a rainfall or snowmelt event. If you select "rainfall" then indicate the duration (in hours) of the rainfall event, rainfall total (in inches) for that rainfall event, and time (in days) since the previous measurable storm event in line items 2.a-c. For both rainfall and snowmelt monitoring, you must identify the date of collection for the monitoring event in column 3.g. of the table. If the discharge occurs during a period of both rainfall and snowmelt, check both the rainfall and snowmelt boxes and report the appropriate rainfall information in item 2.a-c. To report multiple monitoring events in the same reporting period, copy Page 2 of

# ANNUAL REPORT FORM

## for the Non-mining and Mining Multi-Sector General Permits

ADEQ Arizona Department of Environmental Quality

Use this form for documenting results from the annual Comprehensive Facility Inspection, in accordance with Part 4.3 and Part 7.2 of both permits. All permittees must complete an annual report form and file it with the SWPPP. Permittees with facilities that discharge to an impaired or outstanding Arizona water shall submit an annual report on or before July 15 (postmark date) during each year until coverage is terminated (*not* when the permit expires) to the following address:

**Arizona Department of Environmental Quality; Surface Water Section / Stormwater Program**
**1110 West Washington, 5415A-1; Phoenix, Arizona 85007**
**Faxed forms are not acceptable.**

### A. GENERAL INFORMATION

1. AZPDES Authorization Number: AZMSG – _____

2. Facility Name: _____

3. Facility Physical Address:

   Street: _____

   City: _____ State: |__|__| Zip Code: _____

4. Lead Inspector's Name: _____ Title _____

   Additional Inspector's Name(s): _____ _____

5. Contact Person: _____ Title: _____

   Telephone: _____ Ext. _____ E-mail: _____

6. Inspection Date: |__|__| / |__|__| / |__|__|__|__|

### B. GENERAL INSPECTION FINDINGS

1. As part of this comprehensive facility inspection, did you inspect all potential pollutant sources, including areas where industrial activity may be exposed to stormwater?

   ☐ YES ☐ NO

   If NO, explain why not:

***Note:*** *Complete Section C of this form for each industrial activity area inspected and included in your SWPPP or as newly identified in B.2 or B.3 below where pollutants may be exposed to stormwater.*

2. Did this inspection identify any stormwater or non-stormwater outfalls not previously identified in your SWPPP: ☐ YES ☐ NO

   If YES, for each location, describe the sources of those stormwater and non-stormwater discharges and any associated control measures in place.

3. Did this inspection identify any sources of stormwater or non-stormwater discharges not previously identified in your SWPPP?

☐ YES ☐ NO

If YES, describe these sources of stormwater or non-stormwater pollutants expected to be present in these discharges and any control measures in place.

4. Did you review stormwater monitoring data as part of this inspection to identify potential areas of concern for stormwater pollution?

☐ YES ☐ NO ☐ N/A, no monitoring performed

If YES, summarize the findings of that review and describe any additional inspection activities resulting from this review::

5. Describe any evidence of pollutants entering the drainage system or discharging to surface waters and the condition of and around outfalls, including flow dissipation measures to prevent scouring:

6. Have you taken or do you plan to take any corrective actions, as specified in Part 3 of the permit, since your last annual report submission (or since you received authorization to discharge under this permit if this is your first annual report), including any corrective actions identified as a result of this annual comprehensive facility inspection?

☐ YES ☐ NO

***NOTE:*** *Complete the attached Corrective Action Form (Section D) for each condition identified, including any conditions identified as a result of this comprehensive stormwater inspection.*

## C. INDUSTRIAL ACTIVITY AREA-SPECIFIC FINDINGS

**Complete one block for each industrial activity area where pollutants may be exposed to stormwater.**

In reviewing each area, you must look for:

- ► Industrial materials, residue or trash that may have or could come into contact with stormwater;
- ► Leaks or spills from industrial equipment, drums, tanks and other containers;
- ► Offsite tracking of industrial or waste materials from areas of no exposure to exposed areas; and
- ► Tracking or blowing or raw, final, or waste materials from areas of no exposure to exposed areas.

**INDUSTRIAL ACTIVITY AREA** _____

1. Brief Description:

2. Are any control measures in need of maintenance or repair? ☐ YES ☐ NO
3. Have any control measures failed and require replacement? ☐ YES ☐ NO
4. Are any additional/revised control measures necessary in this area? ☐ YES ☐ NO

If YES to any of these three questions, provide a description of the problem: (Any necessary corrective actions should be described on the attached Corrective Action Form – Section D.)

**INDUSTRIAL ACTIVITY AREA** _____

1. Brief Description:

2. Are any control measures in need of maintenance or repair? ☐ YES ☐ NO
3. Have any control measures failed and require replacement? ☐ YES ☐ NO
4. Are any additional/revised control measures necessary in this area? ☐ YES ☐ NO

If YES to any of these three questions, provide a description of the problem: (Any necessary corrective actions should be described on the attached Corrective Action Form.)

**INDUSTRIAL ACTIVITY AREA** _____

1. Brief Description:

2. Are any control measures in need of maintenance or repair? ☐ YES ☐ NO
3. Have any control measures failed and require replacement? ☐ YES ☐ NO
4. Are any additional / revised control measures necessary in this area? ☐ YES ☐ NO

If YES to any of these three questions, provide a description of the problem: (Any necessary corrective actions should be described on the attached Corrective Action Form.)

**Copy this page for additional industrial activity areas and attach additional pages as necessary**

**INDUSTRIAL ACTIVITY AREA** _____

1. Brief Description:

2. Are any control measures in need of maintenance or repair? ☐ YES ☐ NO
3. Have any control measures failed and require replacement? ☐ YES ☐ NO
4. Are any additional / revised control measures necessary in this area? ☐ YES ☐ NO

If YES to any of these three questions, provide a description of the problem: (Any necessary corrective actions should be described on the attached Corrective Action Form.)

**INDUSTRIAL ACTIVITY AREA** _____

1. Brief Description:

2. Are any control measures in need of maintenance or repair? ☐ YES ☐ NO
3. Have any control measures failed and require replacement? ☐ YES ☐ NO
4. Are any additional/revised control measures necessary in this area? ☐ YES ☐ NO

If YES to any of these three questions, provide a description of the problem: (Any necessary corrective actions should be described on the attached Corrective Action Form.)

**INDUSTRIAL ACTIVITY AREA** _____

1. Brief Description:

2. Are any control measures in need of maintenance or repair? ☐ YES ☐ NO
3. Have any control measures failed and require replacement? ☐ YES ☐ NO
4. Are any additional / revised control measures necessary in this area? ☐ YES ☐ NO

If YES to any of these three questions, provide a description of the problem: (Any necessary corrective actions should be described on the attached Corrective Action Form.)

## D. CORRECTIVE ACTIONS

***Complete this page for each specific condition requiring a corrective action. Copy this page for additional corrective actions.***

1. Corrective Action # |___|___| of |___|___| for this reporting period.

2. Is this correction action:

   ____ An update on a corrective action from a previous annual report, or

   ____ A new corrective action?

3. Identify the conditions(s) triggering the need for this review.

   ____ Unauthorized release or discharge

   ____ Violation of a numeric effluent limitation guideline

   ____ Control measures inadequate to meet applicable water quality standards

   ____ Control measures inadequate to meet an adopted Waste Load Allocation

   ____ Control measures not properly operated or maintained

   ____ Change in facility operations necessitated change in control measures

   ____ Other (describe): _____

4. Briefly describe the nature of the problem identified.

5. Date problem identified: |__|__| / |__|__| / |__|__|__|__|

6. How problem was identified:

   ____ Comprehensive facility inspection

   ____ Visual assessment

   ____ Quarterly routine facility inspection

   ____ Benchmark, numeric Effluent Limitation Guideline or other analytical monitoring

   ____ Notification by ADEQ, EPA or another Federal, State or local agency having stormwater program authority, or the operator of a regulated MS4 receiving discharges from the facility (where applicable)

   ____ Other (describe): _____

7. Description of corrective action(s) taken or to be taken to eliminate the problem (e.g., describe modifications or repairs to control measures, analyses to be conducted, etc.) or if no modifications are needed, basis for that determination.

8. Did / will this corrective action require modification to your SWPPP? ☐ YES ☐ NO

9. Date corrective action initiated: |___|___| / |___|___| / |___|___|___|___|

10. Date corrective action completed: |___|___| / |___|___| / |___|___|___|___| or expected to be completed: |___|___| / |___|___| / |___|___|___|___|

11. If corrective action not yet completed, provide the status of corrective action at the time of the comprehensive facility inspection and describe any remaining steps (including timeframes associated with each step) necessary to complete corrective action.

## E. ANNUAL REPORT CERTIFICATION

1. Compliance Certification.

   Do you certify that your annual comprehensive facility inspection has met the requirements of Part 4.3 of the permit, and that, based upon the results of this inspection, to the best of your knowledge; you are in compliance with the permit?

   ☐ YES ☐ NO

   If NO, explain why you are not in compliance with the permit:

2. Annual Report Certification

   I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

   Printed Name: _____ Title: _____

   Signature: _____ Date: _____

## *Attachment 14: Stormwater Pollution Prevention Team*

| Team Assignment | Member Name | Responsibility |
|---|---|---|
| Plan Manager | To Be Determined | Oversee implementation of the stormwater program |
| Facility Inspector | To Be Determined | Perform inspections and assist in implementation of the stormwater program |
| Records-keeper | To Be Determined | Maintain all inspection records and plan updates |
| Spill Prevention and Reporting Manager | To Be Determined | Notify appropriate regulatory agencies of reportable spills |
| Trainer | To Be Determined | Perform SWPPP training |

ADEQ Arizona Department of Environmental Quality

AZMSG2010-002 • AZMSG2010-003

# NOTICE OF INTENT (NOI)

**for Stormwater Discharges Associated with INDUSTRIAL ACTIVITY under the AZPDES 2010 Multi-Sector Permits**

**FOR COVERAGE, A COMPLETE AND ACCURATE NOI MUST BE SUBMITTED TO:**
**Arizona Department of Environmental Quality; Surface Water Section/Stormwater Program**
**1110 West Washington, 5415A-1; Phoenix, Arizona 85007**
**FAX: (602) 771-4528**

Submitting this completed Notice of Intent (NOI) constitutes notice that the operator identified in Section B of this form requests authorization to discharge pollutants to waters of the United States from the facility identified in Section C under the AZPDES Multi-Sector General Permit(s) (MSGP) for industrial stormwater. Submitting this NOI constitutes your notice to ADEQ that the facility identified in Section C of this form meets the eligibility conditions of Part 1.1 of the MSGP. Please read and make sure you comply with all eligibility requirements, including the requirement to prepare a Stormwater Pollution Prevention Plan. Refer to the instructions at the end of this form to complete your NOI.

## A. NOI REVISION (Follow instructions carefully.)

**2010 Authorization #** (ADEQ Use Only)

► Is this NOI a revision for a facility previously filed under the AZPDES 2010 Multi-Sector General Permit?
_____ YES _____ NO If "yes," complete the following:

1. Provide your current authorization #: AZMSG-_____
2. Provide the name of the facility listed in Part C.1 and only the specific information being revised.
3. Complete the certification section (Part F) and have this document signed by the authorized signatory.

## B. FACILITY OPERATOR INFORMATION

- Contact Name: _____ Phone: _____ Ext: _____
- E-mail: _____ Fax: _____
- Operator Business Name: _____
- Mailing Address: _____
- City: _____ State: |_____| Zip Code: _____

## C. FACILITY INFORMATION

1. Facility Name: _____
2. Facility physical location (include the address, if applicable, otherwise provide directions from the nearest municipality):
   - Street: _____
   - City: _____ State: |_____| Zip Code: _____
   - County: _____ Phone: _____ Ext: _____
3. Provide the latitude and longitude of the outfall (discharge location) of the facility in degrees/minutes/seconds:

   Latitude: |__|__|°|__|__|'|__|__| . |_____|" (Degrees, minutes, seconds)  Longitude: |__|__|__|°|__|__|'|__|__| . |_____|" (Degrees, minutes, seconds)

4. Have stormwater discharges from the facility been covered previously under an EPA or AZPDES permit? _____ YES _____ NO
   If yes, provide one of the following:
   - ► The EPA tracking number: AZR05_____ OR
   - ► The AZPDES MSGP authorization number: AZMSG-_____ OR
   - ► The AZPDES Individual Permit number: _____
5. Is the facility located on Indian Country land? _____ YES _____ NO
   - ► ► If you answered yes, DO NOT submit this NOI to ADEQ. The Department does not have permitting authority on Indian Country land. You must coordinate with the U.S. EPA for permit coverage on Indian Country Land within Arizona..

6. PRIMARY INDUSTRIAL ACTIVITY: Identify the sector, subsector, and 4-digit Standard industrial Classification (SIC) or Activity Code (AC) that best represents the products produced or services rendered for which your facility is primarily engaged, as defined in the MSGP.

   Sector |__|__| Subsector |__|__|__| SIC or AC |__|__|__|__|

   ► Area of industrial activity at the primary site that is exposed to stormwater: _____ acres

7. CO-LOCATED INDUSTRIAL ACTIVITY: Identify the applicable sector(s), subsector(s) of co-located industrial activity, and 4-digit Standard Industrial Classification (SIC) or Activity Code (AC) for which you are requesting permit coverage.

