



# REPORT

## FIELD TESTING PROGRAM

### Resolution Copper Project – 2012-2013 Geochemical Annual Evaluation and Final Assessment

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## 1.0 INTRODUCTION

This report is the 2012-2013 annual report on the field testing program for Resolution tailings. It also represents the conclusion of the project and the final evaluation of the leachate trends. The testing program, developed by Golder Associates Inc. (Golder) with Geochimica (Golder/Geochimica), included cleaner and scavenger tailings from the proposed Resolution Copper Project.

In 2009, Resolution Copper Mining (RCM) started a pilot testing program with approximately 3.4 tons of ore that produced five types of material:

- Cleaner tailings
- Scavenger tailings
- Whole tailings
- Cyclone tailings
- Desulfurized cyclone sands

The various tailings types were subjected to the following testing programs:

- Static testing program: SGS Lakefield (SGS) in Lakefield, Ontario conducted geochemical characterization of the different materials.
- Kinetic testing program: SGS performed humidity cell testing (HCT) to evaluate behavior under accelerated and controlled conditions.
- Field testing program: Golder/Geochimica are currently conducting a field cell program. The objective of this program is to observe the weathering behavior of the tailings under ambient conditions to identify potential operational constraints with respect to tailings management.

This report presents results from the field program through January 2013. Also included are a brief summary of the laboratory programs conducted by SGS, as well as a summary of the 2011-2012 field test results. The static and kinetic testing programs are discussed in more detail in the 2010 annual report, which also includes the results of the field program through May 2010 (Golder 2010).



## 2.0 TESTING PROGRAMS AND RESULTS

### 2.1 Summary of Static Testing Program

Between May and June 2009, SGS performed a geochemical characterization program of the material. Based on the acid base accounting (ABA) and net acid generation (NAG) test results, the tailings were classified as:

- Cleaner tailings: likely acid generating
- Scavenger tailings: non-acid generating
- Whole tailings: likely acid generating
- Cyclone sands: uncertain
- Desulfurized cyclone sands: non-acid generating

### 2.2 Summary of Kinetic Testing Program

Between June 2009 and March 2010, SGS conducted an HCT program to evaluate the long-term behavior of the tailings. In March 2010, after 38 weeks of testing reported by SGS (SGS 2010), the most relevant findings from the HCT program included:

- Cleaner tailings: The pH values of the leachates were acidic (i.e., around 3.0). Sulfate, aluminum, cadmium, copper, iron, nickel, and zinc demonstrated increasing concentration trends.
- Whole tailings: The behavior of this material was similar to the cleaner tailings: acidic pH values (3.8 by March 2010), and the same parameters as for the cleaner tailings reporting increasing trends.
- Cyclone sands: By week 38, the leachate pH demonstrated a slight decrease to a value of 5.9. Sulfate concentrations reported a decreasing trend, while no metals, with the exception of copper and zinc, reported significant increases.
- Desulfurized cyclone sands: The pH of this sample remained circumneutral, with similar sulfate trends as for the cyclone sands sample, and no metals demonstrating increasing trends.

Scavenger tailings were not included in the laboratory HCT program.

### 2.3 Field Testing Program

#### 2.3.1 Field Test Setup

The field cell setup was performed by personnel from Gila Geological Consultants and Golder at BHP's Pinto Valley Operational (PVO) Unit. The setup was completed on May 20, 2009.

The setup involved the physical construction of the site, the arrangement of eleven barrels for the tailings testing, and the placement of the tailings in the barrels. More detail on the barrel construction, the quantities of material used, and the characteristics of the field test are provided in Golder (2009).



The program included two sets of barrels (irrigated vs. ambient) as follows:

Barrel #	Description	Irrigation
1	Cleaner tailings (paste)	no
2	Cleaner tailings (paste)	yes
3	Cleaner tailings (filter cake)	no
4	Scavenger tailings	no
5	Scavenger tailings	yes
6	Scavenger tailings	no
7	Whole tailings	no
8	Cyclone sands	no
9	Cyclone sands	yes
10	Desulfurized cyclone sands	no
11	Desulfurized cyclone sands	yes

### 2.3.2 Summary of 2011 Field Test Results

The principal observations based on the 2011 program were as follows:

- The leachate water quality data collected during the 2011 period provided valuable information to assess the relative behavior of the various tailing materials with respect to acid generation and metal leaching. Consistent with previous years, acidic conditions were present in the cleaner and whole tailings, while the leachates from the scavenger tailings and the cyclone sands remained circumneutral.
- The metals concentrations in the leachates of irrigated barrels 5, 9, and 11 (scavenger tailings, cyclone, and desulfurized cyclone sands, respectively) were either decreasing or remained stable, with only a few exceptions. However, barrel 2 (cleaner tailings) and barrel 7 (whole tailings) exhibited the effect of substantial oxidation: reduced pH values and elevated and increasing sulfate and metals concentrations. The leachate concentrations in the ambient barrels were consistently higher than the irrigated one, due to accumulation of oxidation products over time between rainfall events and the continued acidic conditions. Most constituents in the barrels exhibited seasonal fluctuations, i.e. higher concentrations of metals during rainfall events.
- Good agreement was found between the prediction of acid rock drainage (ARD) potential based on ABA/NAG results and the field program. The cleaner tailings and whole tailings generated acidic conditions, while the scavenger tailings and desulfurized cyclone sands remained neutral. The cyclone sand barrel was still demonstrating circumneutral pH and low metal leachability, but some evidence for sulfide oxidation was observed. Sulfate and metals concentrations were slightly higher in the cyclone sands, in comparison to the desulfurized cyclone sands.
- The HCT results were generally consistent with the results from the field testing in terms of pH trends. However, the metals and sulfate concentrations were higher in the effluents from the field cells. This was thought to reflect the higher solid to solution ratio in the field cells relative to the humidity cells, which resulted in a more concentrated solution.



- Review of the QA/QC results indicated that the quality of the 2011 analytical results was adequate for its intended purpose, i.e. the evaluation of the tailings environmental behavior under field conditions.



### 3.0 2012–2013 FIELD TESTING PROGRAM

#### 3.1 Field Test Sampling and Schedule

During the third year of sampling, the program followed the same irrigation schedule as for the previous years. Four barrels were irrigated monthly with 10 gallons of water. The irrigated barrels are the following:

- Barrel 2: cleaner tailings
- Barrel 5: scavenger tailings
- Barrel 9: cyclone sands
- Barrel 11: desulfurized cyclone sands

Figure 1 presents the weather information through May 2011 from PVO Unit Meteorological Station 1 and the sampling events.

During the 2012 sampling events, leachate was collected from the irrigated barrels 2, 5, 9, and 11 following the standard monthly irrigation (i.e., 10 gallons per barrel), with the exception of barrel 5 during the April sampling event due to lack of sample. Additional leachate samples were collected from the non-irrigated tailings barrels 1, 2, and 3 (January) and 7 (April) due to antecedent rainfall. After precipitation events, samples were collected from the non-irrigated barrels. Sample volumes from ambient barrels 1, 2, and 3 were only sufficient for analysis of non-metals parameters. Duplicate samples were obtained from barrel 9 during the March, May, June, and July sampling events. The trends observed for the four monthly irrigated barrels over the approximately 3.5 years of monitoring generally represent initial flushing followed by ongoing oxidation promoted by regular, monthly leaching and natural precipitation. The leachates generated by the non-irrigated barrels reflect the infrequent, periodic flushing of oxidation products accumulated over time due to rainfall events.

During the sample collection events, field parameters were recorded and leachate samples were shipped to ACZ Laboratories in Steamboat Springs, CO, for comprehensive chemical analysis.

#### 3.2 Field Test Sampling Results

Water quality sampling results were evaluated to assess the environmental performance of each of the materials present in the barrels over the period of monitoring, with an emphasis on acid generation and metal leaching.

All available analytical results for the 2009-13 sampling period are provided in Table 1. Leachate quality results are shown in Figures 2 to 42. Field and laboratory measured pH values are provided in Figure 2. Alkalinity, conductivity, sulfate, and total dissolved solids are shown in Figures 3 through 6, respectively. The remaining parameters are presented in alphabetical order in Figures 7 through 42.



The main observations through the third and final year of monitoring are as follow:

### Cleaner tailings:

- The pH for the leachate from the irrigated cleaner tailings barrel (i.e. barrel 2) showed low values between February and April (i.e., between 2.6 and 2.4), after a period of circumneutral pH values ended in January 2012. During May, pH values increased again, reaching a value of 4.2, decreased in June to 3.6, then increased in July to 4.9. Acidic conditions were re-established in August, but another occurrence of higher pH values (approximately 6) took place in October/November. The lowest pH values were measured in December 2012 and January 2013 (1.6 and 1.8, respectively). Measurable alkalinity was observed between November 2011 and January 2012, although the measurement in November is close to the detection limit. The leachates from the non-irrigated barrels (barrels 1 and 3) during January 2012 presented acidic pH values (i.e., between 2.3 and 3.1). Samples collected after individual precipitation events typically had low pH.
- The sulfate concentrations in leachate from barrel 2 displayed a significant increase from 360 to 3,100 mg/L between January and February 2012, followed by a decrease to 630 mg/L by July. Concentrations then increased to 47,000 mg/L in August, decreased to 500 mg/L by November, and then increased again in December to 33,000 mg/L. The final sulfate concentration in January 2013 was 25,000 mg/L. Elevated sulfate concentrations in leachates from the non-irrigated barrels are consistent with their acidic conditions, reaching values of up to 47,000 mg/L.
- During the third year of monitoring, concentrations in leachates from the irrigated cleaner tailings continued to show elevated concentrations compared to the other samples for aluminum, beryllium, cadmium, chromium, cobalt, copper, fluoride, iron, manganese, nickel, selenium, uranium, vanadium, and zinc. During the last year, elevated concentrations compared to the rest of the barrels have also been reported for arsenic, calcium, silica, silicon, and silver.
- As mentioned previously, during the months of October and November 2012, the pH of the leachate experienced a peak, reaching a value of 6.1, along with a significant decrease for selected parameters, including: sulfate, aluminum, beryllium, calcium, cadmium, chromium, cobalt, copper, iron, lithium, magnesium, manganese, nickel, silica, silicon, uranium, vanadium, and zinc. This increase of pH with the corresponding decrease of metal leaching is likely related to a significant decrease in ambient temperature and a corresponding reduction in sulfide oxidation rates. Potassium, sodium, and strontium reported the opposite trend, showing increasing concentrations during that month, perhaps indicative of a mineral phase with retrograde solubility (i.e. more soluble at lower temperatures).
- Insufficient sample volume was collected from the ambient barrels. Metal concentrations could, therefore, not be determined but the samples were analyzed for field parameters and inorganic constituents only. The concentrations observed in the leachates from these barrels in January 2012 were much higher than in the irrigated barrel 2 while the pH was much lower (approximately 3 in barrel 1 vs. approximately 6 in barrel 2). This is attributed to accumulation of sulfide oxidation products during dry periods and their dissolution during rainfall events.

### Scavenger tailings:

- The pH for the leachate from the irrigated scavenger tailings barrel (i.e., barrel 5) continued to show circumneutral values through 2012. After two months of lower-pH values (i.e., January and February, with pH values of 5.4 and 5.3, respectively), the pH



increased to 8.3 by July. The alkalinity levels in the leachates ranged from 37 mg/L as CaCO<sub>3</sub> in July 2012 to as high as 238 mg/L in January 2012. The final measurement of alkalinity was 176 mg/l as CaCO<sub>3</sub> in January 2013.

- Leachate from barrel 5 reported an increase in the sulfate concentration between January and February coincident with the pH decrease, up to a value of 930 mg/L. Subsequently concentrations decreased to 520 mg/L in May, then increased to 900 mg/L in August and decreased to 510 mg/L by program termination (January 2013).
- Most of the parameters in barrel 5 leachate presented decreasing or stable trends during this period. A few parameters showed increasing concentrations during the first half of 2012, compared to the previous levels reported, including: calcium, cadmium, chloride, fluoride, potassium, molybdenum, sodium, and selenium. Between June 2012 and January 2013, calcium, potassium, and sodium concentrations decreased to previous levels.
- Leachate from barrel 5 presented stable and low concentrations for all metals, except for zinc, which reported an increasing trend during the last half of the year. Other metals had concentration peaks throughout the year, usually in February and March (i.e. during rainfall events). These included: barium, beryllium, cadmium, chromium, and manganese. After the months in which these peaks occurred, the concentrations returned to the values observed before the rainfall events.
- The depletion calculations show that the small amounts of sulfide present in the scavenger tailings sample will be exhausted prior to the complete depletion of the alkalinity. This confirms the classification based on the ABA results that this material is non-acid generating.

#### **Whole tailings:**

- The only measurement of leachate from whole tailings was conducted in April 2012. The ambient whole tailings barrel (i.e., barrel 7) leachate reported a low pH value of 2.3 during that month. This is very similar to pH conditions for the ambient cleaner tailings.
- Leachate from the whole tailings barrel contained a sulfate concentration of 4,600 mg/L during April.
- For most trace parameters, the values reported for barrel 7 leachates were similar to those found in leachates from ambient cleaner tailings barrels, and in general are significantly higher compared to concentrations from barrel 5, with the exception of boron, barium, lithium, molybdenum, tin, strontium, and titanium.

#### **Cyclone and desulfurized cyclone sands:**

- For the monthly irrigated barrels (i.e. barrels 9 and 11), the leachate pH showed circumneutral values during 2012, ranging between 5.6 and 7.9 for the cyclone sands (barrel 9), and between 6.4 and 8.0 for the desulfurized sands (barrel 11). The final pH taken in January 2013 was measured at 5.6 for barrel 9 and 6.4 for barrel 11. The alkalinity levels in the barrel 9 leachate ranged between 144 to 227 mg/L as CaCO<sub>3</sub> with a final measurement in January 2013 of 201 mg/L. The alkalinity levels in the barrel 11 leachate ranged between 82 to 224 mg/L as CaCO<sub>3</sub> with a final measurement of 162 mg/L in January 2013.
- Sulfate concentrations in leachate barrel 9 displayed a range in concentrations from 320 to 680 mg/L; while leachate from barrel 11 reported a range of 340 to 780 mg/L. Final measurements for sulfate were 460 mg/L for leachate barrel 9 and 430 mg/L for leachate barrel 11.



- The leachates from monthly irrigated barrels 9 and 11 indicated stable or decreasing trends, with seasonal variations fluctuations (i.e., increasing concentrations by the end of summer and decreasing trends towards winter months) for most of the metals. Copper reported an increasing concentration in irrigated barrel 9 by the end of 2012, while both barrels reported increasing trends in concentration for calcium, cadmium, potassium, molybdenum, antimony, and selenium during the first half of 2012. By January 2013, these constituents became stable or decreased to pre-January 2012 levels.
- The depletion calculations indicate that in barrel 9, alkalinity would be depleted prior to the complete depletion of sulfide, while in barrel 11, the depletion of sulfide would occur first. These results suggest a long-term acid generation potential for cyclone sands, while desulfurized cyclone sands are confirmed to be non-acid generating.

### 3.3 Geochemical Controls

#### 3.3.1 Model Selection

The evaluation of the barrels' water qualities included geochemical modeling. The geochemical model used in this study was PHREEQC Version 2.16.04 (Parkhurst and Appelo 1999), an equilibrium speciation and mass-transfer code developed by the United States Geological Survey (USGS). This model has the ability to simulate the pertinent processes occurring in mine wastes, such as mixing of multiple solutions, precipitation/dissolution of selected solids, redox reactions, evaporation, atmospheric interaction, and adsorption of metals. PHREEQC was chosen because it combines the thermodynamic and adsorption capabilities of MINTEQA2 with the ability to conduct mixing and reaction path modeling. The MINTEQA2 database (minseq.V4.dat) was applied.

#### 3.3.2 Model Assumptions

Use of geochemical modeling to predict mine water qualities necessarily requires use of assumptions due to the general inability to unequivocally determine the physical and geochemical characteristics of the complex systems being modeled. General assumptions inherent to the prediction of water qualities are as follows:

- Modeled waters are in full thermodynamic equilibrium. The equilibrium assumption is the standard computational basis of PHREEQC; although kinetic considerations can be taken into account should this be deemed critical. On a detailed scale, such equilibrium is unlikely to be the case for all chemical components throughout all mine waters. However, geochemical evaluations of natural and mine waters over the last few decades have shown that the equilibrium assumption is a powerful tool that in many circumstances produces results that accurately describe the nature of the general chemistry of such waters.
- The PHREEQC model appropriately simulates chemical reactions and contains the appropriate thermodynamic constants.
- Precipitation of credible mineral phases may limit dissolved phase concentrations. Geochemical model simulations included an evaluation of the potential for mineral controls to limit dissolved phase concentrations. Following conservative mixing, speciated solution chemistries were evaluated. A large number of geochemically-credible supersaturated mineral phases were identified and assessed for their likelihood to precipitate from solution. The selection of geochemically-credible mineral phases was



based on the occurrence of these minerals at other mining sites (e.g., Nordstrom and Alpers 1999). Observations of these phases in mine-waste environments suggest that kinetic impediments to precipitation of these phases are not significant.

- Dissolved phase results were used to define input water qualities for geochemical modeling as the dissolved fraction represents the geochemically-reactive component in aqueous environments. Predicted water qualities are therefore representative of dissolved phase concentrations.
- Derivation of input water qualities for geochemical modeling assumed that concentrations reported as below detectable limits in the leachates were equal to the detection limit. This assumption may, in some cases, result in estimates of mine water concentrations that are biased high.

Concentrations that are predicted to be below one microgram per liter are presented as such (i.e., <0.001 milligrams per liter) without further quantification.

### **3.3.3 Model Results**

The various water qualities from the barrels were used as inputs for geochemical modeling in PHREEQC. The geochemical modeling included an evaluation of metals speciation, redox (Eh), pH, alkalinity, and saturation indices for mineral phases. Supersaturated mineral phases were identified and assessed for their likelihood to precipitate from the solution. After equilibration with the selected solid phases, the solution composition was determined anew.

Barrels leachate model results are shown in Table 2 through 5. Results for each barrel simulation are shown with and without geochemical controls.

The main observations from the geochemical modeling are as follows:

#### **Cleaner tailings (Table 2):**

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.

#### **Scavenger tailings (Table 3), cyclone sands (Table 4), and desulfurized cyclone sands (Table 5):**

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.



## 4.0 QUALITY ASSURANCE / QUALITY CONTROL

The data quality assurance/quality control (QA/QC) program for the barrel test included the following:

- Inclusion of a duplicate sample at a frequency of approximately 10% of the number of leachate samples obtained to assess field and laboratory precision.
- Inclusion of blank samples of the water used for artificial irrigation to assess potential contamination during the sampling.
- Calculation of charge balance errors to assess laboratory accuracy and the completeness of the analytical suite.

Based on the review of QA/QC data, the quality of the data set has been deemed adequate for its intended purpose. The current study focuses on a robust evaluation of the weathering behavior of the tailings under field conditions and leachate quality trends, rather than a quantitative performance assessment against regulatory compliance criteria.



## 5.0 DISCUSSION AND CONCLUSIONS

The results from the field program are in good agreement with the evaluation of ARD potential based on static geochemical testing (i.e., ABA and NAG tests). The cleaner and whole tailings are acid generating while scavenger tailings and desulfurized cyclone sands did not show signs of significant oxidation or acid production, consistent with their classification as non-acid generating. The cyclone sands barrel demonstrated neutral pH and low metal leachability, but evidence for sulfide oxidation and pH reduction was observed during the last year of monitoring, while depletion calculations indicate a potential for ARD generation (based on ABA and NAG results, this material was classified as uncertain). The cyclone sands produced pH as low as 5.6, but seasonal fluctuations increased pH to greater than 7 for more than half the months tested in 2012-2013.

Metals concentrations in the leachates of irrigated barrels 5, 9, and 11 (scavenger tailings, cyclone sands, and desulfurized cyclone sands, respectively) were either decreasing or remained stable, with only a few exceptions. However, barrel 2 (cleaner tailings) exhibited the effect of substantial sulfide oxidation: low pH values, and elevated sulfate and dissolved metals concentrations.

Barrels 9 and 11 presented some evidence for a seasonal influence on concentration trends of certain parameters, with concentrations increasing during the summer months and decreasing during the winter months. Because rainfall is more intense in the summer months, the observed trend may be related to the more effective flushing of reaction products, as is observed periodically for the cleaner and scavenger tailings as well. It is also considered possible that the trends represent a response to increased temperatures in the summer months, resulting in enhanced sulfide oxidation and mineral reactivity.

The pH increase observed for barrel 2 (cleaner tailings) during October and November 2012 is similar to the increase reported between November and December 2011. In both 2011 and 2012, the increase of pH was accompanied by a reduction in sulfate and metals concentrations, and in both years, these changes in leachate quality coincided with a decrease in temperature. It is considered likely that the rate of sulfide oxidation was reduced due to colder temperatures, resulting in an increase in pH and a reduction in sulfate and metal concentrations. Several parameters, including potassium, sodium, and strontium, were not affected, but concentrations instead increased through November and December 2011 and October and November 2012. This may be due to the retrograde solubility of their host minerals (i.e. an increase in dissolution with decreasing temperatures). Temperature, therefore, may affect metal concentrations in different ways, depending on whether they originate through sulfide oxidation or mineral dissolution. The temperature effects were less pronounced in the other barrels, possibly due to the significantly lower degree of sulfide oxidation occurring in these less reactive materials.



The modeling of the leachate water qualities and the evaluation of geochemical controls indicate that certain parameters in the leachate composition can be controlled by mineral precipitation. Most notably, these include sulfate, barium, and iron in the leachate from the cleaner tailings, and barium, iron, copper, fluorite and calcium in leachates from the scavenger tailings, cyclone sands, and desulfurized cyclone sands. In the latter group, pH may be buffered by the presence of calcite. The likelihood of secondary mineral precipitation depends on the pH values of the leachate, with a reduced potential for mineral formation at lower pH.

Review of the QA/QC results indicate that the analytical quality of the data set is adequate for its intended purpose, which is the evaluation of the tailings environmental behavior under field conditions.



## 6.0 REFERENCES

- Golder Associates Inc. (2009). Technical Memorandum: Field Test Setup – Resolution Copper Project. July 14, 2009.
- Golder Associates Inc. (2010). Report: Field Testing Program. Resolution Copper Project – 2009-2010 Geochemical Annual Evaluation. July 13, 2010.
- Nordstrom, D.K., and C.N. Alpers, 1999. Geochemistry of Acid Mine Waters. In Plumlee, G.S. and Logsdon, M. (eds.). The Environmental Geochemistry of Mineral Deposits. Part A: Process, Techniques, and Health Issues. Reviews in Economic Geology Volume 6A. Society of Economic Geologists. P133-160.
- Parkhurst, D.L., and C.A.J. Appelo, 1999. User's Guide to PHREEQC (Version 2) - A Computer Program for Speciation, Batch-Reaction, One-Dimensional Transport, and Inverse Geochemical Calculations, U.S. Geological Survey Water-Resources Investigations Report 99-4259, Denver, CO.
- SGS Mineral Services. (2010). Report: Continuation/Decommissioning of Resolution Pilot Plant Tailings Humidity Cell tests SGS Reference No. 11976-002. March 04, 2010.

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## **TABLES**

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

Parameter	Units	Barrel 1 - Cleaner													
		Feb-10		Mar-10		Jul-11		Aug-11		Sep-11		Nov-11		Dec-11	
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Aluminum	mg/l	468	380	170	157	2940	1910	1820	1970	2080	1380	2200		1950	
Beryllium	mg/l	0.129	0.062	0.031	0.027	0.337	0.261	0.212	0.236	0.245	0.214	0.227		0.232	
Bismuth	mg/l	ND	ND	ND	ND	ND	2.1	ND	2.2	ND	0.4	ND		1.2	
Boron	mg/l	0.1	ND	ND		ND									
Calcium	mg/l	ND	593	ND	419		455		591		347				
Hardness	Calc														
Iron	mg/l	989	0.006	265	239	14900	10300	7280	8700	7620	8390	9870		11000	
Lithium	mg/l	0.3	0.2	0.13	0.13	1	0.7	ND	0.6	ND	0.4	0.7		0.7	
Magnesium	mg/l		430		205		1510		1470		859				
Mercury	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
Potassium	mg/l	ND	12	ND	7.4		ND		ND		ND				
Silica	mg/l	72	61	42.6	44.4	230	173	150	226	130	190	201		119	
Silicon	mg/l	34	28.5	19.9	20.8	108	81	70	106	61	89	94		56	
Sodium	mg/l		4		1.7		ND		ND		2				
Strontium	mg/l	2.5	0.34	0.27	0.3	ND	0.1	ND	0.2	ND	0.13	ND		0.1	
Tin	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	
Titanium	mg/l	ND	ND	0.15	ND	ND	0.21	ND	0.2	ND	0.15	0.3		0.13	
Antimony	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
Arsenic	mg/l	0.008	0.013	0.009	ND	1.09	0.88	0.43	0.19	0.205	0.2	0.544		0.77	
Barium	mg/l	0.05	0.03	0.117	0.014	ND	ND	0.2	ND	ND	ND	ND		ND	
Cadmium	mg/l	0.06	0.032	0.0227	0.021	0.18	0.151	0.121	0.135	0.123	0.119	0.0971		0.123	
Chromium	mg/l	1	1.1	0.15	0.09	26.7	14.2	10.9	13.2	16.8	10.8	17.9		16.8	
Cobalt	mg/l	6.1	4.4	2.77	2.56	36.9	19.3	18.3	18	16.4	10.3	18.8		14.5	
Copper	mg/l	1880	1170	905	853	6830	4780	3740	2940	2920	3000	3020		3160	
Lead	mg/l	0.012	0.006	0.017	ND	0.059	0.095	0.007	0.007	ND	ND	ND		ND	
Manganese	mg/l	30.1	16.2	11.8	11.3	75.2	48.7	43.5	49.5	41.1	26.3	39		34.7	
Molybdenum	mg/l	ND	0.2	0.04	0.03	ND	ND	ND	ND	ND	ND	ND		ND	
Nickel	mg/l	12	8.57	4.98	4.67	59.7	32.6	30.6	32	29	18.6	32.8		24.9	
Selenium	mg/l	0.373	0.181	0.123	0.095	0.411	0.283	0.146	0.06	0.068	0.058	0.1785		0.121	
Silver	mg/l	ND	ND	0.03	ND	ND	0.3	ND	ND	1.7	ND	ND		ND	
Thallium	mg/l	0.002	ND	ND	ND	0.017	ND	ND	ND	ND	ND	ND		ND	
Uranium	mg/l	0.165	0.054	0.0287	0.026	0.571	0.42	0.269	0.261	0.24	0.213	0.252		0.251	
Vanadium	mg/l	ND	0.08	0.09	0.02	5.9	2.86	4	4.7	4.6	3	3.4		5.96	
Zinc	mg/l	8.5	6.01	4.11	3.54	41.9	22.4	21.1	22.4	19.9	11.7	17		15.8	
Acidity	mg/l	7600		2390		55000		35900		ND				46500	
Alkalinity as CaCO3	mg/l	ND		ND		ND		ND		ND				#N/A	
Chloride	mg/l	10		11		ND		ND		ND				#N/A	
Fluoride	mg/l	104		69		540		460		450				420	
Orthophosphate - P	mg/l	0		0		0		0		0				0	
Sulfate	mg/l	7000		3800		39000		33000		ND				46000	
Total Dissolved Solids	mg/l	13400		7270		86200		71600		63400				91200	
Lab pH	pH units	3.7		3.7		1.9		2.2		ND				2.2	
Phosphorus	mg/l	0.55		0.45		139		40		ND				132	150
<b>FIELD PARAMETERS</b>															
Field pH	pH units	4.5		3.83		2.19		2.17		2.05		2.48		2.19	3.09
Temperature	Celsius	8.3		10.9		27.7		27.4		24.1		17.6		2.9	8.7
Conductivity	µs/cm	5970		5120		0		18700		ND		19040		0	8130