   Sector |__|__| Subsector |__|__|__| SIC or AC |__|__|__|__| ► Area of industrial activity exposed to stormwater: _____ acre(s)

   Sector |__|__| Subsector |__|__|__| SIC or AC |__|__|__|__| ► Area of industrial activity exposed to stormwater: _____ acre(s)

   Sector |__|__| Subsector |__|__|__| SIC or AC |__|__|__|__| ► Area of industrial activity exposed to stormwater: _____ acre(s)

   Sector |__|__| Subsector |__|__|__| SIC or AC |__|__|__|__| ► Area of industrial activity exposed to stormwater: _____ acre(s)

   Sector |__|__| Subsector |__|__|__| SIC or AC |__|__|__|__| ► Area of industrial activity exposed to stormwater: _____ acre(s)

   Sector |__|__| Subsector |__|__|__| SIC or AC |__|__|__|__| ► Area of industrial activity exposed to stormwater: _____ acre(s)

8. Is the facility expected to be inactive and unstaffed at any time during the permit term? _____ YES _____ NO

   ► If yes, indicate the estimated starting and ending dates that you expect the facility to be inactive and unstaffed:

   From _____ to _____

## D. DISCHARGE INFORMATION

1. Does the facility discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? _____ YES _____ NO

   ► If yes, name the MS4 operator: _____

2. Receiving Waters.

| a. List the closest water that receives stormwater directly and/or through an MS4 or other conveyance. | b. Check, as appropriate, if there are any of the discharges within 2.5 miles of any segment of an impaired or outstanding Arizona water (OAW.) | If the facility discharges within 2.5 miles of an impaired water, answer the following three questions | | |
|---|---|---|---|---|
| | | c.1. What pollutant(s) are causing the impairment? | c.2. Are the pollutant(s) causing the impairment present in the discharge? | c.3. Has a TMDL been completed for the pollutant(s) causing the impairment? |
| | _____ OAW<br>_____ Impaired | | ____Yes ____No | ____Yes ____No |

3. Water Quality Standards. (***Answer only if the facility has not been covered under the previous EPA or AZPDES permit.***)

   a. Are any of the new discharges into any portion of a receiving water designated by ADEQ as an impaired water?

      _____ YES _____ NO

   b. Has the receiving water(s) been designated as an outstanding Arizona water (OAW)? _____ YES _____ NO

4. Effluent Limitation Guidelines and Sector-Specific Requirements.

   a. Are you requesting permit coverage for any stormwater discharges subject to effluent limitation guidelines? _____ YES _____ NO

      ► If yes, which effluent limitation guidelines apply to the stormwater discharges? (see page 3)

| Effluent Limitation Guidelines (40 CFR Part/Subpart) | Eligible Discharges | Affected MSGP Sector | Check if Applicable |
|---|---|---|---|
| Part 429, Subpart I | Discharges resulting from spray down or intentional wetting of logs at wet deck storage areas | A | |
| Part 418, Subpart A | Runoff from phosphate fertilizer manufacturing facilities that comes into contact with any raw materials, finished product, by-products or waste products (SIC 2874) | C | |
| Part 443, Subpart A | Runoff from asphalt emulsion facilities | D | |
| Part 411, Subpart C | Runoff from material storage piles at cement manufacturing facilities | E | |
| Part 436, Subpart B, C, or D | Mine dewatering discharges at crushed stone mines, construction sand and gravel mines, or industrial sand mines | J | |
| Part 445, Subparts A & B | Runoff from hazardous waste and non-hazardous waste landfills | K, L | |
| Part 423 | Coal pile runoff at steam electric generating facilities | O | |

b If you are a Sector S (Air Transportation) facility, do you anticipate using more than 100,000 gallons of glycol-based deicing/anti-icing chemicals and/or 100 tons or more of urea on an average annual basis? _____ YES _____ NO

## E. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

1. I confirm that a SWPPP meeting the requirements of the general permit has been developed and will be implemented prior to discharging stormwater from this facility. _____ YES _____ NO
2. Name of the person to contact to view the SWPPP: _____
3. Telephone number of the SWPPP contact: _____ Ext: _____ Fax: _____
4. E-mail: _____
5. If the facility is located within 2.5 miles of an OAW or impaired water, have you enclosed a copy of the SWPPP with this NOI? _____ YES _____ NO

   (The SWPPP will be reviewed and approved by ADEQ before permit authorization is issued.)

## F. CERTIFICATION

*I certify under penalty of law that I have met the eligibility conditions of this permit and that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I certify that I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.*

Print Name: _____ Title: _____

Signature: _____ Date: _____

Business Name: _____

Address: _____

City: _____ State: _____ Zip Code: _____

E-Mail: _____ Phone: _____ Ext: _____

ADEQ Arizona Department of Environmental Quality

# AZMSG2010-002 • AZMSG2010-003
# NOTICE OF INTENT INSTRUCTIONS
## for Stormwater Discharges Associated with INDUSTRIAL ACTIVITY under the AZPDES 2010 Multi-Sector Permits

**Who Must File A Notice Of Intent (NOI)**

Under section 402(p) of the Clean Water Act (CWA) and regulations in 40 CFR 122, stormwater discharges associated with industrial activity are prohibited to waters of the United States unless covered under an authorizing permit. In Arizona, such discharges are covered by Arizona Pollutant Discharge Elimination System (AZPDES) permits. Coverage may be obtained under one, or both, Multi-Sector General Permits (MSGPs) by submitting a completed NOI if you operate a facility that:

- Discharges stormwater associated with industrial activities, identified in Appendix C of the MSGP;
- Meets the eligibility requirements in Part 1.1 of the permit;
- Develops a stormwater pollution prevention plan (SWPPP) in accordance with Part 5 of the MSGP; and
- Installs and implements control measures in accordance with Parts 2 and 8 of the MSGP to meet numeric and non-numeric effluent limits.

If you are unsure if you need an AZPDES stormwater permit for discharges associated with industrial activity, contact ADEQ's storm-water permitting program at (602) 771-4508.

One NOI must be submitted for each facility for which you are seeking permit coverage. However, you do not need to submit a separate NOI for each type of industrial activity present at your facility, provided your SWPPP covers all industrial activities.

**When to File the NOI Form**

Do not file your NOI until you have obtained and thoroughly read the AZPDES 2010 MSGPs, which are located at:

**Mining**: http://azdeq.gov/environ/water/permits/download/2010/122010g.pdf.

**Non-Mining**: http://azdeq.gov/environ/water/permits/download/2010/122010f.pdf.

The MSGPs describe procedures to ensure your eligibility, prepare your SWPPP, install and implement appropriate stormwater control measures, and complete the NOI form questions – all of which must be done before you sign the NOI certification statement attesting to the accuracy and completeness of your NOI. You will also need a copy of the appropriate MSGP once you have obtained coverage so that you can comply with the implementation requirements of the permit.

**Where to File the NOI Form**

Notice of Intent forms sent by regular or overnight/express mail:

Arizona Department of Environmental Quality
Surface Water Section / Stormwater Program
1110 West Washington, 5415A-1
Phoenix, Arizona 85007

Notice of Intent forms sent by facsimile:

(602) 771-4528

The SWPPP does not need to be submitted to ADEQ for review unless the facility is within 2.5 miles of an impaired or outstanding Arizona water (OAW) or ADEQ specifically requests a copy of the SWPPP.

**Completing the NOI Form**

Be certain that you complete all fields. Make a photocopy for your records before you send or fax the completed form to the location listed above.

Section A. NOI Revision

This section does not apply to a permit renewal.

Complete this section ONLY if your facility is permitted under one, or both, of the 2010 MSGPs and information has changed that requires you to update your NOI.

Section B. Facility Operator Information

Provide the name of the person who will serve as the primary contact for the facility.

Provide the legal name of the firm, public organization or other public entity that operates the facility described in this NOI. An operator is a legal entity that controls the operation of the facility.

Provide the operator's mailing address, telephone number, fax number (optional), and email address. All correspondence will be sent to this address.

Section C. Facility Information

1. Provide the facility's official or legal name. Unless the name of your facility has changed, please use the same name provided on prior NOIs.
2. Provide the street address, city, state, zip code, and county of the actual physical location of the facility. If the facility does not have an address, provide driving directions from the nearest municipality. Do not use a PO Box number.
3. Provide the latitude and longitude of the facility in degrees, minutes, and seconds. You can obtain these coordinates through geographic information system tools, topographic maps, or ADEQ's web-based GIS mapping system at: http://gisweb.azdeq.gov/arcgis/emaps/?topic=impaired.

   For consistency, take the coordinates from the location of your facility's stormwater outfall. Outfalls are locations where the stormwater exits the facility, including pipes, ditches, swales, and other structures that transport stormwater. If there is more than one outfall present, provide the coordinates of the primary outfall (i.e., the outfall with the largest volume of stormwater discharge associated with industrial activity).
4. Indicate if industrial stormwater discharges from your facility were previously covered by a NPDES or AZPDES permit.

   If the facility was covered by the 2000 MSGP, include the EPA tracking number or the ADEQ authorization number, whichever is applicable. If the facility was covered under an AZPDES individual permit, include that permit number.
5. Indicate whether the facility is located on Indian Country Lands. If you answered yes, DO NOT submit this NOI to ADEQ. The Department does not have permitting authority on Indian County Lands. You must coordinate with the U.S. EPA for permit coverage on Indian Country Land within Arizona.
6. Provide the sector and subsector codes, and SIC or Activity Codes that best describes the primary industrial activities performed by your facility. Your primary industrial activity includes any activities performed onsite that are (1) identified by the facility's SIC code for which the facility is primarily engaged; and (2) included in the narrative descriptions of 40 CFR 122.26(b)(14)(i), (iv), (v), or (vii) and (ix). See Appendix C of the MSGP for a complete list of SIC codes and Activity Codes. See the footnote in Appendix C, or Table 1, for how to determine the SIC code.

   Enter the area (in acres) of industrial activity at your facility that is exposed to stormwater.
7. If your facility has co-located industrial activities that are not identified as your primary industrial activity, identify the sector and subsector codes, SIC or Activity Codes, and area (in acres) that describe these other industrial activities. For a complete list of sector and subsector codes, see Appendix C of the MSGP.

   Enter the area of industrial activity (by SIC or AC code) of all co-located sites exposed to stormwater.
8. Indicate whether the facility is expected to be inactive and unstaffed at any time during the permit term. If yes, specify the

term (with approximate dates) in which the facility will be inactive and unstaffed.

Section D. Discharge Information

1. Indicate whether stormwater from your facility will be discharged into a municipal separate storm sewer system (MS4). An MS4 is a conveyance or system of conveyances, including roads with drainage systems, municipal streets, catch basins, storm drains, curbs and gutters, ditches and man-made channels, owned or operated by a state, city, town, county, district, association or other public body, used to collect or convey stormwater.

   If you checked "yes," identify the name of the MS4 operator. A list of MS4 operators can be found at: http://www.azdeq.gov/environ/water/permits/stormwater.html#ms4.

2. Receiving Water.

   a. Indicate the name(s) of the receiving water(s) into which stormwater from your facility will discharge. The receiving water may be a lake, stream, river, dry wash, wetland, or other waterbody, and may or may not be located adjacent to your facility.

      Stormwater from the facility may discharge directly to a receiving water or indirectly via a storm sewer system, an open drain or ditch, or other conveyance structure. DO NOT list a man-made conveyance, such as a storm sewer system, as your receiving water. Indicate the first receiving water your stormwater discharge enters. For example, if the discharge enters a storm sewer system that empties into Trout Creek, which flows into Pine River, the receiving water is Trout Creek because it is the first waterbody the discharge will reach. Similarly, a discharge into a ditch that feeds Spring Creek should be identified as "Spring Creek" since the ditch is a manmade conveyance.

      If the facility discharges into a municipal separate storm sewer system (MS4) you must identify the waterbody into which that portion of the storm sewer discharges. That information should be readily available from the operator of the MS4.

   b. Indicate whether the facility discharges within 2.5 miles of a lake, river, stream segment, wash, etc. that is classified as an impaired or outstanding Arizona water (OAW) under the "2006/2008 303(d) List of Impaired and Not Attaining Waters" (http://www.azdeq.gov/environ/water/assessment/download/2008/2006_2008.pdf).

   c. Answer the following questions only if you answered "yes" to Item D.2.b.

      i. Provide the pollutants listed as causing the impairment in the water identified in Item D.2.b.

      ii. Out of the pollutant(s) that you identified in Item D.2.c.1, indicate which pollutants you believe will be present in the discharge. If you do not expect any of these pollutants to be in the discharge, then enter "none."

      iii. Indicate the pollutants that have a Total Maximum Daily Load (TMDL) for the impaired stream segment that you identified in Item D.2.c.2. (See the 2006/2008 list of impaired waters at: http://www.azdeq.gov/environ/water/assessment/download/2008/2006_2008.pdf.)

3. Water Quality Standards

   If you selected "yes" in Item C.4 you are considered an existing discharger and may skip this question.

   If you selected "no" in Item C.4 indicating that stormwater discharges from your facility have not been previously covered under an NPDES or AZPDES permit, you are considered a new discharger and must answer this question.

   a. If you are a new discharger, any discharge into an impaired water is not automatically eligible for coverage under the MSGP. (See Part 1.1.4.5 of the permit.)

   b. If you selected "yes" in Item D.3.b indicating that the receiving water has been designated as an outstanding Arizona water (OAW) under A.A.C. R18-11-112 you are not eligible for coverage under the MSGP. (See Part 1.1.4.6 of the permit.)

4. Effluent Limitation Guidelines and Sector-Specific Requirements

   a. Depending on your industrial activities, your facility may be subject to effluent limitation guidelines that include additional effluent limits and monitoring requirements for your facility. Review the requirements, described in Part 2.2.1 of the MSGP, and check any appropriate boxes on the NOI form.

   b. For Sector S facilities (Air Transportation), indicate whether you anticipate that the entire airport facility will use more than 100,000 gallons of glycol-based deicing/anti-icing chemicals and/or 100 tons or more of urea on an average annual basis. If so, additional effluent limits and monitoring conditions apply to your discharge (See Part 8, Sector S of the MSGP).

Section E. Stormwater Pollution Prevention Plan (SWPPP)

Identify the name, telephone number and e-mail address of the person who will serve as a contact for ADEQ on issues associated with stormwater management at your facility. This person should be able to answer questions related to stormwater discharges, the SWPPP, and other matters related to stormwater permit coverage, or have immediate access to individuals with that knowledge. This person does not have to be the facility operator, but should have intimate knowledge of stormwater management activities at the facility.

You must keep a copy of your SWPPP onsite or otherwise make it available to facility personnel responsible for implementing provisions of the permit.

Section F. Certification

Certification statement and signature (See Appendix B.9 of the MSGP for more information). Enter the certifier's (authorized signatory) printed name, title, and e-mail address.

Sign and date the form. (CAUTION: An unsigned or undated NOI form will prevent the granting of permit coverage.) This NOI must be signed as follows:

*For a corporation*: by a responsible corporate officer, this means:

1. President, secretary, treasurer, or vice-president of the corporation in charge of the principal business function, or any other person who performs similar policy or decision making functions, or
2. The manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit NOI requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

*For a partnership or sole proprietorship*: by a general partner or the proprietor; or

*For a municipality state, federal, or other facility*: by either a principal executive or ranking elected official.