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

Parameter	Units	Barrel 2 - Cleaner												Barrel 3 - Water																		
		May-09		Jun-09		Jul-09		Aug-09		Sep-09		Oct-09		Nov-09		Dec-09		Jan-10		Feb-10		Mar-10		Apr-10		May-10		Jun-10		Jul-10		
	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved		
Aluminum	mg/l	2.9	ND	1.5	ND	7.73	5.8	35.4	16.5	11.2	7.93	32.1	25.5	18.5	11.2	5.46	0.52	9.11	3.9	1150	1060	1430	1390	1.58	1.11	15.8	13.5	87.2	75.9	122	119	
Beryllium	mg/l	ND	ND	ND	ND	0.0053	0.0053	0.0076	0.0059	0.004	0.0038	0.007	0.006	0.0044	0.0029	0.0011	0.0007	0.0022	0.0019	0.229	0.288	0.31	0.253	0.0009	0.0008	0.0027	0.0028	0.0126	0.0106	0.015	0.016	
Bismuth	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.04	0.04	0.04	0.04	
Boron	mg/l	ND	ND	ND	ND	0.05	0.05	0.06	0.05	0.05	0.04	ND	0.08	0.08	0.05	0.05	0.05	0.05	0.05	0.04	0.4	ND	0.1	ND	0.06	0.05	0.04	0.05	0.06	0.08	0.03	0.03
Calcium	mg/l	20	27	180	190			129		137		142		134		129		123		127	ND	376	ND	542		120		114		129		117
Hardness	Calc	51	74	690	710																											
Iron	mg/l	27	ND	29	ND	1.47	ND	182	35.6	28.4	3.71	245	202	109	87.2	34	0.73	48.7	21.3	5560	5710	7410	7410	21.4	8.42	171	149	376	311	352	325	
Lithium	mg/l	ND	ND	ND	ND	0.06	0.06	0.07	ND	0.06	0.06	0.07	0.1	0.07	0.07	0.06	0.04	0.07	0.06	ND	0.5	0.6	0.7	0.06	0.06	0.07	0.02	0.02	0.09	0.09		
Magnesium	mg/l	2	1.7	57	58			59.7		77		78.8		122		87.4		44.3		52.7		1050		1270		57.1		85.9		139		136
Mercury	mg/l	0.00022	ND	ND	N	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	0.0002	0.0002	0.0002		
Potassium	mg/l	6.3	5.8	8.6	8.2			3.3		2		2.5		ND		2.7		3		3	ND	ND	ND	ND	ND	ND	ND	3.2	3.1	5	2.4	
Silica	mg/l	14	3.6	23	19	16.4	18.8	18	20	13.7	17.4	16.8	18	10	18.1	20.7	18.6	13.5	17.2	110	117	124	163	15.3	15.7	15.8	19.2	15	20	16.3	16.7	
Silicon	mg/l	6.4	1.7	11	8.8	7.6	8.7	8.4	9.3	6.4	8.1	7.8	8.4	4.6	8.4	9.6	8.6	6.3	8	51	55	58	76	7.1	7.3	7.3	8.9	7	9.3	7.6	7.8	
Sodium	mg/l	19	26	44	44			40.4		39		37.9		36		42.6		40.1		37.5		6		5		43.4		43.8		54		37.8
Strontium	mg/l	0.14	0.17	1	1	0.98	0.95	1	0.89	0.97	0.91	0.95	0.86	0.91	0.79	0.96	0.94	0.91	0.78	ND	0.2	0.1	ND	0.89	0.88	0.9	0.99	0.86	0.82	0.82		
Tin	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	0.1	0.1		
Titanium	mg/l	ND	ND	ND	ND	ND	ND	0.157	ND	0.013	ND	0.01	ND	0.024	ND	0.062	ND	0.04	ND	ND	ND	ND	ND	ND	ND	ND	0.032	ND	0.005	0.005	0.02	0.01
Antimony	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0004	0.0004	0.0004	0.0004	
Arsenic	mg/l	0.0051	ND	0.0057	ND	0.0013	0.0012	0.018	ND	0.0066	ND	0.0057	ND	0.0057	0.0005	0.0042	0.0007	0.09	0.077	0.06	0.04	0.001	0.0007	0.002	0.0012	0.004	0.0029	0.011	0.0005	0.0005	0.0005	
Barium	mg/l	0.046	0.0086	0.045	0.029	0.02	0.016	0.115	ND	0.018	0.016	0.02	0.05	0.018	0.012	0.041	0.009	0.04	0.021	ND	0.05	0.05	0.024	0.028	ND	0.028	0.04	0.05	0.017	0.014		
Cadmium	mg/l	ND	ND	ND	ND	0.006	0.0058	0.0078	0.0071	0.0059	0.0057	0.0126	0.012	0.0066	0.0056	0.0013	0.003	0.0025	0.138	0.136	0.19	0.175	0.0017	0.0051	0.0054	0.0142	0.0124	0.013	0.014	0.014		
Chromium	mg/l	0.041	ND	0.031	ND	ND	0.5	ND	0.1	ND	0.15	ND	0.14	ND	0.13	ND	0.07	ND	22.6	21	28.5	26.8	ND	ND	0.07	0.01	0.46	0.24	1.1	0.9		
Cobalt	mg/l	0.017	ND	0.11	0.075	0.58	0.59	0.93	0.84	0.67	0.66	1.95	1.86	0.89	0.78	0.11	0.07	0.27	0.3	14.7	14.9	18.3	17.6	0.31	0.3	0.82	0.73	1.47	1.33	1.29	1.19	
Copper	mg/l	0.82	0.0055	1.7	0.49	107	95.5	366	327	111	84.7	466	432	209	156	21.4	8.42	59	35	4440	4220	5530	4790	26.1	20.6	197	177	456	378	289	311	
Lead	mg/l	ND	ND	ND	ND	0.0001	ND	0.0097	ND	0.0054	ND	0.0114	0.0002	0.0052	ND	0.0025	ND	0.0019	ND</													

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Parameter	Units	Barrel 2 - Cleaner																														
		Aug-10		Sep-10		Oct-10		Nov-10		Dec-10		Jan-11		Feb-11		Mar-11		Apr-11		May-11		Jun-11		Jul-11		Aug-11		Sep-11		Oct-11		
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved			
Aluminum	mg/l	25.5	16.2	1140	697	763	771	8.62	5.52	1180	856	507	402	359	288	277	198	592	521	157	155	167	170	468	415	547	466	13.6	4.94	12.8	10.8	
Beryllium	mg/l	0.0052	0.0039	0.104	0.063	0.072	0.067	0.0013	0.001	0.128	0.08	0.056	0.041	0.037	0.027	0.032	0.0212	0.068	0.0424	0.0197	0.018	0.0163	0.0151	0.046	0.037	0.055	0.04	0.0017	0.001	0.0018	0.0015	
Bismuth	mg/l	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	ND	ND	0.7	ND	ND	ND	ND	1	ND	ND	ND										
Boron	mg/l	0.06	0.04	0.01	0.01	0.01	0.01	0.5	0.3	0.07	0.04	0.7	0.01	ND	ND	ND	ND	ND	ND	1.06	ND	0.17	0.07	ND	ND	ND	ND	ND	0.06	0.05	0.04	
Calcium	mg/l	128		559		568		115		520		461		459		532		382		355		244		227		250		104		101		
Hardness	Calc																															
Iron	mg/l	210	180	7230	4230	7270	7240	400	428	9370	6680	4010	3540	2710	2050	2140	1690	5280	4140	1050	1110	1660	1540	3670	3290	3410	2910	198	118	427	466	
Lithium	mg/l	0.07	0.07	0.7	0.4	0.6	0.5	0.08	0.07	0.9	0.8	0.4	0.3	0.2	ND	0.1	0.2	0.2	0.1	0.19	0.2	ND	ND	0.2	ND	ND	ND	0.07	0.07	0.06	0.06	
Magnesium	mg/l	81.9		496		658		86		796		333		254		240		445		225		176		279		280		54.6		72.6		
Mercury	mg/l	0.0002		0.0002		0.0002		0.0002		0.0002		ND																				
Potassium	mg/l	3		0.3		0.3		3.4		0.3		ND		ND		ND		ND		1.6		ND		ND		ND		2.8		2.6		
Silica	mg/l	17.3	16.3	119	103	35	229	16	18.3	140	167	64	79	70	60	66	60	90	111	83.8	94	103	122	113	156	171	24.9	16.3	14.4	16.2		
Silicon	mg/l	8	7.6	56	48.1	16	107	7.4	8.5	65	78	30	37	32.7	28	30.9	29	42	51.9	39.2	43.9	48	57	52.8	73	80	11.6	7.6	6.7	7.5		
Sodium	mg/l		41		25		17		44.5		64		21		27		49		20		69.4		42		16		22		40.5		39.2	
Strontium	mg/l	0.89	0.84	0.2	0.36	0.01	0.4	0.86	0.82	0.7	0.4	0.4	0.5	0.36	0.3	0.39	0.88	0.42	0.5	0.72	1.27	0.71	0.7	0.3	0.43	0.4	0.5	0.83	0.78	0.8	0.74	
Tin	mg/l	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	ND	ND	1	ND	ND	ND															
Titanium	mg/l	0.096	0.005	0.12	0.04	0.005	0.15	0.05	0.008	0.23	0.1	0.08	0.06	0.05	ND	ND	ND	ND	0.07	0.06	ND	0.02	ND	0.03	0.06	0.06	0.079	ND	ND	ND	ND	
Antimony	mg/l	0.0005		0.0006		0.0004		0.0004		0.0004		ND																				
Arsenic	mg/l	0.013	0.0005	0.427	0.201	0.11	0.08	0.005	0.005	0.21	0.11	0.064	0.0236	0.081	0.07	0.031	0.017	0.06	0.048	0.007	ND	0.008	0.008	0.01	0.02	ND	0.0072	0.0006	0.0017	ND		
Barium	mg/l	0.075	0.023	0.003	0.003	0.05	0.062	0.021	0.16	0.003	ND	0.11	ND	ND	0.05	0.07	ND	ND	0.05	0.07	ND	ND	ND	ND	ND	ND	0.053	0.019	0.024	0.021		
Cadmium	mg/l	0.0043	0.0042	0.032	0.041	0.042	0.002	0.004	0.064	0.041	0.029	0.018	0.021	0.017	0.021	0.0138	0.037	0.0299	0.0103	0.011	0.0105	0.0086	0.027	0.03	0.026	0.021	0.0015	0.0012	0.0021	0.0021		
Chromium	mg/l	0.29	0.01	24.2	13.3	19.1	17.8	0.06	0.01	28.1	17.9	15.6	7.2	6.8	5.3	4.5	2.99	13.3	10	3.02	2.7	4.46	4	11.5	9.2	11.2	9.9	0.19	ND	0.04	ND	
Cobalt	mg/l	0.54	0.5	11	6.5	7.4	7.7	0.56	0.57	11.9	8.3	4.8	3.8	3.39	2.8	3.06	2.29	5.8	5.3	1.6	1.73	2.07	1.9	3.5	2.98	3.3	2.8	0.2	0.14	0.41	0.38	
Copper	mg/l	81.7	99.7	1690	874	1040	1160	106	118	1800	1120	778	658	621	497	567	419	1060	892	256	284	287	291	481	429	443	384	20.5	14.6	64.7	60.5	
Lead	mg/l	0.0042		0.003		0.014		0.003		0.009	0.007	ND		ND	0.004	ND	ND	0.0015	ND	0.013	ND	0.0082	0.022	0.035	0.007	0.007	0.009	ND	ND	ND	ND	
Manganese	mg/l	1.26	1.22	22.6	14.7	13.8	13.8	0.86	1.03	22.5	20.5	14.2	7.74	6.32	5.59	5																

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Parameter	Units	Nov-11		Dec-11		Jan-12		Feb-12		Mar-12		Apr-12		May-12		Jun-12		Jul-12		Aug-12		Sep-12		Oct-12		Nov-12		Dec-12		Jan-13		
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved																							
Aluminum	mg/l	689	1.68	3.9	0.26	3.37	0.18	162	162	118	113	91.6	91.7	34.3	32.9	17.9	17.6	2.82	1.41	1380	1360	2.76	0.34	2.34	0.6	1550	1070	518	570			
Beryllium	mg/l	0.047	ND	0.0003	ND	0.0002	0.0001	0.0113	0.0119	0.009	0.009	0.008	0.0072	0.0024	0.0025	0.0018	0.0015	0.0003	0.0004	0.071	0.07	0.0001	0.00006	0.00012	0.00008	0.063	0.057	0.029	0.028			
Bismuth	mg/l	ND	0.06	ND	ND	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04			
Boron	mg/l	ND	0.06	0.06	0.06	0.05	0.07	0.05	0.06	0.03	0.01	0.19	0.07	0.06	0.04	0.04	0.05	0.04	0.05	0.01	0.01	0.05	0.06	0.06	0.05	2	0.01	0.3	0.3			
Calcium	mg/l	113	104	104	104	228	227	187	185	169	171	#N/A	130	570	570	130	130	130	130	130	130	136	136	120	120	573	573	470	470			
Hardness	Calc																													2460		
Iron	mg/l	5070	61.6	30.9	9.5	32.2	4.74	844	823	668	615	592	583	469	408	223	219	74	52.2	15300	15200	66.9	5.99	51.4	30.3	16200	13900	6270	6900			
Lithium	mg/l	0.3	0.07	0.06	0.06	0.07	0.06	0.1	0.1	0.12	0.1	0.1	0.1	0.08	0.08	0.08	0.08	0.06	0.06	0.02	0.2			0.07	0.06	0.06	0.02	0.6	0.4	0.5		
Magnesium	mg/l	55.4	43.9	43	43	105	101	101	101	76.7	75	54.1	550																	312		
Mercury	mg/l	ND	ND	ND	ND	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	
Potassium	mg/l	2.9	3.1	3	3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
Silica	mg/l	147	15.5	17	16.3	17.5	17	38	38	34	41.7	30	37	19.1	19.1	14.7	18.7	18.9	17.1	270	260	19	15.7	15.7	17.3	290	205	162	190			
Silicon	mg/l	69	7.3	8	7.6	8.2	8	17.8	17.8	15.9	19.5	14	17.3	8.9	8.9	6.9	8.7	8.8	8	126	122	8.9	7.3	7.3	8.1	136	96	76	89			
Sodium	mg/l	41.8	41.9	41.9	40.3	40.3	40.3	29	29	40.3	39	42.3	45.7	41.4	41.4	30															75	
Strontium	mg/l	0.4	0.8	0.87	0.8	0.85	0.8	0.59	0.6	0.78	0.71	0.77	0.77	0.89	0.87	0.93	0.96	0.88	0.83	0.8	0.8	0.93	0.84	0.87	0.82	0.01	0.4	0.5	0.5			
Tin	mg/l	ND	ND	ND	ND	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Titanium	mg/l	0.1	ND	0.032	ND	0.042	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Antimony	mg/l	ND	ND	ND	ND	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	
Arsenic	mg/l	0.093	ND	0.0076	ND	0.0065	0.0005	0.01	0.011	0.01	0.009	0.003	0.0005	0.01	0.003	0.005	0.005	0.005	0.005	0.3	0.32			0.02	0.0005	0.0069	0.0005	2.73	2.39	0.63	0.697	
Barium	mg/l	0.019	0.035	0.015	0.036	0.015	0.003	0.003	0.003	0.003	0.003	0.003	0.005	0.014	0.01	0.015	0.016	0.012	0.003	0.003			0.043	0.01	0.028	0.007	0.003	0.003	0.003	0.003	0.003	0.003
Cadmium	mg/l	0.0201	ND	0.0002	0.0002	0.0002	0.0002	0.0053	0.0061	0.0041	0.0045	0.0048	0.0044	0.0016	0.0017	0.001	0.0008	0.0003	0.021	0.02			0.0001	0.0001	0.0002	0.0023	0.02	0.008				
Chromium	mg/l	12.6	ND	0.08	ND	0.09	0.01	2.39	2.34	1.56	1.47	1.05	1.04	0.24	0.11	0.08	0.04	0.02	0.01	33.2	32.7			0.14	0.01	0.02	0.01	38	36.7	17.5	19.6	
Cobalt	mg/l	4.7	0.13	0.03	0.02	0.03	0.02	0.02	0.05	0.02	0.05	0.02	0.02	0.05	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Copper	mg/l	512	4.8	2.52	0.8	1.93	0.5	113	112	86	80	80.7	81.2	50.3	51.3	32.9	34.1	6.74	5.25	895	886	1.75	0.54	2.18	1.81	808	726	362	404			
Lead	mg/l	ND	0.014</td																													