**Notes:** Operators cannot delegate the responsibility for signature on a Notice of Intent (NOI) form to a consultant, agent, or any other third party.

State statutes provide for severe penalties for submitting false information on this NOI form.

# NOTICE OF TERMINATION (NOT)

## of Coverage under an AZPDES General Permit for Stormwater Discharges Associated with Industrial Activity

**FOR TERMINATION OF COVERAGE, A COMPLETE AND ACCURATE NOT MUST BE SUBMITTED TO:**
**Arizona Department of Environmental Quality / Stormwater Program**
**1110 West Washington, 5415A-1; Phoenix, Arizona 85007**
**FAX: (602) 771-4528**

Submitting this Notice of Termination (NOT) constitutes notice that the party identified in Section B below is no longer authorized to discharge stormwater associated with industrial activity under the AZPDES program for the facility identified in Section C below. All necessary information must be included on this form. Refer to the instructions.

### A. PERMIT INFORMATION

MSGP Authorization Number: AZMSG-_____

Reason for Termination (check one):

_____ Operational control has been transferred to another operator.

_____ Operations have ceased at the facility, there are not or no longer will be stormwater discharges associated with industrial activity from the facility, and the necessary sediment and erosion controls as required by Part 2.1.1.5 have already been implemented.

_____ The facility is classified as a Sector G or J facility and has met the applicable termination requirements.

_____ Coverage has been obtained under an alternative AZPDES permit.

_____ No Exposure Certification received. (List No Exposure # _____)

### B. FACILITY OPERATOR INFORMATION

Operator Name: _____ Phone: _____

E-mail: _____ Fax: _____

Business Name: _____

Mailing Address: _____

_____

City: _____ State: |___|___| Zip Code: _____

### C. FACILITY LOCATION INFORMATION

Facility Name: _____

Facility Address or Site Physical Location: _____

_____

_____

City: _____ State: |___|___| Zip Code: _____

County: _____

### D. CERTIFIER INFORMATION

I certify under penalty of law that I have met at least one of the reasons for terminating permit coverage listed in Section A above. I understand that by submitting this Notice of Termination, I am no longer authorized to discharge stormwater associated with industrial activity under this general permit, and that discharging pollutants in stormwater associated with industrial activity to waters of the United States is unlawful under the Clean Water Act where the discharge is not authorized by an AZPDES permit. I also understand that the submittal of this Notice of Termination does not release me from liability for any violations of this permit or the Clean Water Act.

Printed Name: _____ Title: _____

Signature: _____ Date: _____

E-mail Address: _____ Phone: _____

Address **(Complete ONLY if different from Section B)**: _____

_____

City: _____ State: |___|___| Zip Code: _____

# NOTICE OF TERMINATION INSTRUCTIONS

**for Stormwater Discharges Associated with INDUSTRIAL ACTIVITY under the Multi-Sector General Permit (MSGP)**

**Who May File Notice of Termination (NOT) Form**

Permittees currently covered by the AZPDES stormwater Multi-Sector General Permit (MSGP) must submit a Notice of Termination (NOT) form within 30 days after one or more of the following conditions have been met:

- A new owner or operator has assumed responsibility for the facility; or
- Operations have ceased at the facility, there are not or no longer will be stormwater discharges associated with industrial activity from the facility, and the necessary sediment and erosion controls as required by Part 2.1.1.5 have been implemented; or
- The facility is categorized in Sector G or J and has met the applicable termination requirements; or
- Coverage under an individual or alternative general permit has been obtained for all discharges required to be covered by an AZPDES permit.

See Part 1.4 of the MSGP for more information.

**Where to File NOT form**

Notice of Termination forms sent by regular mail:

Arizona Department of Environmental Quality
Surface Water Section / Stormwater Program
1110 West Washington, 5415A-1
Phoenix, Arizona 85007

Notice of Termination forms sent by facsimile:

(602) 771-4528

**Completing the Form**

To complete this form, type or print in uppercase letters in the appropriate areas only. Please complete all questions. Make sure you make a photocopy for your records before you send the completed original form to the address above.

Please use ink when you sign the original document. If you have any questions about this form, you may call (602) 771-4632.

**Section A. Permit Information**

1. Enter either the EPA NPDES tracking number or ADEQ's Authorization Number if you received coverage after Dec. 5, 2002.
2. Indicate your reason for submitting this Notice of Termination by checking the appropriate box (see Part 1.4 of the MSGP for more information).

**Section B. Facility Operator Information**

1. Provide the legal name of the firm, public organization, or any other entity that operates the facility described in this application. The operator of the facility is the legal entity that controls the facility's operation, *not* the plant or site manager. Do not use a colloquial name.
2. Enter the complete mailing address, email address, telephone number, and fax number of the operator. This address will be used for any future correspondence between ADEQ and the facility operator.

**Section C. Facility Information**

1-2. Enter the facility's official or legal name and complete address, including city, county, or similar government subdivision, state, and zip code.

**Section D. Certification**

Certification statement and signature (see Appendix B, Section B.9 of the MSGP for more information). Enter the certifier's (authorized signatory) printed name, title, and email address. Sign and date the form.

Federal regulations require this application to be signed as follows:

*For a corporation*: by a responsible corporate officer, this means:

(i) President, secretary, treasurer, or vice-president of the corporation in charge of the principal business function, or any other person who performs similar policy or decision making functions, or

(ii) The manager of one or more manufacturing, production, or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

*For a partnership or sole proprietorship*: by a general partner or the proprietor; or

*For a municipality state, federal, or other facility*: by either a principal executive office or ranking elected official.

State statutes provide for severe penalties for submitting false information on this application form.

# APPENDIX X

Wildlife Management Plan




General Plan of Operations

# Wildlife Management Plan

September 2014

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# 1. INTRODUCTION

Resolution Copper Mining, LLC (Resolution Copper) submitted a General Plan of Operations (Plan), dated November 2013, to the Tonto National Forest (TNF) for authorization to construct an underground mine, ore processing operation, and associated facilities and infrastructure near Superior, Pinal County, Arizona. These components are collectively identified as the Resolution Copper Project (Project). The proposed location for the Project is referred to as the General Project Area (GPA) as defined in the submitted Plan.

The main sites and associated primary project elements within the GPA include:

- East Plant Site (EPS) – Underground mine and attendant shafts and surface support facilities;
- West Plant Site (WPS) – Ore and development rock stockpiles, Concentrator (ore processing facilities), and administrative facilities;
- Tailings Storage Facility (TSF) – Tailings storage area and associated Tailings Corridor (distribution pipeline and access roads);
- The Magma Arizona Railroad Company (MARRCO) Corridor (existing and future pipelines); and
- Filter Plant and Loadout Facility

Resolution Copper would implement a Wildlife Management Plan to discourage wildlife from entering active mining areas at the East Plant Site (EPS), West Plant Site (WPS), Tailings Storage Facility (TSF) and Filter Plant and Loadout Facility. The plan would provide guidance to Resolution Copper personnel on the management of wildlife that may be attracted to the tailings decant pond, non-contact and contact water catchments, and process water ponds. Resolution Copper would employ the application of the least aggressive management practices to deter and prevent wildlife from gaining access to these areas.

The goal of the Wildlife Management Plan would be to reduce the potential for wildlife injury and mortality at active mining facilities. The plan would continue to evolve and would be periodically modified within an adaptive management framework aimed at improving the efficacy of wildlife protection measures. A final Wildlife Management Plan would be developed as the Project advances through National Environmental Policy Act (NEPA).

The following sections provide a brief description of the facilities and areas that would require implementation of wildlife protection measures (***Section 2***) and the types of wildlife protection measures and protocols that would be implemented by Resolution Copper for the Project (***Section 3***).

# 2. FACILITY DESCRIPTIONS

This section describes the process water ponds and the non- contact and contact water basins at the EPS, WPS, TSF and Filter Plant and Loadout Facility that would require monitoring and implementation of protection measures to prevent wildlife from gaining access to these areas. Details on facility design

and existing site conditions for the proposed facility locations (e.g. existing facilities, infrastructure, and environmental setting) are contained within the submitted Plan.

## 2.1. EAST PLANT SITE

The EPS is approximately 68 miles east of Phoenix and 2 miles east of Superior. The EPS encompasses the proposed underground mine, associated shafts and ore handling systems, and surface support facilities. The existing mine and related surface support facilities are on private lands, and during mine operations, would largely expand onto private lands. The support facilities, some of which already exist, are in a previously disturbed area and include a mine site where Shaft 9 was constructed in the 1970s. Additional area encompassed by the EPS includes the land surface above the ore body, comprised of unpatented mining claims on the Tonto National Forest and Arizona State Trust lands administered by the Arizona State Land Department (ASLD).

Facilities that would be monitored for wildlife at EPS include three contact water basins (E1, E2, and E3). Contact Water Basins E1 and E2 would be constructed at the eastern edge of the EPS. The basins would be sited at low points in an existing drainage to capture the majority of the stormwater flows from the newly developed mine area. These basins would be emptied after each storm event, and contact water would be reused in the process water supply or the underground mine operations. Contact Water Basin E3 would contain flows from the existing and new mine facilities. This basin would be in the area of an existing sump, which would be deepened and widened to catch all contact flow from these areas. This basin would be lined to prevent surface water infiltration.

## 2.2. WEST PLANT SITE

The WPS is approximately 65 miles east of Phoenix and 1 mile north of Superior on Resolution Copper private property and the Tonto National Forest. The WPS encompasses facilities associated with past mining activity and facilities that are currently in operation either to support new development or for closure of legacy facilities. New features at WPS would include rail facilities, development rock stockpiles, new ore processing facilities (the Concentrator Complex), conveyor systems, and associated surface infrastructure (including administration buildings) to support the underground development and mining occurring at the EPS.

Facilities at WPS that would be monitored for wildlife include a process water pond and contact water basins. Process water for WPS use would be stored in the 50-million-gallon (190,000-$m^3$) Process Water Pond. This pond would receive water from the CAP well field and CAP canal, filtrate from the Filter Plant, reclaim water from the TSF and contact water pumped from the local contact water ponds. Overflow water from the tailings, copper, and pyrite thickeners would drain or be pumped to the Tailings Thickener Overflow Tank for pumping back to the Process Water Pond where it would be recycled.

Contact water basins (W1, W2, W3, W4, and W5) would be built to act as storage facilities for contact stormwater from the WPS. These basins would provide stormwater management for the following facilities:

- Development Rock and Intermediate Rock stockpiles;
- The Concentrator Complex, which includes the process water pond, ore stockpile facility, tailings thickeners, copper molybdenum and copper concentrator thickeners, and the molybdenum plant;

Non-Contact water basins (W6, W7, W8, and W9) would be built to act as storage facilities for stormwater that falls in the Ancillary Facilities catchment areas. Ancillary Facilities include the administration building, contractor and warehouse laydown yards, and construction and employee parking. No mining activity would occur within the Ancillary Facilities area.

### 2.3. TAILINGS STORAGE FACILITY

The TSF would be situated west of the WPS and north of Queen Station, within the TNF. The TSF would consist of the tailings storage area and associated Tailings Corridor (distribution pipeline and access roads). Tailings would arrive at the TSF from the WPS via a pipeline that traverses the intervening area (along with other infrastructure) along the Tailings Corridor.

Facilities at the TSF that would be monitored for wildlife include the tailings decant pond, seepage collection ponds, and stormwater catchment basins. The stormwater that falls directly on the TSF, or downstream of the diversion channels in early stages of tailings construction, would be contained within the TSF. This water would directly offset supply water needs for tailings void fill and water lost to evaporation. The stormwater that seeps through the tailings would be collected in a series of rockfill underdrains to report to one of 11 seepage collection dams.

### 2.4. FILTER PLANT AND LOADOUT FACILITY

The Filter Plant and Loadout Facility would be constructed near Magma adjacent to the existing Magma Arizona Railroad Company (MARRCO) right-of-way. The Filter Plant and Loadout Facility would consist of a copper concentrate filtration plant and facility to load concentrate onto trains for shipment.

Contact water from the Filter Plant and Loadout Facility would be contained on site in contact water basins (F1 and F2) and recycled back into the process water circuit. Drainage from the Concentrate Filter Plant, Conveyor, Concentrate Loadout, Clarifier, Ancillary Facilities, an SRP Substation, a helipad, and a parking area would flow to Contact Water Basin F1. The runoff from the Filter Plant Site, CAP Water Pump Station, and CAP Water Tank would flow to Contact Water Basin F2.

## 3. WILDLIFE PROTECTION MEASURES

### 3.1. MONITORING

#### 3.1.1. AVIAN SPECIES

Monitoring for wildlife would generally include daily, routine inspections at the EPS, WPS, TSF and Filter Plant and Load out Facility for avian species. Inspections would occur at the tailings decant pond,

non-contact and contact stormwater catchments, and process water ponds and would likely be conducted from a designated vehicle inspection route and/or pedestrian inspection walkway. During these inspections, a trained staff member would use binoculars to scan the ponds and vicinity looking for birds or bird sign. Any observations of birds made during these inspections would be documented in a field log. If a bird is encountered, the trained staff member would employ the appropriate deterrence method in accordance with the bird hazing program to be developed for the Project as described in ***Section 3.5***. An inspection frequency and schedule would be determined for the final Plan.

### 3.1.1. SONORAN DESERT TORTOISE

The Sonoran desert tortoise, a US Forest Service Sensitive Species and Candidate for listing under the ESA has the potential to occur in the vicinity of the proposed TSF. In general, a biological monitor would: 1) pre-survey the activity areas that include the known elevation range and habitat requirements of the Sonoran desert tortoise before ground disturbing activities start, 2) investigate the area for Sonoran desert tortoise shelter sites and, 3) monitor the excavation of any shelter sites. Any individuals encountered would be avoided and allowed to move out of the way prior to ground disturbing activities. If encountered near an activity area, work would stop at the area until the tortoise vacates to a safe distance. Guidelines for handling desert tortoise[1] published by Arizona Game and Fish Department (AGFD) would be used if absolutely necessary to move individual tortoises. A biological monitoring report would be submitted to the TNF.

## 3.2. DETERRENT METHODS

Non-lethal harassment techniques would start with implementation of the least invasive techniques (preventative measures and vegetation management). Effectiveness would be observed for a period of time by site staff during routine non-formal daily observations of the tailings storage facility, process water ponds, and contact and non-contact stormwater ponds and would ramp up to harassment, scare measures, floating covers or balls, and lastly the use of netting until wildlife use is diminished. Non-lethal harassment techniques listed in the plan would be adjusted or discontinued based on the observations in order to maximize effectiveness.