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

Parameter	Units	Barrel 3 - Cleaner											
		Feb-10		Mar-10		Apr-11		Aug-11		Dec-11		Jan-12	
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Aluminum	mg/l	643	701	472	481	3160		2790	2720	2320			
Beryllium	mg/l	0.134	0.152	0.083	0.073	0.462		0.304	0.321	0.269			
Bismuth	mg/l	ND	ND	ND	ND	ND		ND	3	0.9			
Boron	mg/l	ND	ND	ND	ND	3.5		ND	ND	0.01			
Calcium	mg/l	ND	631	ND	303				680				
Hardness	Calc												
Iron	mg/l	1400	1580	764	783	16700		15000	12600	13100			
Lithium	mg/l	ND	0.3	0.2	0.2	1.5		ND	ND	0.9			
Magnesium	mg/l		792		527				2120				
Mercury	mg/l	ND	ND	ND	ND	ND		ND	ND	0.0002			
Potassium	mg/l	ND	13	ND	2				ND				
Silica	mg/l	60	83	53	72	154		230	250	125			
Silicon	mg/l	28	39	24.8	33.7	72		108	117	58			
Sodium	mg/l		7		ND				ND				
Strontium	mg/l	0.8	0.9	0.16	0.3	ND		ND	ND	0.1			
Tin	mg/l	ND	ND	ND	ND	ND		ND	ND	0.1			
Titanium	mg/l	ND	ND	0.04	ND	0.3		0.5	0.4	0.17			
Antimony	mg/l	ND	ND	ND	ND	ND		ND	ND	0.0004			
Arsenic	mg/l	0.01	0.006	0.008	ND	3.46		1.88	1.08	1.1			
Barium	mg/l	ND	ND	0.03	ND	0.15		0.4	ND	0.003			
Cadmium	mg/l	0.084	0.0849	0.042	0.041	0.159		0.158	0.175	0.13			
Chromium	mg/l	2.4	2.1	1.71	1.74	31.4		22	21.6	19.2			
Cobalt	mg/l	8.6	9.6	5.77	5.75	31		27	26	16.8			
Copper	mg/l	2170	2510	1550	1480	5600		5220	5370	3800			
Lead	mg/l	0.013	0.0156	0.0105	0.005	ND		0.006	0.007	0.0001			
Manganese	mg/l	34.8	38.5	19.9	20.1	70.9		62.5	64.1	39.6			
Molybdenum	mg/l	ND	0.7	0.05	ND	0.5		ND	ND	0.01			
Nickel	mg/l	16.5	18.6	11.1	11.4	46.5		44	44.9	29.1			
Selenium	mg/l	0.39	0.366	0.166	0.128	1.36		1	0.427	0.314			
Silver	mg/l	ND	ND	0.09	ND	ND		ND	ND	0.01			
Thallium	mg/l	ND	ND	ND	ND	ND		ND	ND	0.0001			
Uranium	mg/l	0.132	0.175	0.0795	0.075	0.669		0.447	0.431	0.287			
Vanadium	mg/l	0.2	0.19	0.4	0.32	3.2		4.1	5.7	5.9			
Zinc	mg/l	13.2	13.2	7.17	6.78	29.3		29	29.1	17.9			
Acidity	mg/l	10000		6380				53000			51100		
Alkalinity as CaCO3	mg/l	ND		ND				ND			#N/A		
Chloride	mg/l	20		20				ND			#N/A		
Fluoride	mg/l	230		340				640			560		
Orthophosphate - P	mg/l												
Sulfate	mg/l	12000		14400				51000			47000		
Total Dissolved Solids	mg/l	20700		27100				110000			97800		
Lab pH	pH units	3.3		3.1				1.9			2.3		
Phosphorus	mg/l	0.88		0.99				151		140		150	
<b>FIELD PARAMETERS</b>													
Field pH	pH units	3.21		3.27		1.99		1.86		2.13		2.25	
Temperature	Celsius	9.6		12		23		28.1		2.9		8.6	
Conductivity	µs/cm	9280		8530		13770		26900			15030		

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

Barrel 4 - Scavenger			
Parameter	Units	Feb-10	
		Total	Dissolved
Aluminum	mg/l	0.09	ND
Beryllium	mg/l	ND	ND
Bismuth	mg/l	ND	0.11
Boron	mg/l	0.03	0.01
Calcium	mg/l	ND	394
Hardness	Calc		
Iron	mg/l	0.22	0.08
Lithium	mg/l	ND	ND
Magnesium	mg/l		30.4
Mercury	mg/l	ND	ND
Potassium	mg/l	ND	14.7
Silica	mg/l	9.1	10.3
Silicon	mg/l	4.2	4.8
Sodium	mg/l		78.3
Strontium	mg/l	1.96	2.03
Tin	mg/l	ND	ND
Titanium	mg/l	ND	ND
Antimony	mg/l	ND	0.0004
Arsenic	mg/l	0.0017	0.0026
Barium	mg/l	0.105	0.11
Cadmium	mg/l	ND	ND
Chromium	mg/l	ND	ND
Cobalt	mg/l	ND	ND
Copper	mg/l	0.07	0.12
Lead	mg/l	ND	ND
Manganese	mg/l	0.07	0.087
Molybdenum	mg/l	0.66	0.71
Nickel	mg/l	ND	ND
Selenium	mg/l	0.0235	0.0246
Silver	mg/l	ND	0.02
Thallium	mg/l	0.0001	ND
Uranium	mg/l	0.0059	0.0065
Vanadium	mg/l	0.01	ND
Zinc	mg/l	0.12	0.14
Acidity	mg/l	ND	
Alkalinity as CaCO <sub>3</sub>	mg/l	27	
Chloride	mg/l	53	
Fluoride	mg/l	2.1	
Orthophosphate - P	mg/l	0	
Sulfate	mg/l	1000	
Total Dissolved Solids	mg/l	1770	
Lab pH	pH units	7.4	
Phosphorus	mg/l	0.02	
<b>FIELD PARAMETERS</b>			
Field pH	pH units	5.62	
Temperature	Celsius	9.9	
Conductivity	µs/cm	1808	

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Barrel 5 - Scavenger																																	
Parameter	Units	May-09		Jun-09		Jul-09		Aug-09		Sep-09		Oct-09		Nov-09		Dec-09		Jan-10		Feb-10		Mar-10		Apr-10		May-10		Jun-10		Jul-10		Aug-10	
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved																
Aluminum	mg/l	0.8	ND	0.27	ND	0.18	ND	0.21	ND	0.63	ND	3.92	ND	6.17	ND	13.3	ND	0.09	ND	14.6	0.08	1.57	ND	3.44	1.62	1.09	0.16	0.13	14.4	0.03			
Beryllium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	0.0005	ND	ND	ND	0.0002	ND	0.0004	ND	ND	ND	ND	0.0009	ND	0.0001	ND	0.0001	0.0003	0.0001	0.0001	0.0006	0.0001			
Bismuth	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	ND	ND	ND	0.04	0.04	0.04	0.04															
Boron	mg/l	ND	ND	ND	ND	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.07	0.06	0.04	0.05	0.06	0.05	0.08	0.06	0.05	0.06	0.06	0.06	0.06	0.04	0.04	0.04	0.04	0.04			
Calcium	mg/l	280	290	150	150	143	141	154	154	118	114	121	121	118	ND	319	108	119	113	119	113	121	121	121	121	121	121	121	121	121	121		
Hardness	Calc	960	1000	570	570																												
Iron	mg/l	1.3	ND	0.22	ND	0.2	ND	0.21	ND	0.51	ND	3.81	0.02	1.9	0.03	3.1	ND	5.71	0.05	0.59	ND	8.76	0.1	1.09	ND	1.46	18.3	1.05	0.23	2.5	0.12	8.86	0.1
Lithium	mg/l	ND	ND	ND	ND	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05			
Magnesium	mg/l	64	66	45	44	47.7	48.3	55.2	50.8	52.9	53.8	51.3	51.3	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8	50.8		
Mercury	mg/l	ND	ND	ND	ND	0.0002	0.0003	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	0.0002	0.0002	0.0002				
Potassium	mg/l	11	10	4.4	4.1	5.4	5.9	4.8	9	12.1	12.1	3.5	10.8	ND	36.9	3.4	4.2	4.1	5	8	5	8	5	8	5	8	5	8	5	8			
Silica	mg/l	32	31	20	19	22.4	20.6	19.8	19.2	18.2	19.6	25.5	20.5	32	19.6	37	20.1	10.2	10.7	46.9	18.7	21.4	19	26.5	20.4	25.2	19.2	25.8	18.4	47.4	18.1		
Silicon	mg/l	15	15	9.4	9.1	10.5	9.6	9.2	8.9	8.5	9.1	11.9	12	9.5	15	9.1	17.3	9.4	4.7	5	21.9	8.7	10	8.8	12.4	9.5	11.8	8.9	12.1	8.6	22.2	8.4	
Sodium	mg/l	58	59	39	38	41.2	39.1	39.9	39.1	45.2	53.6	39.7	53.6	88.8	41.3	42.9	41.3	42.9	44.8	41.5	44.2	41.5	44.2	41.5	44.2	41.5	44.2	41.5	44.2	41.5	44.2		
Strontium	mg/l	1.2	1.2	1.1	1.1	1.14	1.11	1.1	1.04	1.09	1.1	1.03	0.9	0.9	0.82	1.11	1.17	0.8	1.64	1.69	1.08	0.93	0.97	1.02	0.9	0.96	0.89	1.04	0.99	1.13	0.97		
Tin	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND															
Titanium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND															
Antimony	mg/l	ND	ND	ND	ND	0.0006	0.0006	ND	ND	0.0007	ND	ND	ND	ND	ND	ND	0.0005	0.0006	ND	ND	ND	ND	0.0004	0.0004	ND	ND	0.0004	0.0004	0.0004	0.0007			
Arsenic	mg/l	ND	0.0079	0.0066	0.007	0.0061	0.0065	0.0069	0.0069	0.0057	0.0058	0.0052	0.0081	0.0071	0.0093	0.0063	0.0011	0.0016	0.0112	0.0051	0.0064	0.0065	0.0068	0.0018	0.0018	0.0062	0.0015	0.0062	0.0046	0.014	0.0067		
Barium	mg/l	0.081	0.064	0.037	0.033	0.03	0.027	0.035	0.027	0.08	0.02	0.048	0.01	0.102	0.021	0.166	0.013	0.05	0.052	0.278	0.081	0.06	0.037	0.044	0.026	0.046	0.021	0.059	0.018	0.268	0.029		
Cadmium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND															
Chromium	mg/l	0.0067	ND	ND	ND	ND	ND	ND	ND	0.01	ND	ND	0.03	ND	0.02	ND	ND	0.07	ND	ND	ND	0.11	ND	ND	ND	0.03	ND	0.01	0.01	0.1	0.1		
Cobalt	mg/l	0.0075	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND															
Copper	mg/l	0.11	0.02	0.056	0.035	0.04	0.03	0.09	0.05	0.08	0.02	0.68	0.04	0.37	0.07	0.37	0.03	0.68	0.05	0.04	0.04	1.78	0.26	0.19	0.05	0.25	22.1	0.16	0.41	0.33	0.16	0.97	
Lead	mg/l	ND	ND	ND	ND	0.0005	ND	0.0008	ND	0.018	ND	0.0122	ND	0.0003	ND	0.0152</td																	

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

		Barrel 5 - Scavenger																											
Parameter	Units	Sep-10		Oct-10		Nov-10		Dec-10		Jan-11		Feb-11		Mar-11		Apr-11		May-11		Jun-11		Jul-11		Aug-11		Sep-11		Oct-11	
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved		
Aluminum	mg/l	2.39	0.03	2.39	0.16	2.63	0.03	2.2	0.03	14.7	ND	4.85	ND	0.53	ND	1.43	ND	ND	0.6	5.02	ND	1.17	ND	5.5	ND	7.68	ND	1.85	
Beryllium	mg/l	0.0001	0.0001	0.0003	0.0001	0.0001	0.0001	0.0002	0.0001	0.0004	ND	0.0002	ND	0.0005	ND	ND	0.0001	0.0002	ND	ND	0.0002	ND	0.0003	ND	ND	ND	ND		
Bismuth	mg/l	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	ND	ND																		
Boron	mg/l	0.06	0.05	0.05	0.06	0.06	0.06	0.07	0.05	0.05	0.06	0.06	0.05	0.05	0.04	0.06	0.04	0.06	0.05	0.06	0.06	0.07	0.06	0.07	0.06	0.06	0.06	0.06	
Calcium	mg/l	109		113		110		106		109		117		113		114		110		110		109		104		104		1	
Hardness	Calc																												
Iron	mg/l	1.31	0.04	2.56	1.42	2.11	0.15	2	0.02	6.93	0.04	4.2	ND	1.22	ND	3.14	ND	0.06	1.62	2.72	ND	1.5	0.1	3.53	ND	3.8	ND	2.18	
Lithium	mg/l	0.06	0.05	0.06	0.06	0.07	0.06	0.07	0.06	0.08	0.06	0.07	0.05	0.06	0.06	0.07	0.06	0.06	0.05	0.07	0.06	0.06	0.08	0.06	0.06	0.06	0.07		
Magnesium	mg/l	45.3		42		74.2		44.2		46.4		49.3		48		53		45.8		50		45.3		45.2		40		50	
Mercury	mg/l	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	ND	ND																		
Potassium	mg/l			4.2		3.6		11.5		4.6		4.7		5		5.1		5.2		4.7		5.3		4.3		3.2		4.4	
Silica	mg/l	23	19.5	18.7	18.5	29.1	21.1	24.3	18.9	64.6	19.3	32.4	19.6	19.2	19.4	19.5	19.7	18	20.4	35.6	19.4	34.8	19.4	31.6	18.9	45.3	18.3	21.3	
Silicon	mg/l	10.8	9.1	8.7	8.6	13.6	9.8	11.4	8.8	30.2	9	15.1	9.1	8.9	9	9.1	9.2	8.4	9.5	16.6	9	16.3	9	14.8	8.8	21.2	8.5	9.9	
Sodium	mg/l			47.3		44.2		83.1		49.8		50.5		49.5		50		52.7		47.7		52.9		48.5		41.5		50	
Strontium	mg/l	0.99	1.02	0.98	0.93	0.97	0.88	0.94	0.9	1.08	0.9	0.99	0.92	0.92	0.91	0.96	0.88	0.89	0.99	0.89	0.94	1	0.89	1	0.89	0.93	0.0		
Tin	mg/l	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	ND	ND																		
Titanium	mg/l	0.068	0.005	0.073	0.005	0.159	0.005	0.069	0.005	0.47	ND	0.191	ND	0.015	ND	0.021	ND	ND	0.011	0.162	ND	0.146	ND	0.201	ND	0.24	ND	0.041	
Antimony	mg/l	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	ND	ND																		
Arsenic	mg/l	0.0077	0.0073	0.0092	0.0075	0.0065	0.0048	0.0079	0.0073	0.013	0.008	0.0108	0.0076	0.0082	0.0069	0.0111	0.0069	0.0068	0.0089	0.0088	0.0068	0.007	0.0065	0.0085	0.0058	0.0104	0.0071	0.0097	
Barium	mg/l	0.057	0.028	0.081	0.034	0.092	0.014	0.08	0.019	0.145	0.019	0.11	0.01	0.042	0.026	0.057	0.018	0.022	0.046	0.088	0.021	0.05	0.021	0.118	0.015	0.126	0.015	0.043	
Cadmium	mg/l	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	ND	ND	ND	ND	0.0002	ND	ND	0.0001	ND	ND	ND	0.0001	ND	ND	ND	ND	ND	ND	
Chromium	mg/l	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.06	ND	0.05	ND	0.03	ND	ND	0.03	ND	ND	0.03	ND	0.03	ND	0.03	ND	0.04	ND	ND	
Cobalt	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	ND	ND																	
Copper	mg/l	0.19	0.01	0.4	0.22	0.28	0.09	0.28	0.01	0.85	0.05	0.62	0.03	0.32	0.04	0.79	0.04	0.4	0.43	0.39	0.03	0.22	0.03	0.48	0.01	0.53	ND	0.19	
Lead	mg/l	0.0035	0.0001	0.0046	0.0001	0.0031	0.0001	0.0182	0.0001	0.0055	ND	0.0057	ND	0.003	ND	0.01	ND	ND	0.0031	0.0048	0.0003	0.0024	0.0005	0.0055	0.0002	0.0143	ND	0.0018	
Manganese	mg/l	0.005	0.006	0.027	0.005	0.023	0.005	0.019	0.005	0.06	0.007	0.035	ND	0.009	ND	0.057	ND	ND	0.021	0.025	ND	0.011	0.036	ND	0.032	ND	0.012		
Molybdenum	mg/l	0.06	0.06	0.04	0.04	0.84	0.81	0.11	0.1	0.16	0.13	0.12	0.11	0.11	0.19	0.08	0.06	0.23	0.24	0.13	0.12	0.17	0.15	0.05	0.04	0.2	0.06		
Nickel	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.04	ND	ND	0.02	ND	ND	ND												
Selenium	mg/l	0.0006	0.0005	0.0007	0.0001	0.0049	0.0054	0.0011	0.0011	0.0015	0.0012	0.0016	0.0012	0.0013	0.0021	0.0018	0.0012	0.0013	0.0021	0.0022	0.0011	0.0012	0.0015	0.0009	0.0009	0.0017	0.0001		
Silver	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	ND																		
Thallium	mg/l	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	ND	ND																		
Uranium	mg/l	0.0102	0.0108	0.0128	0.0106	0.0062	0.0058	0.0105	0.0097	0.0107	0.0097	0.0082	0.0066	0.0097	0.0093	0.0104	0.0079	0.0086	0.0098	0.0085	0.0089	0.0094	0.009	0.0078	0.0104	0.0085	0.0118		
Vanadium	mg/l	0.012	0.012	0.014	0.007	0.02	0.005	0.019	0.006	0.06	0.006	0.028	0.005	ND	ND	0.007	ND	0.018	ND	0.016	ND	0.018	ND	0.023	ND	0.008			
Zinc	mg/l	0.05	0.01	0.11	0.03	0.08	0.02	0.13	0.08	0.22	0.09	0.17	0.06	0.18	0.12	0.16	0.07	0.08	0.15	0.07	ND	0.1	0.04	0.07	ND	0.13	0		
Acidity	mg/l	10		10		10		ND																					
Alkalinity as CaCO3	mg/l	230		227		247		235		209		244		236		228		223		221		218		212		230			
Chloride	mg/l	33		33		59		35		37		30		38		41		35		41		37		38		33		39	
Fluoride	mg/l	0.5		0.4		1		0.4		0.6		0.5		0.3		0.5		0.5		0.6		0.5		0.5		0.5		0.5	
Orthophosphate - P	mg/l																												
Sulfate	mg/l	230		260		400		230		250		240		270		240		290		250		260		230		280			
Total Dissolved Solids	mg/l	670		660		940		710		650		660		730		670		760		680		690		610		730			
Lab pH	pH units	8.3		8.2		8.2		8.3		8.2		8.3		8.4		8.3		8.2		8.2		8.1		8.2		8.3		8.3	
Phosphorus	mg/l	0.05		0.27		0.15		0.15		0.55		0.54		0.25		0.17		1.7		0.18		0.1		0.38		0.36		0.14	
<b>FIELD PARAMETERS</b>		pH units	8.44		8.09		6.97		8.1		8.06		8.1		7.81		7.9		7.89		6.42		7.76		7.65		6.53		6.95
Temperature	Celsius	28.7		22.4		16.4		13		15.7		7.7		22.5		23.2		22.4		34		30.9		31.2		25.3		24	
Conductivity	µS/cm	950		968		972		1043		976		1059		965		1040		928		1021		1010		1043		900		1081	

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Parameter	Units	Barrel 5 - Scavenger																													
		Nov-11		Dec-11		Jan-12		Feb-12		Mar-12		Apr-12		May-12		Jun-12		Jul-12		Aug-12		Sep-12		Oct-12		Nov-12		Dec-12		Jan-13	
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved		
Aluminum	mg/l	8.91	ND	4.79	0.03	9.55	0.06	0.14	0.03	0.04	0.05	ND	0.07	0.03	0.05	0.05	0.03	0.09	0.07	8.29	0.03	4.52	0.07	0.03	0.07	2.85	0.03				
Beryllium	mg/l	0.0005	ND	0.0003	0.0001	0.0005	0.021	0.0001	0.0001	0.0001	0.0001	ND	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			
Bismuth	mg/l	ND	0.05	0.04	0.05	0.04	0.04	0.04	0.04	0.04	0.04	ND	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04			
Boron	mg/l	0.06	0.07	0.06	0.07	0.06	0.05	0.06	0.07	0.06	0.05	ND	ND	0.14	0.12	0.12	0.14	0.15	0.05	0.05	0.06	0.06	0.07	0.05	#N/A	0.05	0.15	0.07			
Calcium	mg/l	118		118		104		236		229		ND	ND	160		149		128		166		112		106		106		70.6			
Hardness	Calc										ND	ND																			
Iron	mg/l	6.7	0.03	3.15	0.03	4.74	0.04	0.69	0.05	0.76	0.08	ND	ND	0.63	0.07	0.21	0.06	0.13	0.02	0.7	0.16	12.8	0.02	3.84	0.06	1.27	0.06	7.81	0.1		
Lithium	mg/l	0.06	0.07	0.06	0.07	0.07	0.06	0.08	0.08	0.06	0.09	ND	ND	0.09	0.09	0.11	0.11	0.1	0.09	0.1	0.07	0.06	0.06	0.09	0.06	0.07	0.07	0.07			
Magnesium	mg/l	52.1		52.1		40.7		84.4		49.8		ND	ND	65.4		85.6		0.2		105		44.4		43.2		43.2		59.8			
Mercury	mg/l	ND		0.0002		0.0002		0.0002		0.0002		ND	ND	0.0002		0.0002		0.0002		0.0002		0.0002		0.0002		0.0002		0.0002			
Potassium	mg/l	4.9		4.9		3.3		27.1		22.4		ND	ND	17.9		18.5		15.2		14.4		3.5		3.6		3.6		5			
Silica	mg/l	36.6	18.8	28.2	18.8	43.1	19.4	13.3	12.9	9.1	11.3	ND	ND	12.8	15	14.1	17.8	14.7	15.8	7.5	12.5	43	19.8	25.6	19.4	12.3	14.2	8.8			
Silicon	mg/l	17.1	8.8	13.2	8.8	20.1	9.1	6.2	6	4.3	5.3	ND	ND	6	7	6.6	8.3	6.9	7.4	3.5	5.8	20.1	9.3	12	9.1	5.8	9.1	6.6	4.1		
Sodium	mg/l	52.7		52.7		40.8		72.7		86.2		ND	ND	103		123		102		150		43.2		42.5		42.5		56.5			
Strontium	mg/l	1.05	0.91	0.97	0.91	1.02	0.87	1.34	1.34	1.15	1.11	ND	ND	1.16	1.13	1.28	1.3	1.32	1.27	1.34	1.5	1.12	0.93	1.06	0.96	1.47	0.96	1.01	1.07		
Tin	mg/l	ND	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	ND	ND	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Titanium	mg/l	0.271	ND	0.096	0.005	0.27	0.005	0.01	0.006	0.005	0.005	ND	ND	0.008	0.005	0.005	0.006	0.005	0.005	0.006	0.006	0.121	0.005	0.103	0.005	0.006	0.005	0.051	0.005		
Antimony	mg/l	ND	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	ND	ND	0.0007	0.0006	0.0007	0.0007	0.0007	0.0006	0.0006	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004			
Arsenic	mg/l	0.013	0.006	0.0113	0.006	0.0133	0.0069	0.007	0.005	0.0007	0.0005	ND	ND	0.001	0.0008	0.0019	0.0012	0.0013	0.0017	0.0015	0.0015	0.0012	0.028	0.0074	0.0131	0.0089	0.0013	0.0089	0.0024	0.0008	
Barium	mg/l	0.177	0.016	0.066	0.016	0.132	0.021	0.036	0.034	0.033	0.03	ND	ND	0.053	0.054	0.051	0.052	0.064	0.063	0.064	0.064	0.133	0.024	0.108	0.05	0.049	0.05	0.082	0.029		
Cadmium	mg/l	0.0002	ND	0.0001	0.0001	0.0002	0.0001	0.0008	0.0009	0.0006	0.0007	ND	ND	0.0003	0.0004	0.0001	0.0002	0.0002	0.0005	0.0003	0.0001	0.0001	0.0002	0.0001	0.0004	0.0001	0.0001	0.0001			
Chromium	mg/l	0.07	ND	0.03	0.01	0.06	0.01	0.01	0.01	0.01	0.01	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.09	0.01	0.02	0.01	0.01	0.01	0.01	0.01			
Cobalt	mg/l	ND	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			
Copper	mg/l	0.84	0.05	0.62	0.05	0.9	0.04	0.34	0.2	0.16	0.14	ND	ND	0.06	0.09	0.03	0.03	0.02	0.05	0.05	3.06	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Lead	mg/l	0.0109	ND	0.0048	0.0001	0.0117	0.0001	0.0003	0.0001	0.0001	0.0001	ND	ND	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.04										

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Barrel 6 - Scavenger					
Parameter	Units	Feb-10		Apr-10	
		Total	Dissolved	Total	Dissolved
Aluminum	mg/l	0.31	ND	ND	
Beryllium	mg/l	ND	ND	ND	
Bismuth	mg/l	ND	ND	ND	
Boron	mg/l	0.03	0.01	0.04	
Calcium	mg/l	302		705	
Hardness	Calc				
Iron	mg/l	0.87	ND	0.2	
Lithium	mg/l	ND	ND	0.04	
Magnesium	mg/l		17.3		53
Mercury	mg/l	ND	ND	ND	
Potassium	mg/l	ND	10.3	19.6	
Silica	mg/l	11	10.9		17.7
Silicon	mg/l	5.1	5.1		8.2
Sodium	mg/l		19.6		113
Strontium	mg/l	1.67	1.64	4.19	
Tin	mg/l	ND	ND	ND	
Titanium	mg/l	ND	0.006	0.009	
Antimony	mg/l	ND	ND	0.0007	
Arsenic	mg/l	0.0021	0.0026	0.0083	
Barium	mg/l	0.105	0.102	0.047	
Cadmium	mg/l	ND	ND	0.0002	
Chromium	mg/l	ND	ND	ND	
Cobalt	mg/l	ND	ND	ND	
Copper	mg/l	0.03	0.02	0.02	
Lead	mg/l	0.0005	ND	0.0013	
Manganese	mg/l	0.05	0.069	0.026	
Molybdenum	mg/l	0.21	0.23	0.72	
Nickel	mg/l	ND	ND	ND	
Selenium	mg/l	0.0056	0.0064	0.085	
Silver	mg/l	ND	0.01	ND	
Thallium	mg/l	ND	ND	ND	
Uranium	mg/l	0.0042	0.0045	0.0113	
Vanadium	mg/l	0.02	ND	0.02	
Zinc	mg/l	0.19	0.22	0.11	
Acidity	mg/l	ND			
Alkalinity as CaCO <sub>3</sub>	mg/l	20			
Chloride	mg/l	7			
Fluoride	mg/l	1.6			
Orthophosphate - P	mg/l	0			
Sulfate	mg/l	720			
Total Dissolved Solids	mg/l	1200			
Lab pH	pH units	7.6			
Phosphorus	mg/l	0.02			
<b>FIELD PARAMETERS</b>					
Field pH	pH units	8		7.74	
Temperature	Celsius	12.1		23.8	
Conductivity	µs/cm	1344		3450	