Ongoing deterrent efforts are being conducted by Resolution Copper and can be used to help determine the most effective deterrence strategies for the Project which would be incorporated into the final Wildlife Management Plan.

[1] Arizona Game and Fish Department (AGFD) 2007. Guidelines for Handling Sonoran Desert Tortoises Encountered on Development Projects. Phoenix, Arizona. http://www.azgfd.gov/hgis/pdfs/Tortoisehandlingguidelines.pdf

## 3.3. PREVENTATIVE MEASURES

Fencing, where possible due to topographic constraints, would be installed around the perimeter of each site. The fence would act to prevent and block mammals from entering the sites. Additional barriers that may be used include floating balls, strategically mounted artificial predatory birds and decoys, or cover and netting on the tailings impoundment and process water ponds.

## 3.4. VEGETATION MANAGEMENT

Vegetation growth within the contact and non-contact stormwater catchment basins and process water ponds would be monitored and periodically removed as often as necessary to further discourage the presence of wading birds.

## 3.5. HAZING PROGRAM

Some additional non-lethal harassment and scare devices to deter and disperse wildlife from the tailings decant pond, non-contact and contact stormwater catchment basins and process water ponds may also be considered and could include: plastic ball covers, vehicle lights and horns, motion sensor lights, flags, perch deterrents, shell crackers, bird bangers, screamers, distress cries/electronic noise systems, bird scare balloons, propane cannons, and mylar scare tape.

A bird hazing protocol would be developed for Resolution Copper employees and would include a combination of harassment techniques. Additional hazing techniques may be adjusted or added as necessary based on field observations and ongoing research efforts. The protocol would include an inspection schedule, acceptable harassment techniques, a field log procedure, and incident reporting procedures. Resolution Copper staff responsible for implementing the bird hazing program would be trained on the protocol prior to its initiation.

## 3.6. PREVENTATIVE MAINTENANCE

During operations, the tailings decant pond, non-contact and contact stormwater catchment basins, and process water ponds would be routinely inspected as part of an operational and preventative maintenance program. Additionally, maintenance and/or operations personnel would be present on a daily basis to ensure prompt repair of the site fencing and other preventative or harassment/scare devices to discourage wildlife from the facility.

## 3.7. REPORTING

Resolution Copper documents all wildlife sightings and would report to the necessary agencies if any sick, injured, or deceased wildlife are observed on site. If a bird injury or mortality is observed during inspections, Resolution Copper staff would report the incident to the Environmental Manager who would then notify a wildlife rehabilitation expert in the case of an injury or U.S. Fish and Wildlife Law Enforcement or AGFD authorities in the case of mortality. A final reporting procedure would be developed for the final General Plan of Operations.

# APPENDIX Y

Post-Closure Grading Plan

# POST CLOSURE GRADING PLAN FOR THE RESOLUTION COPPER PROJECT IN PINAL COUNTY, ARIZONA

**Prepared for:** Resolution Copper Mining LLC

**Prepared by:** WestLand Resources, Inc.

**Date:** September 18, 2014

**Project No.:** 807.94

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   - 2.3. Filter Plant and Loadout Facility ..... 4


## FIGURES

(*follow text*)


Figure 1. East Plant Site Overview Post Closure Grading Plan
Figure 2. East Plant Site Detail Post Closure Grading Plan
Figure 3. West Plant Site North Post Closure Grading Plan
Figure 4. West Plant Site South Post Closure Grading Plan
Figure 5. Filter Plant and Loadout Facility Post Closure Grading Plan
Figure 6. Tailings Storage Facility Post Closure Grading Plan

## 1. INTRODUCTION

Resolution Copper Mining, LLC (Resolution Copper) submitted a General Plan of Operations (Plan), dated November 2013, to the Tonto National Forest (TNF) for authorization to construct an underground mine, ore processing operation, and associated facilities and infrastructure near Superior in Pinal County, Arizona. These components are collectively identified as the Resolution Copper Project (Resolution Project or Project).

The main sites and associated primary project elements include:

- East Plant Site (EPS) – Underground mine and attendant shafts and surface support facilities;
- West Plant Site (WPS) – Ore and development rock stockpiles, Concentrator (ore processing facilities), and administrative facilities;
- Tailings Storage Facility (TSF) – Tailings storage area and associated Tailings Corridor (distribution pipeline and access roads);
- Filter Plant and Loadout Facility (proximate to the existing Magma Arizona Railroad Company [MARRCO] right-of-way); and
- Connecting Infrastructure – Including the MARRCO Corridor.

The Resolution Project will have a total operational life of approximately 40 years, not including initial site construction and final reclamation work. Initial site construction could take up to ten years, while reclamation is projected to take between 5 and 10 years, although that time frame will be refined through National Environmental Policy Act (NEPA). WestLand Resources, Inc. (WestLand) has prepared this technical memorandum to describe the conceptual post closure grading plan for the EPS, WPS, and the Filter Plant Loadout Facility as shown in ***Figures 1-5***. The post-closure grading plan for the TSF (***Figure 6***) was developed by Klohn Crippen Berger and is not described in this technical memorandum.

## 2. POST CLOSURE GRADING PLAN

Resolution Copper facility areas (EPS surface facilities and WPS, TSF and Tailings Corridor, Filter Plant and Loadout Facility, and pipeline corridors) will be cross ripped along the contour, re-graded and contoured to blend into the surrounding topography and terrain as well as provide for erosion control and water collection for seed and seedlings. Compacted areas such as roads, parking and storage areas, building and structure sites will be cross ripped or disked along the contour or otherwise left in a roughened condition prior to growth medium material replacement. Closure of potentially discharging facilities will be completed in accordance with Aquifer Protection Permit (APP), Arizona Pollutant Discharge Elimination System, Pinal Air Quality Control District, Mine Land Reclamation Plan, and other applicable requirements. ***Figures 1-5*** show the main facility areas after re-grading as well as the water management structures (e.g., surface water diversions) that will either remain or be relocated after reclamation.

## 2.1. EAST PLANT SITE

The EPS facilities (shafts, hoist houses, etc.) will be decommissioned and the land surfaces will be cross-ripped along the contour, contoured and re-graded to blend into the surrounding topography and terrain, and reclaimed with appropriate local species seed mixes. The EPS post closure-grading plan is shown in ***Figures 1 and 2*** and includes the following:

- A berm and/or a fence will be constructed, monitored, and maintained along the entire perimeter of the Block Cave Subsidence Zone to prevent access. No additional reclamation activities are planned for this area. However, to the extent practicable, surface water diversions may be constructed to move storm water away from the subsidence zone and into natural drainages.
- All fill slopes shall be laid back to a maximum of 2.5:1.
- Shaft collars and subcollars will be permanently sealed. Shafts will be decommissioned or salvaged as necessary.
- The North and South Diversion Channels will be relocated as necessary to route flow to existing drainages.
- Contact Water Basins E1, E2 and E3 will be closed per permit requirements.

## 2.2. WEST PLANT SITE

WPS facilities will be decommissioned and the land surfaces will be contoured and graded as necessary to blend into the surrounding topography and terrain, and reclaimed with appropriate local species seed mixes. Onsite drainages will remain in place and be used to direct flow to the natural drainages. The post closure-grading plans for the northern and southern portions of WPS are shown in ***Figures 3 and 4***, respectively. The plan includes the following:

- All fill slopes shall be laid back to a maximum of 2.5:1.
- The West Diversion Channel, the East Stormwater Channel, and an onsite channel will remain in place to route flow through a new diversion channel to the Apex Tunnel to existing drainages (e.g. Silver King Wash)
- The Process Water pond located at the northern portion of WPS will be closed per APP requirements (e.g., pond will be drained, the liner removed, area will be backfilled, regraded and contoured to match as close as possible the pre-mining topography).
- Contact Water Basins W1 through W5 will be closed per APP requirements (e.g., pond will be drained, the liner removed, area will be backfilled, regraded and contoured to match as close as possible the pre-mining topography).
- The emergency overflow ditch from Contact Water Basin W1 will remain in place.
- Non-Contact Water Basins W6 through W9 will be graded to drain.
- Indian Pond, located at the southern portion of WPS, will be graded to drain.

## 2.3. FILTER PLANT AND LOADOUT FACILITY

Facilities at the Filter Plant and Loadout Facility that are not designated for salvage and/or that won't have a post-mining use will be demolished and the land reclaimed. For those areas that are regraded and reseeded, local species seed mixes will be used. The Filter Plant and Loadout Facility post closure-grading plan is shown in ***Figure 5*** and includes the following:

- The North Diversion Channel will remain in place and route flows to existing drainages.
- Contact Water Basins F1 and F2 will be closed per APP requirements (e.g., pond will be drained, the liner removed, area will be backfilled, regraded and contoured to match as close as possible the pre-mining topography).

# FIGURES

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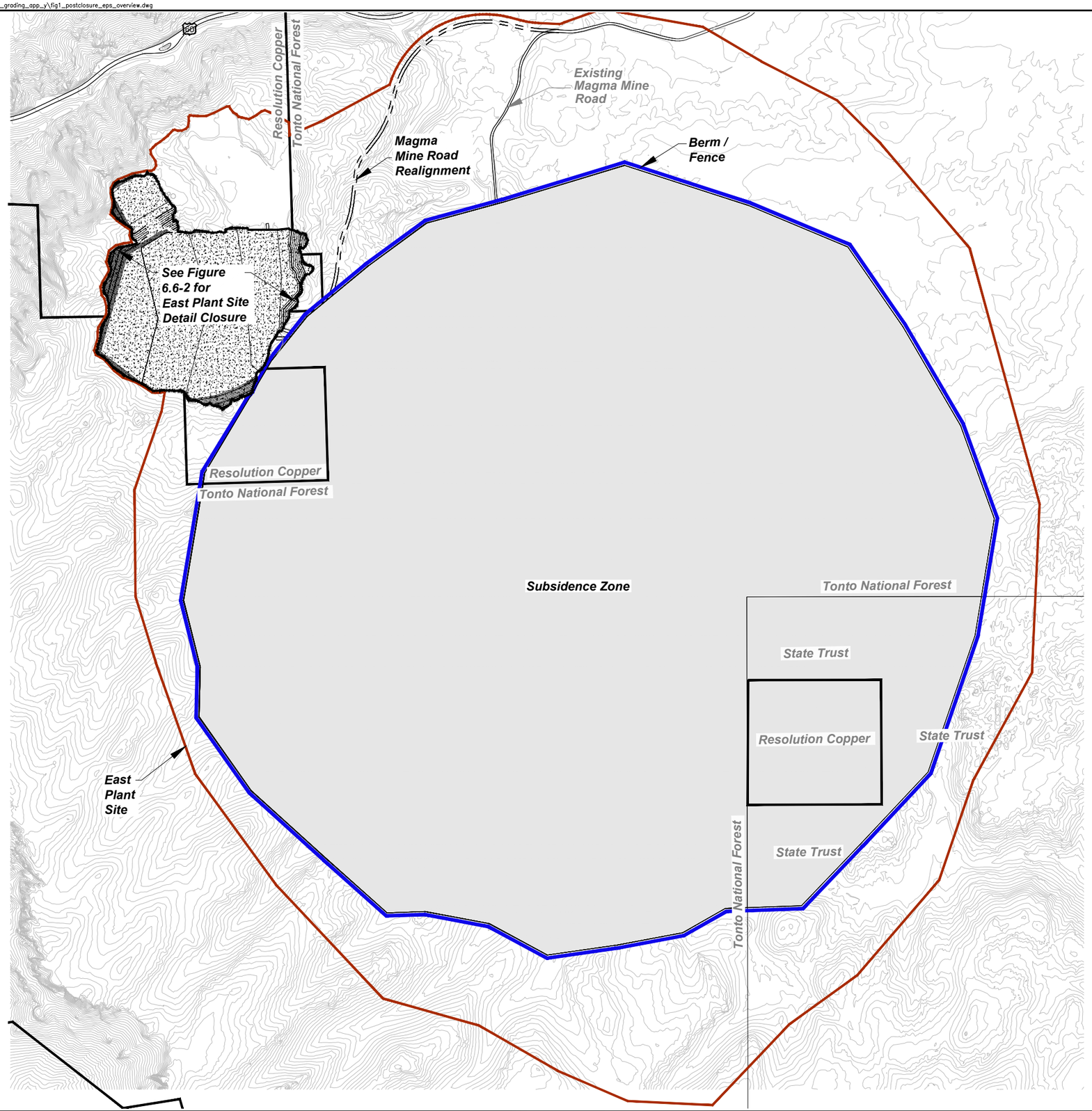


**Legend**

- Resolution Holdings
- Project Area
- Seeded Area
- Berm / Fence

N

0 500 1,000 Feet

0 150 300 Meters

RESOLUTION COPPER

General Plan of Operations

EAST PLANT SITE OVERVIEW
POST CLOSURE GRADING PLAN

Figure 1

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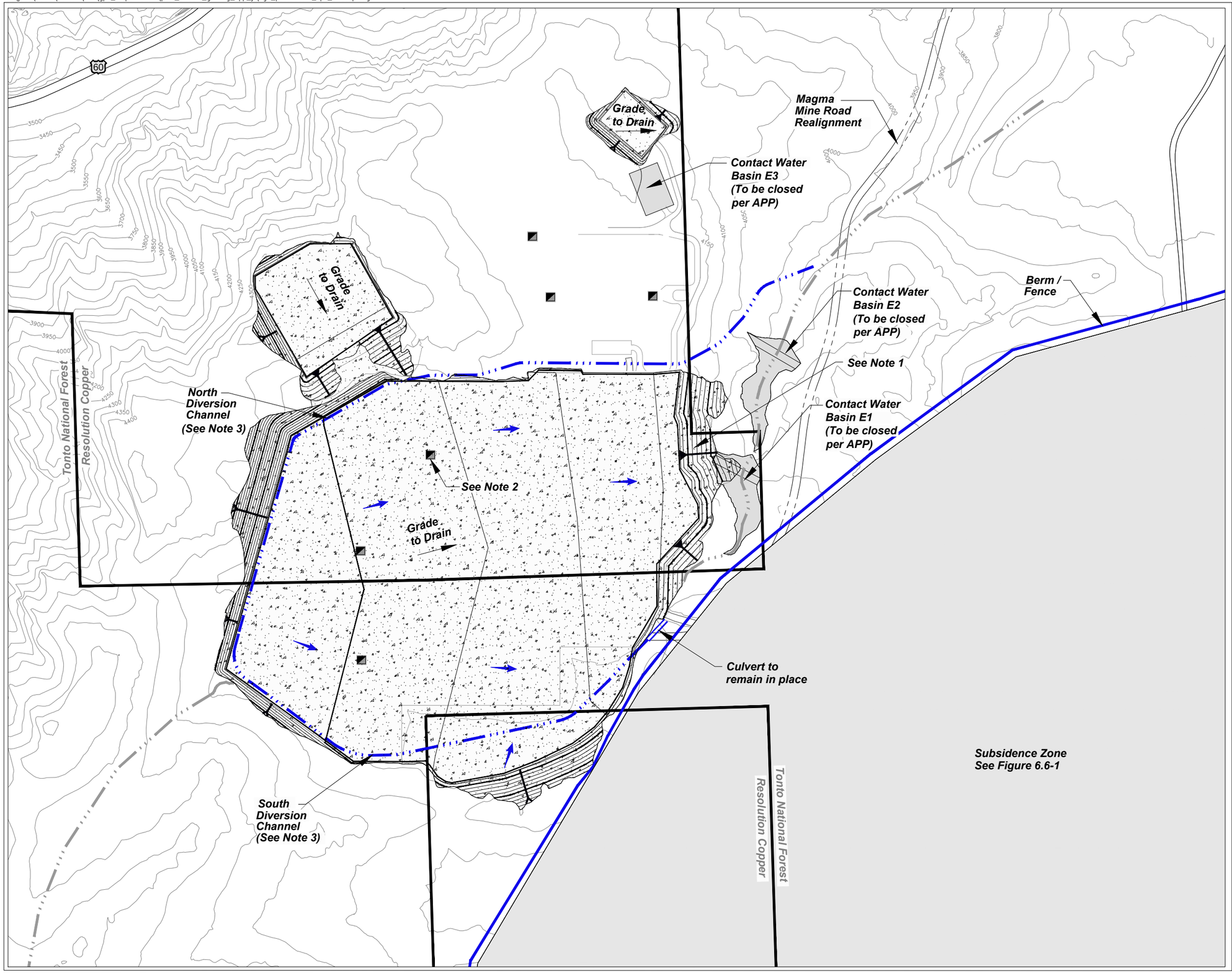


**Legend**

- Resolution Holdings
- Seeded Area
- Shaft
- Cut
- Fill
- Direction of Flow
- Existing Drainage
- Channel/Drainage
- Berm / Fence
- Buried Culvert

Notes:

1. All fill slopes shall be laid back to a maximum of 2.5:1.
2. Shaft collars and subcollars will be permanently sealed. Shafts will be decommissioned or salvaged as necessary.
3. Relocate North and South Diversion Channels as necessary to route flow to existing drainage.

APP = Aquifer Protection Permit

N

0 200 400 Feet

0 50 100 Meters

RESOLUTION COPPER

General Plan of Operations

EAST PLANT SITE DETAIL
POST CLOSURE GRADING PLAN

Figure 2

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West Diversion Channel to remain in place

See Note 1

Process Water Pond (To be closed per APP)

Contact Water Basin W4 (To be closed per APP)

Grade to Drain

Apex Tunnel

Apex Tunnel Entrance

East Stormwater Channel (To remain in place)

Onsite Channel (To remain in place)

Silver King Mine Road

Existing Drainage (To remain in place)

Grade to Drain

New Diversion Channel

Contact Water Basin W1 (To be closed per APP)

Contact Water Basin W5 (To be closed per APP)

Emergency overflow ditch (To remain in place)

SRP Substation

Contact Water Basin W2 (To be closed per APP)

Contact Water Basin W3 (To be closed per APP)

Legacy Tailings Pond 6

Silver King Wash

Tonto National Forest

Resolution Copper

3100 3050 3000 3150 3200 3250 3300 3350 3400 3450 3500 3550 3600 3650 3700 3750 3800 3850 3900 3950 4000 4050

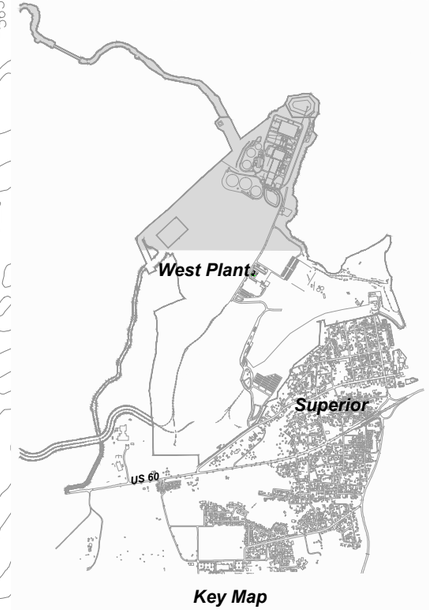
**Legend**

- Resolution Holdings
- Seeded Area
- Cut
- Fill
- Direction of Flow
- Existing Drainage
- Channel/Drainage

Notes:

1. All fill slopes shall be laid back to a maximum of 2.5:1.

APP = Aquifer Protection Permit




Key Map

N

0 325 650 Feet

0 100 200 Meters

# RESOLUTION COPPER

## General Plan of Operations

WEST PLANT SITE NORTH
POST CLOSURE GRADING PLAN

Figure 3

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Contact Water Basin W3 (To be closed per APP)

Contact Water Basin W2 (To be closed per APP)

Non-Contact Water Basin W7 (Grade to Drain)

Non-Contact Water Basin W6 (Grade to Drain)

Grade to Drain

Grade to Drain

Non-Contact Water Basin W8 (Grade to Drain)

Grade to Drain

Non-Contact Water Basin W9 (Grade to Drain)

Indian Pond (Grade to Drain)

Tonto National Forest

Resolution Copper

2900

2850

2800

2750

2700

2650

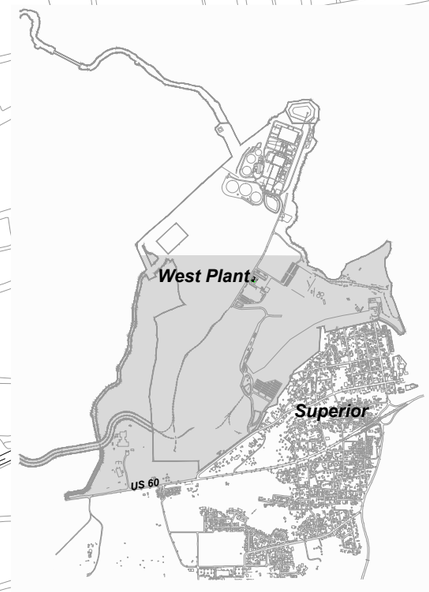
**Legend**

- Resolution Holdings
- Seeded Area
- Cut
- Fill
- Direction of Flow
- Existing Drainage

Notes:

1. All fill slopes shall be laid back to a maximum of 2.5:1.

APP = Aquifer Protection Permit




Key Map

N

0 325 650 Feet

0 100 200 Meters

RESOLUTION COPPER

General Plan of Operations

WEST PLANT SITE SOUTH
POST CLOSURE GRADING PLAN

Figure 4

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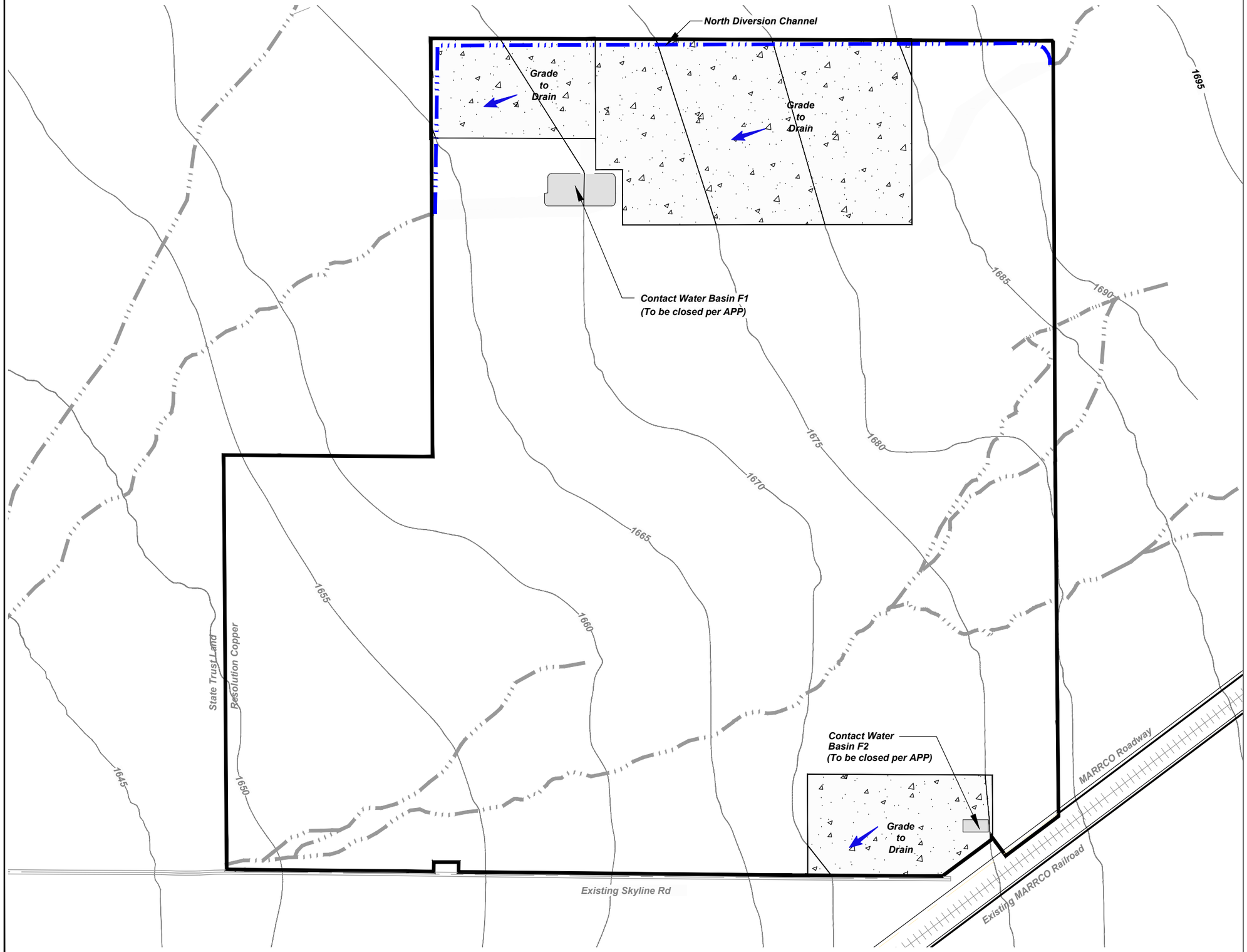


**Legend**

- Resolution Holdings
- Seeded Area
- Direction of Flow
- Existing Drainage
- Channel/Drainage

APP= Aquifer Protection Permit

N

0 300 600 Feet

0 100 200 Meters

Note:
Existing topography to be verified by current survey. All grades shown are subject to change.

# RESOLUTION COPPER
## General Plan of Operations

FILTER PLANT AND LOADOUT FACILITY
POST CLOSURE GRADING PLAN
Figure 5

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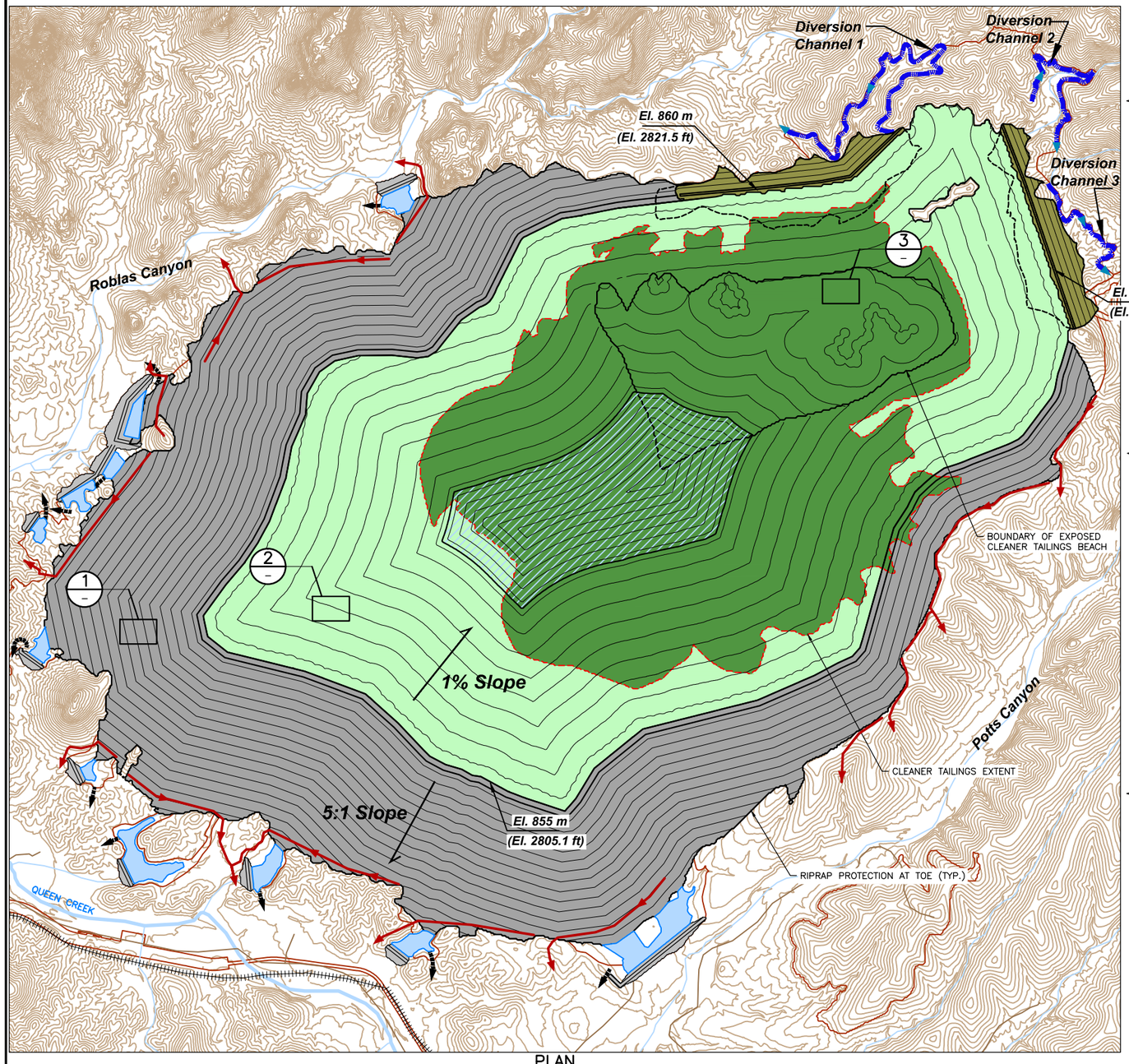
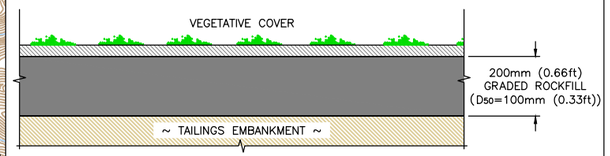
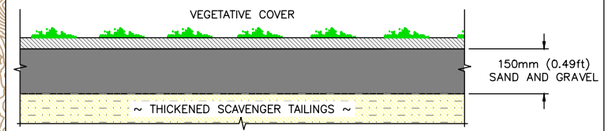