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Barrel 7 - Whole tailings																	
Parameter	Units	Feb-10		Jan-11		Apr-11		Aug-11		Sep-11		Nov-11		Dec-11		Apr-12	
		Total	Dissolved														
Aluminum	mg/l	613	651	1300	715	1060	1120	884	882	1200	851	1470	1290	1060	337	ND	
Beryllium	mg/l	0.106	0.142	0.232	0.118	0.196	0.143	0.117	0.101	0.1298	0.124	0.132	0.13	0.14	0.037	ND	
Bismuth	mg/l	ND	ND	ND	ND	ND	ND	0.5	ND	ND	ND	1.8	0.04	ND	0.04	ND	
Boron	mg/l	ND	ND	ND	ND	0.58	ND	0.2	ND	ND	ND	ND	ND	0.01	0.01	ND	
Calcium	mg/l	ND	662		280		521		427		316		475		179	ND	
Hardness Calc																ND	
Iron	mg/l	577	478	2680	1310	2610	2410	2790	2030	2310	1590	2850	2860	2070	668	ND	
Lithium	mg/l	ND	0.2	0.5	0.3	0.4	0.4	0.3	0.3	ND	0.3	ND	0.7	0.4	0.1	ND	
Magnesium	mg/l		448		596		1060		806		700		1310		274	ND	
Mercury	mg/l	ND	ND	0.0002	0.0002	ND											
Potassium	mg/l	ND	11		ND			ND									
Silica	mg/l	56	57	96	78	13	129	87	147	216	241	241	238	71	47	ND	
Silicon	mg/l	26	27	45	37	6	60	41	69	101	113	113	111	33.2	22	ND	
Sodium	mg/l		6		ND		4		ND		2		ND			ND	
Strontium	mg/l	0.5	0.5	0.2	ND	0.08	0.1	ND	0.1	ND	0.09	ND	0.3	0.05	0.06	ND	
Tin	mg/l	ND	ND	0.1	0.1	ND											
Titanium	mg/l	ND	ND	0.22	0.06	0.1	0.1	0.06	0.05	ND	0.05	0.2	0.2	0.03	0.005	ND	
Antimony	mg/l	ND	ND	0.0004	0.0004	ND											
Arsenic	mg/l	0.006	0.011	0.088	0.043	0.11	0.1	0.14	0.05	0.078	0.09	0.116	0.12	0.17	0.016	ND	
Barium	mg/l	0.06	0.04	ND	ND	0.02	ND	0.05	ND	ND	ND	ND	ND	0.003	ND		
Cadmium	mg/l	0.091	0.095	0.07	0.035	0.059	0.054	0.068	0.055	0.0639	0.066	0.0608	0.069	0.068	0.017	ND	
Chromium	mg/l	1.1	ND	6.1	2.8	6.17	5.1	5.5	4.8	6.6	4.62	8.2	8.9	5.84	1.91	ND	
Cobalt	mg/l	5.9	5	11	5.6	8.6	8.8	7.2	6.5	7.5	5.16	9.4	9.8	5.98	1.87	ND	
Copper	mg/l	1560	1350	1750	888	1310	1290	915	879	948	1000	1000	1050	1150	219	ND	
Lead	mg/l	0.007	0.004	0.008	ND	ND	0.005	0.018	ND	ND	ND	ND	ND	0.0001	0.0001	ND	
Manganese	mg/l	26.8	29.5	34.8	16.2	22.3	23.5	17.1	17.2	20.1	13.8	22.7	20.3	15.6	5.17	ND	
Molybdenum	mg/l	ND	ND	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	0.01	ND	
Nickel	mg/l	10.3	11	14.5	6.7	9.51	12	9.3	8.5	10.3	7.14	13.2	10.4	8.16	2.53	ND	
Selenium	mg/l	0.126	0.118	0.06	0.027	0.049	0.039	0.074	0.031	0.0374	0.037	0.0543	0.047	0.049	0.013	ND	
Silver	mg/l	ND	ND	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.2	0.01	ND	
Thallium	mg/l	ND	ND	ND	ND	0.002	ND	ND	ND	ND	ND	ND	ND	0.0001	0.0001	ND	
Uranium	mg/l	0.126	0.149	0.364	0.17	0.263	0.231	0.206	0.181	0.1797	0.174	0.1973	0.203	0.196	0.044	ND	
Vanadium	mg/l	ND	ND	0.35	0.15	0.072	0.8	1.64	0.27	0.8	0.55	0.9	0.8	1.14	0.12	ND	
Zinc	mg/l	16.6	17.9	15.5	7.7	9.73	10.9	9.1	8.4	10	6.67	11.4	11.5	7.53	2.41	ND	
Acidity	mg/l	6520		11800		680		17600		15100		9080			10300	ND	
Alkalinity as C	mg/l	ND			2	ND											
Chloride	mg/l	ND			5	ND											
Fluoride	mg/l	390		190		1		310		380		310			110	ND	
Orthophosphia	mg/l														0	ND	
Sulfate	mg/l	8200		8800		13700		15600		17000		12900			4600	ND	
Total Dissolve	mg/l	15200		16200		29400		28700		31100		24400			8490	ND	
Lab pH	pH units	3.7		2.3		2.7		2.2		2.2		2.4			2.3	ND	
Phosphorus	mg/l														26		
<b>FIELD PARAMETERS</b>																	
Field pH	pH units	3.93		2.64		2.85		2.1		2.16		2.53		2.26		2.25	ND
Temperature	Celsius	11.8		12.1		17.2		33.1		24.9		13		3		32.1	ND
Conductivity	µs/cm	7080		7060		1527		11070		12320		13750		14760		9650	ND

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

Barrel 8 - Cyclone			
Parameter	Units	Feb-10	
		Total	Dissolved
Aluminum	mg/l	4.65	ND
Beryllium	mg/l	0.0002	ND
Bismuth	mg/l	0.06	ND
Boron	mg/l	0.01	ND
Calcium	mg/l	ND	62
Hardness	Calc		
Iron	mg/l	27.9	0.03
Lithium	mg/l	ND	ND
Magnesium	mg/l		4.4
Mercury	mg/l	ND	ND
Potassium	mg/l	ND	3.2
Silica	mg/l	17.3	6.9
Silicon	mg/l	8	3.2
Sodium	mg/l		20.2
Strontium	mg/l	0.42	0.39
Tin	mg/l	ND	ND
Titanium	mg/l	0.082	ND
Antimony	mg/l	ND	ND
Arsenic	mg/l	0.0031	0.003
Barium	mg/l	0.075	0.024
Cadmium	mg/l	ND	ND
Chromium	mg/l	ND	ND
Cobalt	mg/l	ND	ND
Copper	mg/l	0.55	0.14
Lead	mg/l	0.0073	ND
Manganese	mg/l	0.132	0.069
Molybdenum	mg/l	0.08	0.06
Nickel	mg/l	ND	ND
Selenium	mg/l	0.0033	0.0034
Silver	mg/l	ND	ND
Thallium	mg/l	ND	ND
Uranium	mg/l	0.0033	0.0015
Vanadium	mg/l	0.008	ND
Zinc	mg/l	0.7	0.03
Acidity	mg/l	ND	
Alkalinity as C	mg/l	15	
Chloride	mg/l	13	
Fluoride	mg/l	2	
Orthophosphorus	mg/l	0	
Sulfate	mg/l	157	
Total Dissolve	mg/l	300	
Lab pH	pH units	7.3	
Phosphorus	mg/l	0.16	
<b>FIELD PARAMETERS</b>			
Field pH	pH units	6.63	
Temperature	Celsius	12.9	
Conductivity	µs/cm	448	

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

Parameter	Units	Barrel 9 - Cyclone																																										
		May-09			Jun-09			Jul-09			Aug-09			Sep-09			Oct-09			Nov-09			Dec-09			Jan-10			Feb-10			Mar-10												
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total																
Aluminum	mg/l	1.4	ND	ND	ND	0.05	ND	0.08	ND	ND	ND	ND	0.08	ND	0.07	0.4	ND	1.69	ND	1.61	ND	1.58	0.07	ND	ND	ND	ND	ND	ND															
Beryllium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	ND	ND	ND	ND																								
Bismuth	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.06	0.04	ND	ND	ND	ND	ND	ND	ND														
Boron	mg/l	ND	ND	ND	ND	0.13	0.11	0.12	0.14	0.13	0.13	0.13	0.13	0.09	0.08	0.03	0.03	0.09	0.09	0.07	0.07	0.06	0.03	0.04	ND	ND	ND	ND	ND	ND	ND	ND												
Calcium	mg/l	62	62	330	290	310	343	348	220	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163	163														
Hardness	Calc	180	180	1000	900																																							
Holon	mg/l	0.98	ND	ND	ND	0.03	ND	0.04	ND	0.1	ND	ND	ND	0.24	0.19	0.23	ND	2.05	ND	4.81	ND	2.01	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Lithium	mg/l	ND	ND	ND	ND	0.1	0.08	0.11	0.11	0.16	0.14	0.18	0.15	0.1	0.11	0.03	0.03	0.14	0.13	0.08	0.09	0.03	0.03	0.03	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND										
Magnesium	mg/l	6.4	5.2	52	42	91.2	115	146	137	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5	96.5											
Mercury	mg/l	ND	ND	ND	ND	0.0003	0.0003	ND	ND	ND	ND	ND	ND	ND																														
Potassium	mg/l	9.3	9.1	27	23	26.5	28.2	21.7	17.3	9.6	9.6	4	6.9	ND	ND	ND	ND	ND	ND																									
Silica	mg/l	18	12	22	23	21	20.6	18.5	24.6	14.6	17.4	13.6	16.7	15.5	16.7	10.9	8.9	22.3	14.4	12.4	10.3	12	9.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Silicon	mg/l	8.6	5.7	10	11	9.8	9.6	8.6	11.5	6.8	8.1	6.3	7.8	7.2	7.8	5.1	4.1	10.4	6.7	5.8	4.8	5.6	4.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Sodium	mg/l	60	54	130	110	120	142	153	145	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89	89													
Strontium	mg/l	0.44	0.42	2.3	2	2.37	1.98	1.96	2.28	2.37	2.25	1.77	1.54	1.21	1.15	0.23	0.3	1.38	1.37	0.84	0.85	0.44	0.47	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Tin	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND												
Titanium	mg/l	ND	ND	ND	ND	ND	ND	0.007	ND	ND	ND	ND	ND	ND	ND	ND	0.012	ND	0.029	ND	0.031	ND	0.034	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Antimony	mg/l	ND	ND	ND	ND	0.001	0.001	0.0015	0.0016	0.0014	0.0015	0.0012	0.0014	0.0007	0.0008	0.0005	0.0006	0.0015	0.0012	0.001	0.0011	0.001	0.0009	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Arsenic	mg/l	ND	0.0069	0.0079	0.0065	0.0077	0.0054	0.0069	0.0047	0.005	0.0045	0.0047	0.0034	0.004	0.0025	0.0033	0.0089	0.0054	0.0023	0.0024	0.0039	0.0003	0.0023	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Barium	mg/l	0.035	0.023	0.21	0.18	0.225	0.192	0.201	0.217	0.158	0.157	0.09	0.087	0.056	0.057	0.034	0.041	0.091	0.076	0.03	0.028	0.065	0.048	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Cadmium	mg/l	ND	ND	ND	ND	0.0001	0.0002	0.0003	0.0001	0.0005	0.0005	0.0004	0.0001	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002											
Chromium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND										
Cobalt	mg/l	ND	0.0093	ND	ND	ND	ND	ND	ND	ND	ND																																	
Copper	mg/l	0.021	0.0064	0.0073	0.0077	ND	ND	0.01	0.01	ND	ND	0.02	ND	0.06	0.08	0.01	ND	0.19	0.01	0.12	0.02	0.18	0.09	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND										
Lead	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND										
Manganese	mg/l	ND	0.028	0.098	0.067	0.081	0.081	0.04	0.051	0.036	0.052	0.016	0.016	0.011	0.025	ND	ND	0.04	ND	0.018	0.013	0.018	0.006	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND										
Molybdenum	mg/l	0.13	0.16	0.4	0.31	1.11	0.89	2.68	2.85	4.52	4.2	5.38	4.27	2.59	2.53	0.25	0.38	1.91	2.15	1.08	1.1	0.48	0.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Nickel	mg/l	ND	0.013	0.011	ND	ND	ND	ND	ND	ND	0.02	ND	ND	ND	ND	ND	ND	0.011	ND	0.01	0.01	0.01	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
Selenium	mg/l	0.017	ND	ND	0.0146	0.0147	0.0135	0.0157	0.0187	0.0163	0.0175	0.0155	0.0175	0.0155	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175	0.0175											
Silver	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND										
Thallium	mg/l	ND	ND	ND	ND	0.0002	ND	ND	ND	ND	ND	ND	ND																															
Uranium	mg/l	0.0076	0.0067	0.011	0.0093	0.0041	0.0039	0.0039	0.0047	0.0025	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027	0.0027											
Vanadium	mg/l	ND	ND	0.0052	ND	ND	ND	ND	ND	ND	ND	ND																																
Zinc	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND										
Acidity	mg/l	-65	-124			ND		ND		ND		ND		ND		ND																												
Alkalinity as C	mg/l	70	140		155	191		126		126		190		78		156	0	103		109																								
Chloride	mg/l	48	140		130	120		140		140		73		9		87	0	48		18																								
Fluoride	mg/l	2.9	2.5		2.3	2.6		2.4		2.3		1.2		1.2		1	0	1.1		1																								
Orthophosphorus	mg/l	ND	ND		ND																																							
Sulfate	mg/l	200	980		1200	1190		1300		1000		600		104		620	0	400		143																								
Total Dissolve	mg/l	430	1700		2270	2320	</td																																					