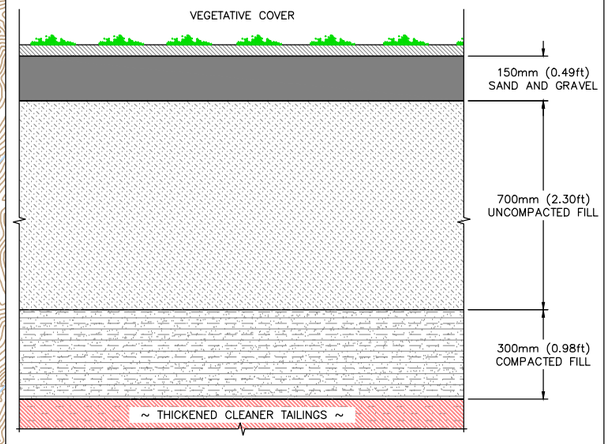

PLAN




DETAIL 1 – EMBANKMENT CLOSURE COVER DETAIL
Not To Scale




DETAIL 2 – SCAVENGER TAILINGS CLOSURE COVER DETAIL
Not To Scale




DETAIL 3 – CLEANER TAILINGS CLOSURE COVER DETAIL
Not To Scale

**Legend**

- Project Area
- Diversion Channel
- Slope Runoff Diversion Channel
- Spillway
- Railway
- Existing Road
- Stream
- Seepage Collection Dam (SCD)
- Reclaimed Upstream Embankment Raise Fill
- Reclaimed Scavenger Tailings
- Reclaimed Cleaner Tailings
- North Dams
- TSF Reclaim Pond
- Seepage Collection Dam Pond

Topography Based on 1 m (3.3 ft) Interval Contours Received From Resolution January, 2013.

N

0 1,000 2,000 Feet

0 500 Meters

Klohn Crippen Berger
2013

# RESOLUTION COPPER
## General Plan of Operations

TAILINGS STORAGE FACILITY
POST CLOSURE GRADING PLAN
Figure 6

# APPENDIX Z

Section I Tables and Figures
Project Disturbance with
Land Exchange

# APPENDIX Z

## Section 1 Tables and Figures

Project Disturbance with Land Exchange

Table A1.5-1. Description of Project Disturbance

| General Project Area | Description of Project Disturbance |
|---|---|
| West Plant Site (***Figures 1.5-2a through 1.5-2e***) | Project disturbance would be the same as described in Table 1.5-1 except that a portion of the Silver King Mine Road would be widened on previously disturbed other private lands rather than on Tonto National Forest lands (***Figures A1.5-2a and A1.5-2d)***. |
| Ore Conveyor/ Infrastructure Corridor (***Figure 1.5-2f***) | Project disturbance would be the same as described in Table 1.5-1 except that the majority of the corridor would be located beneath private lands with a small section located beneath Tonto National Forest lands (***Figure A1.5-2f***). |
| East Plant Site (***Figures 1.5-3a and 1.5-3b***) | New facilities, such as shafts, hoists, and attendant features, would be located on a combination of previously disturbed and minimally disturbed areas on private lands. Subsidence is predicted above the underground mine on private and state trust lands. This area is all identified as new disturbance (***Figure A1.5-3a***). |
| Tailings Storage Facility and Tailings Pipeline Corridor (***Figures 1.5-4a and 1.5-4b***) | Project disturbance would be the same as described in Table 1.5-1. |
| MARRCO Corridor, Filter Plant, and Loadout Facility (***Figures 1.5-5a and 1.5-5b***) | Project disturbance is the same as described in Table 1.5-1. |

**Table A1.5-2. Summary of Proposed Project Disturbance**

| Surface Ownership | Minimally Disturbed or Undisturbed[1] (ac) | Previously Disturbed (ac) | Total (ac) |
|---|---|---|---|
| Tonto National Forest | 4,439 | 26 | 4,465 |
| Resolution Copper | 1,628 | 648 | 2,276 |
| State Trust Lands | 152 | 39 | 191 |
| Other Private Lands | 0 | 19 | 19 |
| ***TOTALS*** | **6,219** | **732** | **6,951** |

[1] Includes lands that have not been disturbed and lands that are largely undisturbed but may contain areas of minimal disturbance, such as small roads or road segments.

DRAFT

# APPENDIX Z

## Section 1 Tables and Figures

Project Disturbance with Land Exchange

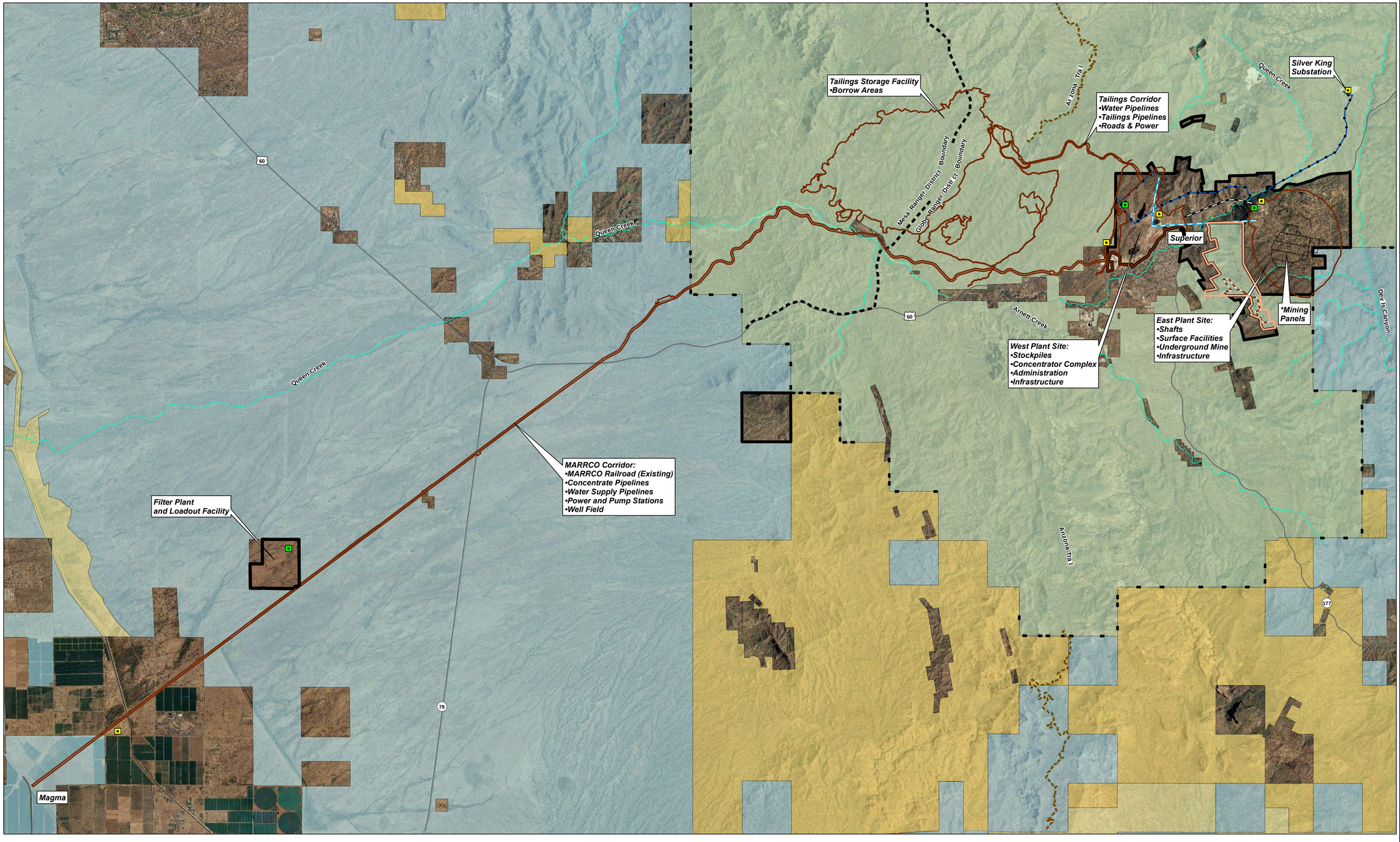
**Table A1.5-3. Proposed Project Disturbance Detail**

| Project Feature | Tonto National Forest | | | Resolution Copper | | | State Trust Lands | | | Other Private | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Minimally Disturbed or Undisturbed (ac) | Previously Disturbed (ac) | Total (ac) | Minimally Disturbed or Undisturbed (ac) | Previously Disturbed (ac) | Total (ac) | Minimally Disturbed or Undisturbed (ac) | Previously Disturbed (ac) | Total (ac) | Minimally Disturbed or Undisturbed (ac) | Previously Disturbed (ac) | Total (ac) |
| ***Tailings and Tailings Corridor*** | | | | | | | | | | | | |
| Tailings Storage Facility | 4,016 | 0 | 4,016 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Borrow Areas/Soil Salvage Stockpile | 202 | 0 | 202 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Tailings Corridor | 114 | 0 | 114 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roads/Infrastructure | 49 | 0 | 49 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Subtotal** | **4,381** | **0** | **4,381** | **2** | **0** | **2** | **0** | **0** | **0** | **0** | **0** | **0** |
| ***East Plant Site and Mine Area*** | | | | | | | | | | | | |
| Plant Area | 0 | 0 | 0 | 88 | 39 | 127 | 0 | 0 | 0 | 0 | 0 | 0 |
| Magma Mine Road | 0 | 0 | 0 | 16 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subsidence | 9 | 0 | 9 | 1,130 | 0 | 1,130 | 93 | 0 | 93 | 0 | 0 | 0 |
| **Subtotal** | **9** | **0** | **9** | **1,234** | **39** | **1,273** | **93** | **0** | **93** | **0** | **0** | **0** |
| ***West Plant Site*** | | | | | | | | | | | | |
| Stockpiles | 0 | 0 | 0 | 0 | 98 | 98 | 0 | 0 | 0 | 0 | 0 | 0 |
| Concentrator Complex/ Yards/Lay-down Areas[1] | 13 | 0 | 13 | 8 | 197 | 205 | 0 | 0 | 0 | 0 | 0 | 0 |
| Administration/Offices | 0 | 0 | 0 | 0 | 22 | 22 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roads/Infrastructure | 0 | 7 | 7 | 10 | 93 | 103 | 0 | 0 | 0 | 0 | 5 | 5 |
| **Subtotal** | **13** | **7** | **20** | **18** | **410** | **428** | **0** | **0** | **0** | **0** | **5** | **5** |
| ***Filter Plant and Concentrate Loadout Facility*** | | | | | | | | | | | | |
| Plant Area | 0 | 0 | 0 | 363 | 190 | 553 | 0 | 0 | 0 | 0 | 0 | 0 |
| Subtotal | 0 | 0 | 0 | 363 | 190 | 553 | 0 | 0 | 0 | 0 | 0 | 0 |
| ***MARRCO Corridor***[1] | | | | | | | | | | | | |
| Pipelines, Booster Stations, Roads/Infrastructure | 32 | 19 | 51 | 11 | 9 | 20 | 45 | 39 | 84 | 0 | 14 | 14 |
| Laydown Areas | 4 | 0 | 4 | 0 | 0 | 0 | 14 | 0 | 14 | 0 | 0 | 0 |
| **Subtotal** | **36** | **19** | **55** | **11** | **9** | **20** | **59** | **39** | **98** | **0** | **14** | **14** |
| **TOTALS** | **4,439** | **26** | **4,465** | **1,628** | **648** | **2,276** | **152** | **39** | **191** | **0** | **19** | **19** |

[1] Includes areas inside and outside of MARRCO right of way.

# FIGURES

Path: M:\Jobs\800's\807.98\ENV\LandExchangeMaps\MXD\Figures from GPO\GPO_Addendum_II_13_2015\AFig1.2-2_General_Arrangement.mxd




**Legend**

- Resolution Holdings
- Project Area
- Apache Leap Special Management Area
- Withdrawal Boundary
- Substation
- Existing Substation
- Power Line
- Conveyor/Infrastructure Tunnel
- Existing Never Sweat Tunnel
- Arizona Trail (ESRI Online Data)
- Tonto National Forest Ranger District Boundary

* Note: Mine Panel Configuration Subject to Change.

**Post Land Exchange Surface Management**

- Bureau of Land Management (BLM)
- Bureau of Reclamation
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Image Source: ESRI Online Microsoft November 2010
Data Source: BLM Surface Management modified 5-2015 to reflect post land exchange status.

N

0 1 2 Miles

0 2 4 Kilometers

Note: This figure is designed to be plotted at 24" x 36". All map elements may not be legible at other plot sizes.

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**General Plan of Operations**

GENERAL ARRANGEMENT

Figure 1.2-2

Path: M:\obs\800\s807.98\ENV\LandExchangeMaps\MXD\Figures from GPO\GPO_Addendum_8_13_2015\AFig1.3.1_Surface_Man.mxd

Tailings Storage Facility
•Borrow Areas

Tailings Corridor
•Water Pipelines
•Tailings Pipelines
•Roads & Power

Silver King Substation

East Plant Site:
•Shafts
•Surface Facilities
•Underground Mine
•Infrastructure

*Mining Panels

West Plant Site:
•Stockpiles
•Concentrator Complex
•Administration
•Infrastructure

MARRCO Corridor:
•MARRCO Railroad (Existing)
•Concentrate Pipelines
•Water Supply Pipelines
•Power and Pump Stations
•Well Field

Filter Plant
and Loadout Facility

Legend

- Resolution Holdings
- Project Area
- Apache Leap Special Management Area
- Withdrawal Boundary
- Substation
- Existing Substation
- Power Line
- Conveyor/Infrastructure Tunnel
- Existing Never Sweat Tunnel
- Arizona Trail (ESRI Online Data)
- Tonto National Forest Ranger District Boundary

* Note: Mine Panel Configuration Subject to Change.

Post Land Exchange Surface Management

- Bureau of Land Management (BLM)
- Bureau of Reclamation
- Private Land (No Color)
- State Trust Land
- US Forest Service (USFS)

Image Source: ESRI Online Microsoft November 2010
Data Source: BLM Surface Management modified 5-2015 to reflect post land exchange status.

N

0 1 2 Miles

0 2 4 Kilometers

Note: This figure is designed to be plotted at 24" x 36". All map elements may not be legible at other plot sizes.

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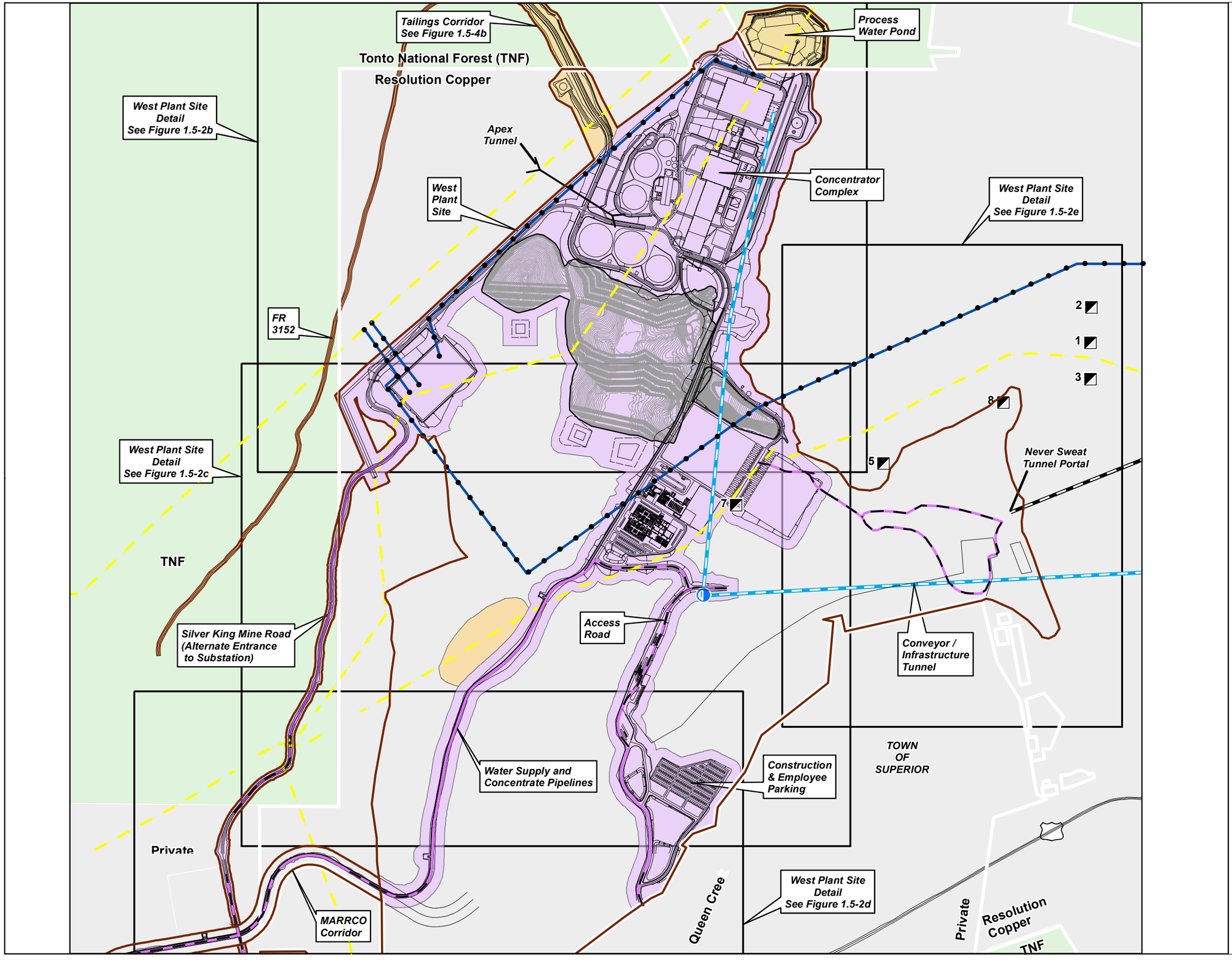
SURFACE OWNERSHIP

Figure A1.3-1

Path: M:\Jobs\800's\807.98\ENV\LandExchangeMaps\MXD\Figures from GPO\GPO_Addendum_8_13_2015\AFig1.5-2a_WPS_Surface_Disturb.mxd




**Legend**

- Resolution Holdings
- Project Area
- Feature Located on Minimally Disturbed or Undisturbed Area
- Feature Located on Disturbed Area / Legacy Mine Area
- Linear Disturbance Feature Located Within Disturbed Area
- Existing SRP 115kV Power Line
- Power Line
- Existing Never Sweat Tunnel
- Conveyor / Infrastructure Tunnel
- Existing Mine Shaft
- Exhaust Raise
- Text for existing features
- Text for proposed features

Note: Portions of some underground features, such as the existing Never Sweat Tunnel and the proposed Conveyor / Infrastructure Tunnel, are not considered part of the Project Area because they lack surface expression.

Data Source:
West Plant Facilities
Provided by M3 Engineering
July 10, 2013

Development Rock Stockpile
Provided by Resolution Copper 2013

Intermediate Rock Stockpile
Provided by Golder Associates 2012

Image Source: Cooper Aerial Surveys Co. 2010
Data Source: BLM Surface Management modified 5-2015 to reflect post land exchange status.

N

0 500 1,000 Feet

0 200 400 Meters

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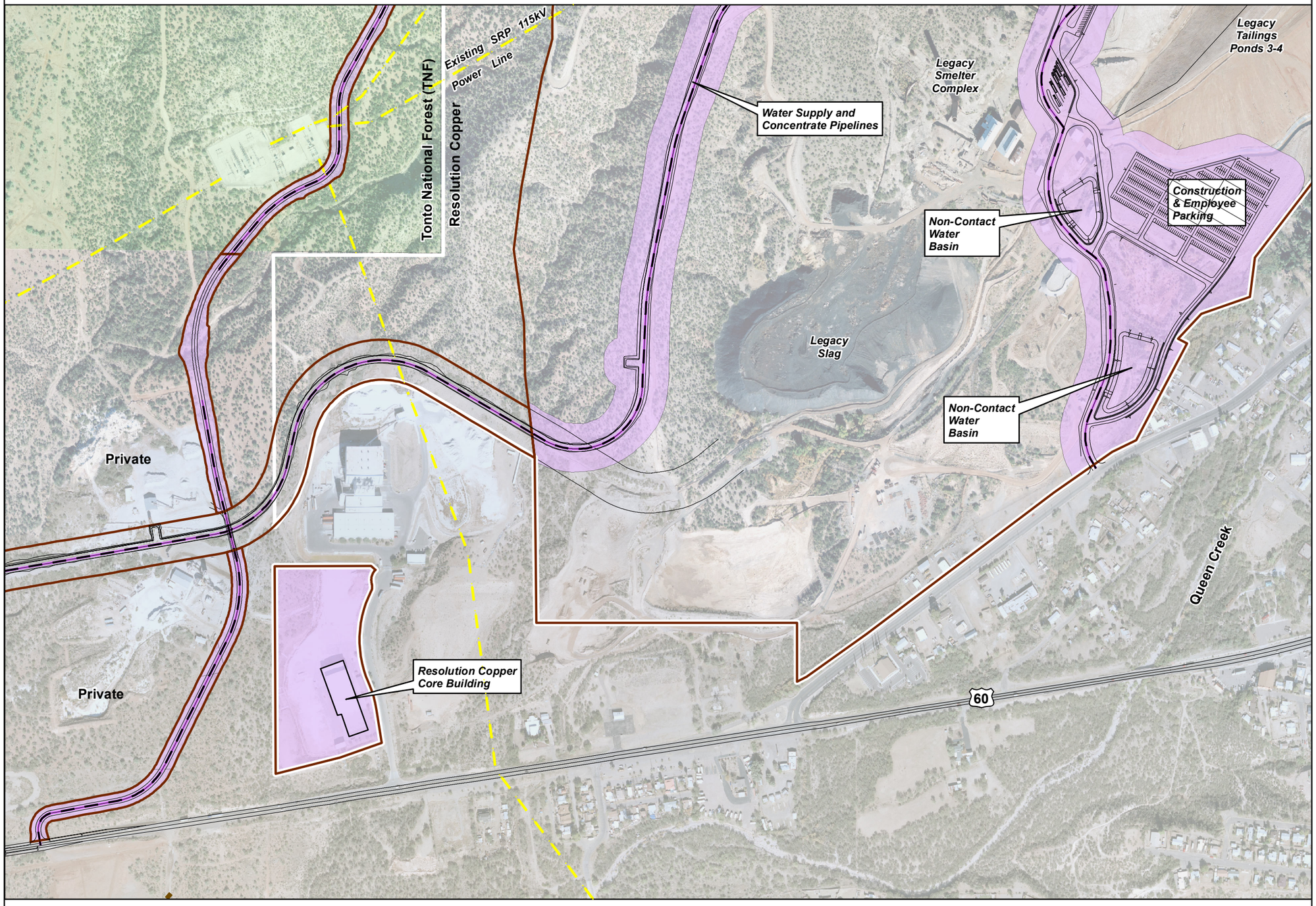
## General Plan of Operations

WEST PLANT SITE - SURFACE DISTURBANCE

Figure A1.5-2a

Path: M:\Jobs\800's\807.98\ENV\LandExchangeMaps\MXD\Figures from GPO\GPO_Addendum_8_13_2015\AFig1.5-2d_WPS_Surface_Disturb_S_Detail.mxd




**Legend**

- Resolution Holdings
- Project Area
- Feature Located on Disturbed Area / Legacy Mine Area
- Linear Disturbance Feature Located Within Disturbed Area
- Existing SRP 115kV Power Line
- Text for existing features
- Text for proposed features

Note: Portions of some underground features, such as the existing Never Sweat Tunnel and the proposed Conveyor / Infrastructure Tunnel, are not considered part of the Project Area because they lack surface expression.

Data Source:
West Plant Facilities
Provided by M3 Engineering
July 10, 2013

Image Source: Cooper Aerial Surveys Co. 2010
Data Source: BLM Surface Management modified 5-2015 to reflect post land exchange status.

N

0 250 500 Feet

0 100 200 Meters

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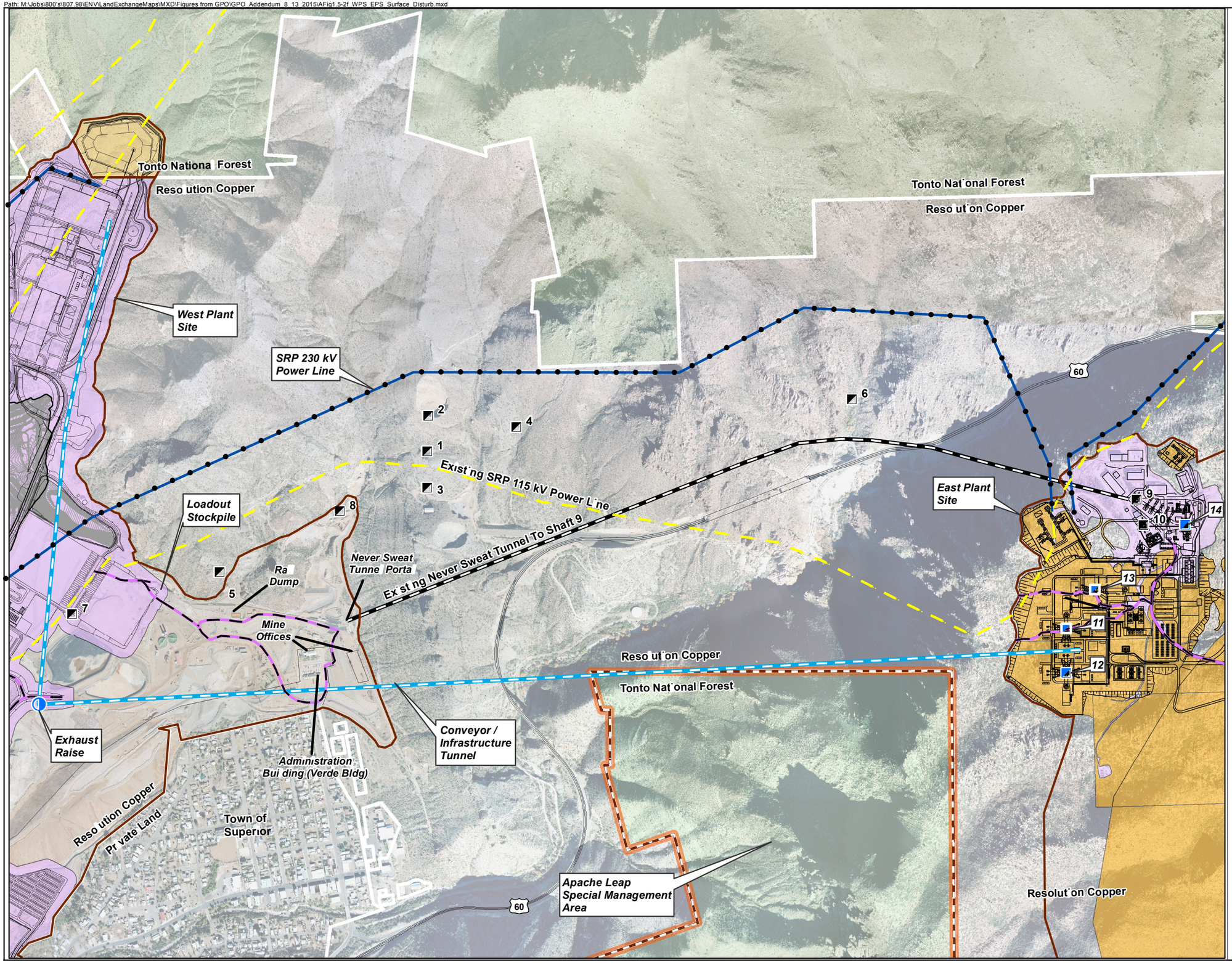
## General Plan of Operations

WEST PLANT SITE - SURFACE DISTURBANCE DETAIL

Figure A1.5-2d

Path: M:\Jobs\800's\807.98\ENV\LandExchangeMaps\MXD\Figures from GPO\GPO_Addendum_8_13_2015\AFig1.5-2f_WPS_EPS_Surface_Disturb.mxd




**Legend**

- Resolution Holdings
- Project Area
- Withdrawal Boundary
- Apache Leap Special Management Area
- Feature Located on Minimally Disturbed or Undisturbed Area
- Feature Located on Disturbed Area / Legacy Mine Area
- Linear Disturbance Feature Located Within Disturbed Area
- Existing SRP 115kV Power Line
- Power Line
- Existing Never Sweat Tunnel
- Conveyor / Infrastructure Tunnel
- Existing Mine Shaft
- Mine Shaft
- Exhaust Raise
- Text for existing features
- Text for proposed features

Note: Portions of some underground features, such as the existing Never Sweat Tunnel and the proposed Conveyor / Infrastructure Tunnel, are not considered part of the Project Area because they lack surface expression.