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

Barrel 9 - Cyclone																								
Parameter	Units	Apr-10		May-10		Jun-10		Jul-10		Aug-10		Sep-10		Oct-10		Nov-10		Dec-10		Jan-11		Feb-11		
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	
Aluminum	mg/l	ND	ND	ND	ND	0.03	0.03	0.08	0.03	0.09	0.03	0.03	0.03	0.03	0.03	0.03	0.26	0.05	0.86	0.12	0.22	0.06	0.15	0.06
Beryllium	mg/l	ND	ND	ND	ND	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	ND	ND	ND	ND	
Bismuth	mg/l	ND	0.05	ND	ND	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	ND	ND	ND	ND	
Boron	mg/l	0.08	0.08	0.14	0.15	0.16	0.23	0.1	0.1	0.18	0.16	0.21	0.15	0.11	0.11	0.11	0.1	0.12	0.12	0.08	0.05	0.09	0.08	
Calcium	mg/l	124		243		312		200		181		214		179		216		170		72		127		
Hardness	Calc																							
Hon	mg/l	ND	ND	ND	ND	0.02	0.02	0.13	0.02	0.16	0.02	0.02	0.02	0.02	0.02	0.29	0.02	0.02	2.7	0.02	0.41	0.03	0.35	0.09
Lithium	mg/l	0.08	0.08	0.2	0.2	0.2	0.3	0.17	0.17	0.21	0.19	0.28	0.23	0.17	0.13	0.19	0.18	0.18	0.19	0.1	0.07	0.1	0.09	
Magnesium	mg/l	61.1		143		203		138		140		161		103		174		122		46.6		79.2		
Mercury	mg/l	ND	ND	ND	ND	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	ND	ND	ND	ND	
Potassium	mg/l	6.9		12.2		20.2		13.9		14.5		15.2		10.5		10.5		12.2		4.1		6.7		
Silica	mg/l	12.3	14.8	13.5	18.6	15.7	20.7	14	17.1	12	15.1	13.3	11.7	15.5	13.7	16.2	16.5	14	12.7	9.7	16	15.3		
Silicon	mg/l	5.7	6.9	6.3	8.6	7.3	9.6	6.5	7.9	5.6	7	6.2	5.4	7.2	7.5	7.7	6.5	5.9	4.5	7.4	7.1			
Sodium	mg/l	60.3		179		268		179		137		187		112		207		140		46.4		84.5		
Strontium	mg/l	1.19	1.16	2.27	2.18	2.09	2.96	1.96	2.03	1.9	1.76	2.89	2.42	2.13	1.84	2.23	2.36	1.95	1.92	1.27	0.8	1.5	1.54	
Tin	mg/l	ND	ND	ND	ND	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	ND	ND	ND	ND	
Titanium	mg/l	ND	ND	ND	ND	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	ND	0.0009	ND	ND	
Antimony	mg/l	0.00012	0.0012	0.0014	0.0015	0.0016	0.002	0.0012	0.0009	0.0019	0.0002	0.0013	0.0015	0.0011	0.0011	0.0008	0.0008	0.0008	0.0009	0.0006	0.001	0.0009		
Arsenic	mg/l	0.0055	0.0065	0.0061	0.0069	0.007	0.0082	0.007	0.006	0.01	0.0066	0.008	0.009	0.0058	0.0067	0.005	0.0059	0.0082	0.0079	0.002	0.002	0.0072		
Barium	mg/l	0.101	0.099	0.139	0.141	0.131	0.189	0.103	0.114	0.069	0.061	0.131	0.106	0.074	0.063	0.062	0.057	0.069	0.056	0.03	0.025	0.044	0.039	
Cadmium	mg/l	0.0001	0.0003	0.0003	0.0003	0.0006	0.0006	0.0007	0.001	0.0008	0.00032	0.0011	0.0004	0.0004	0.0013	0.0014	0.0006	0.0004	ND	0.0001	0.0002	0.0001		
Chromium	mg/l	ND	ND	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	ND	ND	ND	
Cobalt	mg/l	ND	ND	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	
Copper	mg/l	ND	ND	ND	ND	0.02	0.01	0.07	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.01	0.05	0.01	0.01	0.04	0.05	0.07	0.03	
Lead	mg/l	ND	ND	ND	ND	0.0009	0.0001	0.0002	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0014	0.0001	ND	ND	0.0002	ND	
Manganese	mg/l	ND	0.007	0.006	0.01	0.005	0.009	0.01	0.007	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.018	0.005	ND	0.023	ND	ND	
Molybdenum	mg/l	1.53	1.39	5.75	5.53	6.46	12.1	6.8	7.09	15	13.2	27.2	18.6	12	9.57	17.9	18.8	8.97	9.19	4.1	2.04	3.44	3.43	
Nickel	mg/l	ND	ND	ND	ND	0.03	0.01	0.01	0.01	0.01	0.02	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	
Selenium	mg/l	0.0101	0.0114	0.017	0.016	0.0241	0.0215	0.0219	0.0204	0.0206	0.0356	0.0227	0.0202	0.0165	0.0163	0.0188	0.0165	0.0172	0.0066	0.0046	0.0119	0.0117		
Silver	mg/l	ND	ND	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	ND	ND	ND	
Thallium	mg/l	ND	ND	ND	ND	0.0013	0.0006	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001	0.0002	0.0001	0.0008	0.0001	0.0001	0.0001	ND	ND	ND	ND	
Uranium	mg/l	0.00011	0.0009	0.0013	0.0014	0.0015	0.0011	0.0009	0.0009	0.0012	0.0001	0.0014	0.0001	0.0001	0.0008	0.00013	0.0032	0.0021	0.0019	0.0016	0.0012	0.0014	0.0014	
Vanadium	mg/l	0.011	0.009	ND	ND	0.03	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.007	ND	0.02	0.019	
Zinc	mg/l	ND	0.01	ND	ND	0.01	0.12	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.39	0.02	ND	0.13	ND	
Acidity	mg/l	ND	ND	ND	ND	10		10		10		10		10		10		10		ND		ND		
Alkalinity as C	mg/l	201		203		180		180		125		167		203		198		198		153		184		
Chloride	mg/l	57		110		230		120		100		130		74		180		110		27		44		
Fluoride	mg/l	1.6		2.3		3.4		2.5		2.9		2.9		1.8		2.1		1.6		0.8		1.1		
Orthophosphpha	mg/l																							
Sulfate	mg/l	570		920		1560		1050		840		1000		660		1370		820		270		440		
Total Dissolve	mg/l	1030		1770		3120		2000		1760		2020		1380		2470		1670		570		900		
Lab pH	pH units	8.3		8.4		8.5		8.3		8.3		8.2		8.2		8.2		8.2		8.2		8.2		
Phosphorsa	mg/l	0.01		0.02		0.04		0.02		0.05		0.02		0.02		0.02		0.01		21		0.01		
<b>FIELD PARAMETERS</b>																								
Field pH	pH units	8.17		7.8		7.37		7.68		7.03		7.56		5.51		7.41		6.8		6.53		7.86		
Temperature	Celsius	22.8		24		37.1		35.8		39.5		30.1		25.1		10.8		14.2		14.9		8.7		
Conductivity	µs/cm	1213		1758		2840		1825		2530		2420		1907		1479		1936		870		1429		

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

		Barrel 9 - Cyclone																								
Parameter	Units	Mar-11		Apr-11		May-11		Jun-11		Jul-11		Aug-11		Sep-11		Oct-11		Nov-11		Dec-11		Jan-12				
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	
Aluminum	mg/l	0.05	0.06	ND	0.04	0.08	ND	ND	0.21	0.07	0.41	0.22	0.08	ND	ND	0.57	ND	0.03	0.03	0.03	0.03	0.03	0.03	0.03		
Beryllium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		
Bismuth	mg/l	ND	ND	ND	ND	0.05	ND	ND	ND	0.05	0.04	0.04	0.04	0.04	0.04	0.04										
Boron	mg/l	0.12	0.12	0.09	0.11	0.1	0.09	0.11	0.1	0.08	0.12	0.13	0.13	0.1	0.09	0.13	0.08	0.08	0.1	0.12	0.07	0.05	0.06			
Calcium	mg/l	165		125		133		121		107		146		130		125		101		80.7		99.6				
Hardness	Calc																									
Iron	mg/l	0.08	0.05	0.22	0.11	0.1	ND	0.06	ND	0.31	0.05	0.51	0.17	0.09	ND	ND	0.66	ND	0.1	0.02	0.03	0.03	0.02	0.02		
Lithium	mg/l	0.14	0.15	0.11	0.1	0.11	0.12	0.12	0.08	0.1	0.18	0.13	0.12	0.12	0.15	0.14	0.09	0.1	0.11	0.1	0.07	0.09				
Magnesium	mg/l	99.7		84.4		92.6		80.8		75		92		82.9		87.6		75.2		70		63.5				
Mercury	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002		
Potassium	mg/l	8.6		7.8		8.5		8.8		7.6		8.9		7.1		6.9		5.6		4.9		4.4				
Silica	mg/l	13.9	17.1	14.2	16.7	18.4	17.7	20.1	21.2	18	17.8	18.6	19.3	17.5	16.8	15.7	17.8	17	15.8	9.8	10.7	15.3	15.4			
Silicon	mg/l	6.5	7.9	6.6	7.8	8.6	8.2	9.4	9.9	8.4	8.3	8.6	9	8.1	7.8	7.3	8.3	8	7.4	4.6	5	7.2	7.2			
Sodium	mg/l	121		81.2		103		89.4		83		114		97.7		114		63.7		88.1		67.3				
Strontium	mg/l	1.76	1.88	1.51	1.49	1.41	1.62	1.47	1.42	1.12	1.25	2.13	1.75	1.59	1.57	1.71	1.62	1.13	1.15	1.16	1.04	0.96	1.2			
Tin	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	0.1	0.1	0.1	0.1	0.1		
Titanium	mg/l	ND	ND	ND	ND	ND	ND	ND	0.005	ND	ND	0.009	ND	ND	ND	ND	ND	0.014	ND	0.003	0.005	0.005	0.005	0.005	0.005	
Antimony	mg/l	0.0013	0.0015	0.0012	0.0013	0.0011	0.0011	0.0015	0.0008	0.001	0.0009	0.0009	0.0011	0.0011	0.0011	0.0011	0.0009	0.0009	0.0008	0.0006	0.0005	0.0005	0.0005	0.0005		
Arsenic	mg/l	0.0087	0.0058	0.0083	0.0094	0.0093	0.0086	0.0094	0.0098	0.009	0.0093	0.0103	0.0104	0.0096	0.0099	0.0118	0.0105	0.0101	0.0103	0.0054	0.0042	0.0116				
Barium	mg/l	0.052	0.058	0.04	0.042	0.034	0.035	0.038	0.079	0.041	0.054	0.122	0.087	0.066	0.063	0.052	0.048	0.029	0.027	0.03	0.026	0.028	0.037			
Cadmium	mg/l	0.0004	0.0003	0.0002	0.0002	0.0003	0.0003	0.0005	0.0003	0.0002	0.0003	0.0009	0.0006	0.0012	0.0009	0.0004	0.0004	0.0002	0.0004	0.0005	0.0006	0.0001	0.0001			
Chromium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Cobalt	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Copper	mg/l	0.03	0.07	0.11	0.02	ND	0.04	0.03	ND	0.02	0.02	0.04	0.03	ND	ND	ND	ND	ND	0.01	0.04	0.03	0.01	0.01	0.01		
Lead	mg/l	ND	ND	ND	ND	0.0001	ND	ND	0.0002	ND	0.0005	0.0003	0.0002	ND	ND	ND	ND	0.0006	0.0002	0.0001	0.0001	0.0001	0.0001			
Manganese	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.009	ND	0.005	0.005	0.005	0.005		
Molybdenum	mg/l	3.31	3.82	4.20	4.15	3.09	4.43	3.97	4.15	2.25	4.1	9.64	8	10.3	10.4	7.3	7.62	3.74	3.5	6.55	5.11	0.73	1.13			
Nickel	mg/l	0.01	0.01	ND	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01														
Selenium	mg/l	0.013	0.0164	0.0146	0.0153	0.0141	0.0151	0.0188	0.0159	0.0187	0.0243	0.0229	0.0185	0.0192	0.0192	0.0224	0.0128	0.0153	0.0095	0.009	0.0073	0.009				
Silver	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01		
Thallium	mg/l	0.0001	0.0001	ND	0.0001	0.0001	0.0001	0.0002	0.0002	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0002	0.0002	ND	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		
Uranium	mg/l	0.0009	0.001	0.0007	0.0006	0.0004	0.0008	0.0007	0.0007	0.0004	0.0006	0.0007	0.0004	0.0004	0.0005	0.0006	0.0006	0.0011	0.001	0.0006	0.0009					
Vanadium	mg/l	ND	0.006	0.025	0.025	0.02	0.025	0.007	ND	ND	0.045	0.088	0.1	0.013	0.012	0.008	0.02	ND	ND	0.005	0.005	0.005	0.005			
Zinc	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	ND	0.01	0.06	0.01	0.01		
Acidity	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10		10			
Alkalinity as C	mg/l	199	149	228	214	210	189	161	201	146																
Chloride	mg/l	89	62	76	66	60	96	76	87	50																
Fluoride	mg/l	1.6	1.0	1.4	1.6	1.5	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6			
Orthophosphorus	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND			
Sulfate	mg/l	630	520	620	500	450	710	550	600	290																
Total Dissolve	mg/l	1320	1050	1220	1080	960	1440	1100	1260	840																
Lab pH	pH units	8.3	8.2	8.4	8.3	8.3	8	8.1	8.4	8.1																
Phosphorus	mg/l	ND	0.01	ND	0.02	0.02	0.02	0.02	ND	0.07																
<b>FIELD PARAMETERS</b>																										
Field pH	pH units	7.64	7.68	7.76	6.48	6.11	5.87	7.7	7.54	7.93																
Temperature	Celsius	23.9	22.8	21.8	37	31.9	32.4	25	27.8	15.8																
Conductivity	µs/cm	1702	1395	1429	1057	1415	1597	1464	1677	1155																