Data Source:
West Plant Facilities
Provided by M3 Engineering
July 10, 2013

Development Rock Stockpile
Provided by Resolution Copper 2013

Intermediate Rock Stockpile
Provided by Golder Associates 2012

East Plant Facilities
Provided by AMEC
2012

Image Source: Cooper Aerial Surveys Co. 2010
Data Source: BLM Surface Management modified 5-2015 to reflect post land exchange status.

N

0 500 1,000 Feet

0 200 400 Meters

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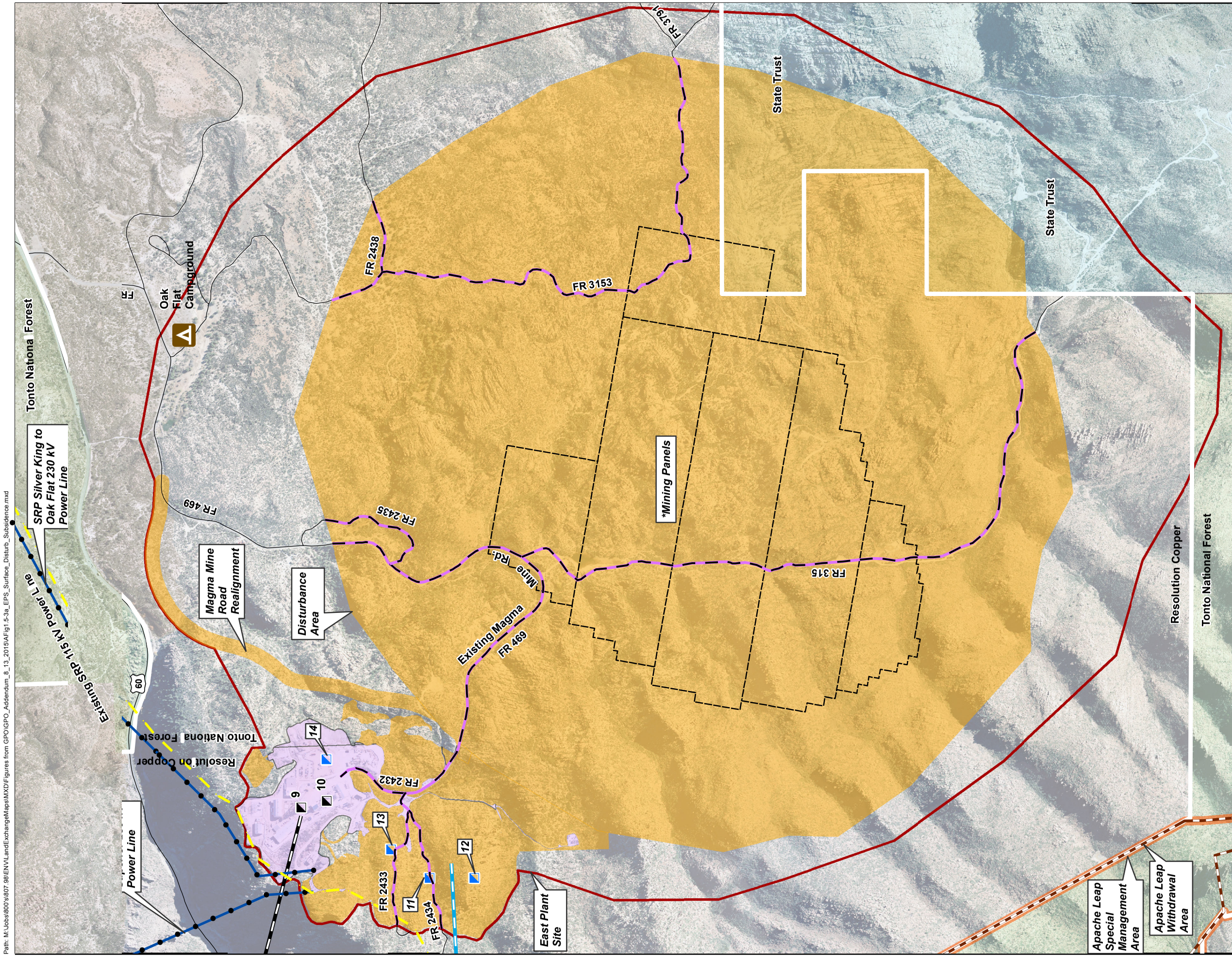
## General Plan of Operations

CONNECTING INFRASTRUCTURE
SURFACE DISTURBANCE
Figure A1.5-2f




Path: M:\Jobs\800's\807.98\ENV\LandExchangeMaps\MXD\Figures from GPO\GPO_Addendum_8_13_2015\AFig1.5-3a_EPS_Surface_Disturb_Subsidence.mxd

**Legend**

- Resolution Holdings
- Feature Located on Minimally Disturbed or Undisturbed Area
- Feature Located on Disturbed Area / Legacy Mine Area
- Text for proposed features

* Note: Mine Panel Configuration Subject to Change

Note 1: Disturbance area around mining panels defined by modeled fracture zone. Project area around disturbance area defined by modeled zone of continuous subsidence.

Note 2: Portions of some underground features, such as the existing Never Sweat Tunnel and the proposed Conveyor / Infrastructure Tunnel, are not considered part of the Project Area because they lack surface expression.

Image Source: Cooper Aerial Surveys Co. 2010
Data Source: BLM Surface Management modified 5-2015 to reflect post land exchange status.

N

0 500 1,000 Feet

0 200 400 Meters

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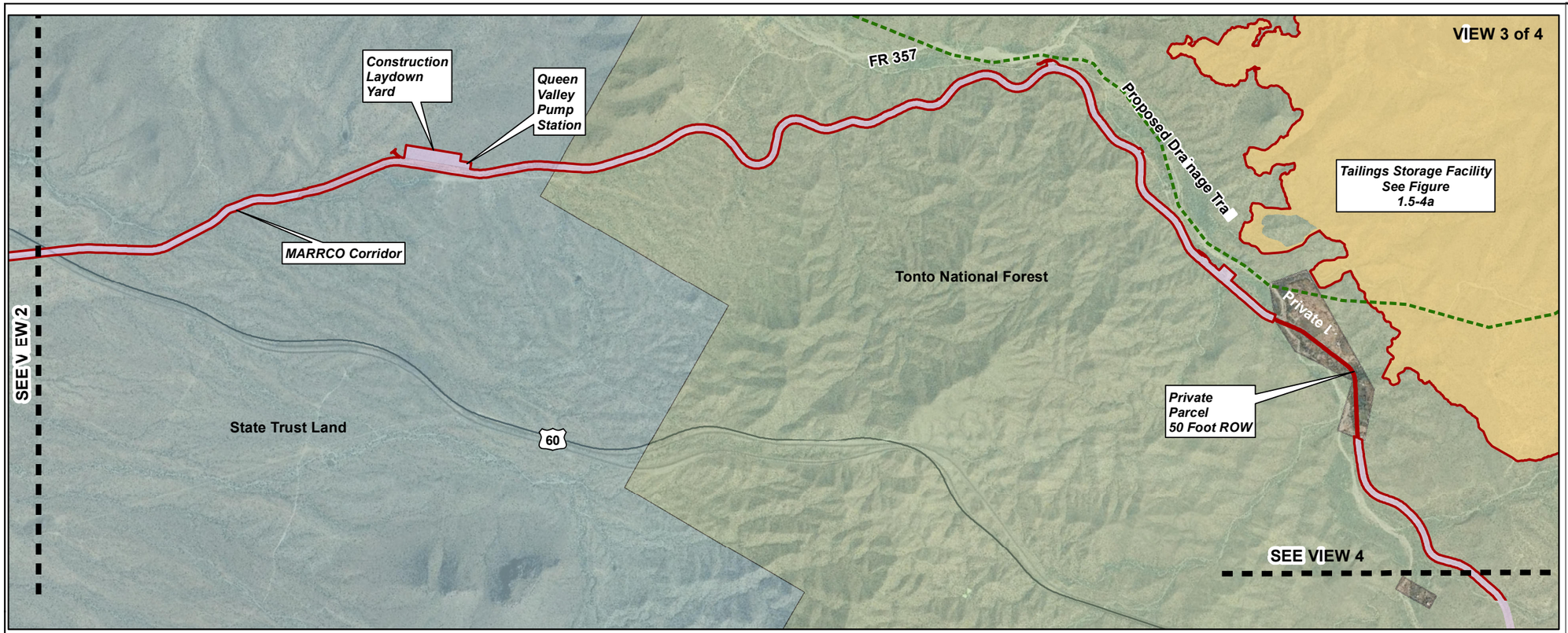
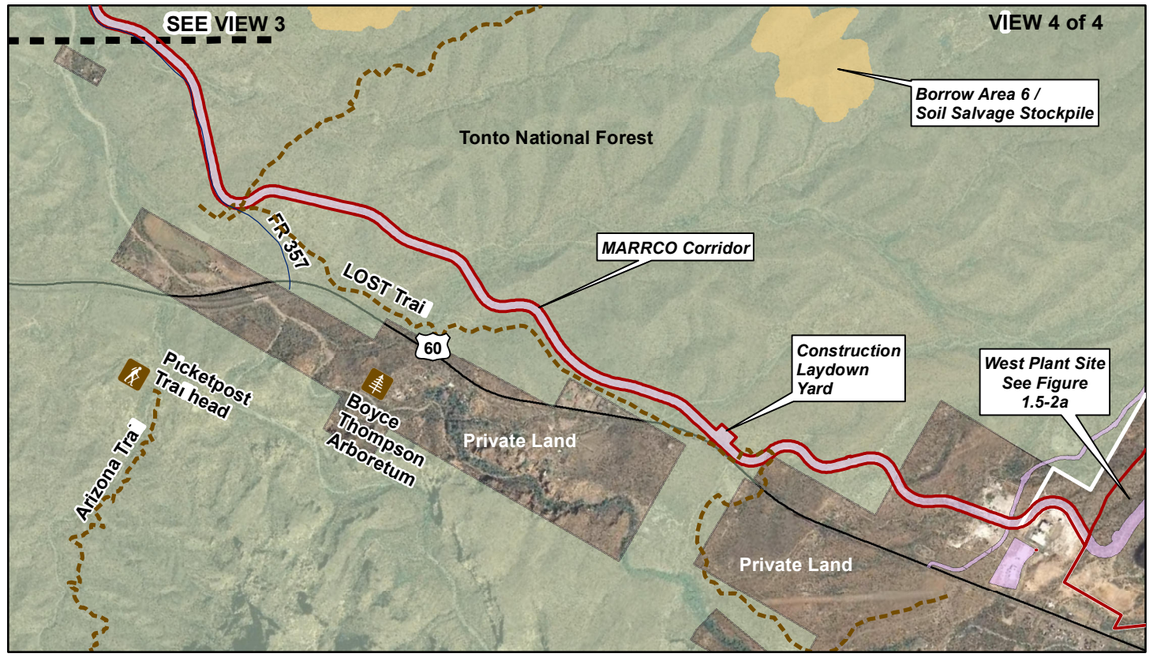
General Plan of Operations

EAST PLANT SITE - SURFACE DISTURBANCE
Figure 1.5-3a

Path: M:\Jobs\800\v807.98\ENV\L and\ExchangeMaps\MXD\Figures from GPO\GPO_Addendum_6_13_2015\Fig1.5-5b_MARRCO_CFiltePl_Disturbance.mxd




**Legend**

- Resolution Holdings
- Project Area
- Feature Located on Minimally Disturbed or Undisturbed Area
- Feature Located on Disturbed Area / Legacy Mine Area
- Trail
- Proposed Drainage Trail
- Trailhead
- Arboretum
- Text for existing features
- Text for proposed features

Note: Portions of some underground features, such as the existing Never Sweat Tunnel and the proposed Conveyor / Infrastructure Tunnel, are not considered part of the Project Area because they lack surface expression.

Data Source:
Pinal County Open Space and Trails Master Plan 2007
USFS Forest Maps and AZ Recreation Map
Arizona Trail Provided by Arizona Trail Association
Aquired September 2012

Image Source:
2010 National Agriculture Imagery Program
Data Source: BLM Surface Management modified 5-2015 to reflect post land exchange status.

0 1,500 3,000 Feet

0 500 1,000 Meters

# RESOLUTION COPPER
## General Plan of Operations

MARRCO CORRIDOR AND
FILTER PLANT AND LOADOUT FACILITY
SURFACE DISTURBANCE

Figure 1.5-5b