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

		Barrel 9 - Cyclone																							
Parameter	Units	Feb-12		Mar-12		Apr-12		May-12		Jun-12		Jul-12		Aug-12		Sep-12		Oct-12		Nov-12		Dec-12		Jan-13	
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Aluminum	mg/l	0.2	0.03	0.07	0.03	0.05	0.05	0.03	0.07	0.03	0.03	0.03	0.03	0.04	0.04	0.16	0.07	0.05	0.05	0.08	0.22	0.03	2.6	0.04	
Beryllium	mg/l	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	
Bismuth	mg/l	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	
Boron	mg/l	0.09	0.09	0.11	0.09	0.07	0.08	0.11	0.08	0.06	0.06	0.07	0.1	0.04	0.03	0.05	0.06	0.05	0.06	0.06	0.04	0.08	0.12	0.08	
Calcium	mg/l	103		112	99.1	113		124		126		129		127		141		101		112		103			
Hardness	Calc															809									
Hon	mg/l	0.32	0.02	0.03	0.02	0.07	0.03	0.31	0.02	0.11	0.02	0.02	0.02	0.06	0.07	0.07	0.07	0.02	0.02	0.38	0.02	6.41	0.02		
Lithium	mg/l	0.12	0.12	0.12	0.12	0.08	0.09	0.15	0.13	0.12	0.12	0.1	0.11	0.24	0.13	0.16	0.14	0.08	0.1	0.08	0.09	0.08			
Magnesium	mg/l	73		89.1	59.2	65.5		89.7		81.2		82.5		93.8		111		62.4		73.2		60.6			
Mercury	mg/l	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002		
Potassium	mg/l	4.4		7.7		5.7		8.4		9.2		7		8.6		8.4		4.6		4.1		4			
Silica	mg/l	16.9	14.9	18	19.6	20.7	20.6	19.1	22.8	19.2	24	17.9	20.6	14.5	21	19.1	19.7	13.5	18	20.5	17.7	20.2	18.2		
Silicon	mg/l	7.9	7	8.4	9.2	9.7	9.6	8.9	10.7	9	11.2	8.4	9.6	6.8	9.8	8.9	9.2	6.5	8.4	9.6	8.3	9.4	8.5		
Sodium	mg/l																								
Strontium	mg/l	1.36	1.27	1.48	1.4	1.16	1.35	1.5	1.55	1.56	1.59	1.51	1.49	2.23	1.46	1.82	1.63	1.15	1.13	1.38	1.21	1.24	1.14		
Tin	mg/l	0.1	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
Titanium	mg/l	0.0009	0.0005	0.0003	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005		
Antimony	mg/l	0.0006	0.0006	0.0006	0.0007	0.0007	0.0006	0.0009	0.0008	0.0008	0.0006	0.0006	0.0009	0.0006	0.0006	0.0006	0.0006	0.0006	0.0004	0.0004	0.0004	0.0004	0.0004		
Arsenic	mg/l	0.0126	0.0111	0.0172	0.0174	0.0159	0.0151	0.0166	0.0156	0.0143	0.0128	0.0123	0.0139	0.0146	0.0139	0.0148	0.013	0.014	0.015	0.0135	0.013	0.01	0.0114		
Barium	mg/l	0.045	0.04	0.054	0.051	0.04	0.044	0.048	0.049	0.076	0.077	0.056	0.055	0.101	0.059	0.085	0.07	0.033	0.033	0.033	0.026	0.051	0.024		
Cadmium	mg/l	0.0001	0.0002	0.0002	0.0002	0.0003	0.0002	0.0006	0.0003	0.0002	0.0002	0.0002	0.0002	0.0003	0.0009	0.0002	0.0002	0.0001	0.0001	0.0003	0.0001	0.0003			
Chromium	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Cobalt	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Copper	mg/l	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.02	0.01	0.01	0.01	0.01	0.03	0.01	0.04		
Lead	mg/l	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003	0.0001			
Manganese	mg/l	0.005	0.005	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005		
Molybdenum	mg/l	1.63	1.46	2.66	2.52	2.25	2.57	5.08	5.12	3.13	3	2.69	2.63	10.7	5.33	10	9.3	2.07	1.68	2.22	2.08	0.75	0.66		
Nickel	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Selenium	mg/l	0.0085	0.0087	0.0123	0.0125	0.0124	0.0128	0.0115	0.0177	0.0181	0.0161	0.0165	0.0172	0.0001	0.0139	0.0119	0.0165	0.0097	0.007	0.0073	0.0066	0.0052	0.005		
Silver	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Thallium	mg/l	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001	0.006	0.0002	0.0003	0.0002	0.0002	0.0003	0.0002	0.0003	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001			
Uranium	mg/l	0.0007	0.0006	0.0023	0.0024	0.0006	0.0009	0.0014	0.0014	0.0013	0.001	0.0003	0.0005	0.0017	0.0016	0.0027	0.0016	0.0015	0.0039	0.0037	0.0063	0.0045			
Vanadium	mg/l	0.01	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.015	0.02	0.005	0.009	0.005	0.007	0.008	0.005		
Zinc	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03		
Acidity	mg/l	10		10		10		10		10		10		10		10		10		10		10		10	
Alkalinity as C	mg/l	181		211		203		227		209		191		175		215		192		223		201			
Chloride	mg/l	65		75		43		42		66		71		76		88		42		66		46			
Fluoride	mg/l	1		1.2		1		1.1		1.4		1.3		1		1.9		1		0.7		1.4			
Orthophosphpha	mg/l																								
Sulfate	mg/l	460		570		320		350		470		540		620		680		350		500		460			
Total Dissolve	mg/l	940		1120		750		800		1070		1150		1190		1410		780		960		880			
Lab pH	pH units	8.3		8.2		8.3		8.4		8.2		8.2		8		8.2		8.3		8.3		8			
Phosphora	mg/l	0.02		0.01		0.01		0.01		0.01		0.01		0.03		0.02		0.02		0.01		0.01			
FIELD PARAMETERS	#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	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A		
Field pH	pH units	6.43		7.54		7.93		7.43		7.56		7.84		7.65		7.49		7.06		6.18		5.59			
Temperature	Celsius	5.9		23.5		26.1		30.6		33		29.8		32		27.1		15.9		14.1		5.8			
Conductivity	µs/cm	1369		1261		1116		1780		1240		1353		1931		1842		1136		1431		1343			

**Table 1: Barrel Test Analytical Results (May 2009 - January 2013)**

Barrel 10 - Cyclone			
Parameter	Units	Feb-10	
		Total	Dissolved
Aluminum	mg/l	3.94	ND
Beryllium	mg/l	0.0001	ND
Bismuth	mg/l	ND	ND
Boron	mg/l	0.02	ND
Calcium	mg/l	ND	79.9
Hardness	Calc		
Iron	mg/l	22.6	ND
Lithium	mg/l	ND	ND
Magnesium	mg/l		5.7
Mercury	mg/l	ND	ND
Potassium	mg/l	ND	3.4
Silica	mg/l	15.3	7.9
Silicon	mg/l	7.1	3.6
Sodium	mg/l		32.2
Strontium	mg/l	0.55	0.52
Tin	mg/l	ND	ND
Titanium	mg/l	0.069	ND
Antimony	mg/l	0.0004	ND
Arsenic	mg/l	0.0038	0.003
Barium	mg/l	0.094	0.039
Cadmium	mg/l	0.0001	ND
Chromium	mg/l	ND	ND
Cobalt	mg/l	ND	ND
Copper	mg/l	0.27	0.01
Lead	mg/l	0.0076	ND
Manganese	mg/l	0.128	0.077
Molybdenum	mg/l	0.27	0.21
Nickel	mg/l	ND	ND
Selenium	mg/l	0.0044	0.0048
Silver	mg/l	ND	0.01
Thallium	mg/l	ND	ND
Uranium	mg/l	0.008	0.0059
Vanadium	mg/l	0.007	ND
Zinc	mg/l	0.43	0.01
Acidity	mg/l	ND	
Alkalinity as C	mg/l	29	
Chloride	mg/l	22	
Fluoride	mg/l	1.5	
Orthophosphorus	mg/l	0	
Sulfate	mg/l	190	
Total Dissolve	mg/l	390	
Lab pH	pH units	7.5	
Phosphorus	mg/l	0.13	
<b>FIELD PARAMETERS</b>			
Field pH	pH units	7.92	
Temperature	Celsius	13.4	
Conductivity	µs/cm	566	

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Barrel 11 - Cyclone																							
Parameter	Units	May-09		Jun-09		Jul-09		Aug-09		Sep-09		Oct-09		Nov-09		Dec-09		Jan-10		Feb-10			
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved				
Aluminum	mg/l	2.5	ND	ND	ND	0.08	ND	ND	ND	0.06	ND	0.27	ND	0.35	ND	0.26	ND	0.19	0.07				
Beryllium	mg/l	—	ND	ND	ND	ND	ND	ND	ND	0.0037	ND	ND	ND	ND	ND	ND	ND	ND	ND				
Bismuth	mg/l	—	ND	ND	ND																		
Boron	mg/l	—	ND	ND	ND	0.11	0.12	0.13	0.11	0.1	0.12	0.13	0.07	0.07	0.03	0.04	0.08	0.11	0.09	0.08	0.03	0.04	
Calcium	mg/l	66	71	200	230	ND	269	344	—	204	—	201	—	120	—	66.8	—	191	ND	115	37.8		
Hardness	Calc	180	200	570	650	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
Iron	mg/l	1.6	ND	0.062	ND	0.05	ND	ND	ND	0.19	ND	0.03	0.52	ND	0.36	ND	3.08	0.02	0.14	0.03			
Lithium	mg/l	—	ND	ND	ND	0.04	0.03	0.05	0.05	0.06	0.08	0.09	0.07	0.04	0.04	0.09	0.09	0.1	0.1	0.04	0.04		
Magnesium	mg/l	4.5	4.4	18	19	80.8	—	113	—	97.3	—	119	—	68.6	—	34.1	—	85.3	—	73.4	19		
Mercury	mg/l	—	ND	ND	ND	0.0003	ND	ND															
Potassium	mg/l	11	10	19	24	31	—	36.2	—	15.4	—	15.7	—	7.4	—	4.2	—	6.5	ND	5.1	4.2		
Silica	mg/l	24	13	24	21	21.7	20.5	19.9	27.4	16.6	18.5	14.9	18.8	18.6	18.8	11.3	12.3	15.5	16.3	11	14.2	11.1	11.2
Silicon	mg/l	11	6.2	11	10	10.1	9.5	9.3	12.8	7.7	8.6	6.9	8.7	8.6	5.2	5.7	7.2	7.6	5.1	6.6	5.1	5.2	
Sodium	mg/l	68	67	91	69	127	—	170	—	107	—	126	—	64	—	38.8	—	87.6	—	85.6	15.6		
Strontium	mg/l	0.49	0.49	1.3	1.3	1.91	1.71	1.64	2.11	1.31	1.13	1.49	1.28	0.84	0.8	0.53	0.53	1.38	1.35	1.01	0.98	0.32	0.38
Tin	mg/l	—	ND	ND	ND																		
Titanium	mg/l	—	ND	ND																			
Antimony	mg/l	—	ND	ND	ND	0.0007	0.0007	0.0008	0.0008	0.0008	0.0007	0.0012	0.0012	ND	0.0007	0.0007	0.0007	0.0015	0.0014	0.0015	0.0011	0.0011	
Arsenic	mg/l	—	ND	ND	ND	0.0027	0.004	0.0034	0.0048	0.0065	0.0073	0.0074	0.0086	0.0082	0.0088	0.0114	0.0126	0.0155	0.0189	0.0125	0.0154	0.0104	
Barium	mg/l	0.042	0.029	0.13	0.18	0.255	0.234	0.256	0.275	0.178	0.147	0.176	0.165	0.073	0.071	0.036	0.034	0.086	0.08	0.046	0.041	0.035	0.039
Cadmium	mg/l	—	ND	ND	ND	ND	ND	ND	ND	0.0001	0.0002	0.0002	0.0054	ND	0.0002	0.0001	0.0001	ND	0.0001	ND	ND		
Chromium	mg/l	—	ND	ND	ND	ND	ND	ND	ND	0.02	ND	ND	ND										
Cobalt	mg/l	—	ND	ND	ND																		
Copper	mg/l	0.011	0.0053	0.0067	0.0081	0.01	0.05	ND	0.03	ND	0.03	ND	0.02	ND	0.03	ND	0.04	ND	0.03	ND	0.02	0.05	
Lead	mg/l	—	ND	ND																			
Manganese	mg/l	0.027	ND	0.029	0.039	0.053	0.051	0.03	0.039	0.026	0.026	0.013	0.016	0.015	0.015	0.028	0.009	ND	0.022	ND	0.051	0.064	ND
Molybdenum	mg/l	0.092	0.12	0.18	0.18	0.14	0.13	0.19	0.22	0.68	0.7	2.12	1.55	0.64	0.69	0.51	0.51	1.14	1.38	0.94	0.95	0.25	0.33
Nickel	mg/l	0.005	ND	0.0079	0.0099	ND	ND	ND	ND	0.02	ND	ND	ND	0.01	0.01	ND	0.01	ND	ND	ND	ND		
Selenium	mg/l	0.011	ND	ND	ND	0.0058	0.0055	0.0073	0.0088	0.0089	0.0092	0.0105	0.0092	0.0189	0.0403	0.0032	0.0037	0.0064	0.0064	0.0055	0.0064	0.0044	
Silver	mg/l	—	ND	ND	ND	ND	ND	ND	ND	0.01	ND	ND	ND	ND	ND	ND	ND	0.01	ND	ND			
Thallium	mg/l	—	ND	ND																			
Uranium	mg/l	0.011	0.01	0.013	0.012	0.0105	0.0103	0.011	0.0133	0.0081	0.0064	0.0129	0.0128	0.0066	0.0057	0.0054	0.0056	0.0063	0.0059	0.0063	0.0065	0.0026	0.0014
Vanadium	mg/l	—	ND	ND	ND	0.0059	ND	ND	0.005	ND	ND	0.006	ND	ND	ND	ND	ND	0.007	ND	ND	ND	0.007	
Zinc	mg/l	—	ND	ND	ND	ND	ND	ND	ND	0.03	ND	ND	0.02	0.06	0.02	ND	0.01	ND	0.03	0.02	ND	0.02	
Acidity	mg/l	-190	-77	-88	ND	ND																	
Alkalinity as C	mg/l	78	83	168	165	161	161	155	155	220	106	181	0	140	0	88	0	88	0	88			
Chloride	mg/l	64	52	130	160	91	91	136	55	36	84	0	55	0	55	0	55	0	55	0	55		
Fluoride	mg/l	2.8	2.7	1.6	1.8	1.3	1.3	1.2	0.7	0.6	0.6	0.7	0	0.7	0	0.7	0	0.7	0	0.6			
Orthophosphorus	mg/l	—	ND	ND	ND																		
Sulfate	mg/l	190	280	1050	1200	690	900	350	220	490	0	430	0	50	0	50	0	50	0	50			
Total Dissolve	mg/l	500	550	2000	2360	1480	1750	870	500	1320	0	880	0	240	0	240	0	240	0	240			
Lab pH	pH units	8.1	7.89	8.2	8.2	8.3	8.1	8.4	8.3	8.4	8.3	8.4	0	8.3	0	8.3	0	8.3	0	8.3			
Phosphorus	mg/l	—	ND	ND	ND	0.03	0.04	0.03	0.04	ND	ND	0.03	0	0.02	0	0.03	0	0.02	0	0.03			
FIELD PARAMETERS	Field pH	pH units	7.82	6.86	6.62	7.67	8.06	7.51	7.6	7.44	8.17	0	8.51	0	7.75	0	7.75	0	7.75				
Temperature	Celsius	31	33.4	35	36.4	29.4	28.3	14.4	11.7	12.2	0	12.7	0	15.3	0	15.3	0	15.3	0	15.3			
Conductivity	µS/cm	447	1442	1806	1932	1520	1805	1302	729	1516	0	1041	0	369	0	369	0	369	0	369			

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Parameter	Units	Barrel 11 - Cyclone																					
		Apr-10		May-10		Jun-10		Jul-10		Aug-10		Sep-10		Oct-10		Nov-10		Dec-10		Jan-11			
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved				
Aluminum	mg/l	ND	ND	ND	ND	0.03	0.03	0.13	0.03	0.27	0.03	0.15	0.09	0.03	0.03	0.15	0.03	0.04	0.05	0.1	ND	ND	0.03
Beryllium	mg/l	ND	ND	ND	ND	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	ND	ND	ND	
Bismuth	mg/l	ND	ND	ND	ND	0.04	0.04	0.04	0.04	0.11	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	ND	ND	ND	
Boron	mg/l	0.1	0.1	0.07	0.1	0.15	0.2	0.09	0.1	0.18	0.17	0.12	0.13	0.1	0.11	0.08	0.08	0.11	0.1	0.17	0.08	0.1	
Calcium	mg/l	122		138		225		141		166		152		144		134		121		68.2		109	
Hardness	Calc																						
Iron	mg/l	0.05	ND	ND	ND	0.02	0.02	0.23	0.02	1.86	0.02	0.86	0.25	0.02	0.11	0.06	0.02	0.06	0.02	0.07	0.07	0.04	
Lithium	mg/l	0.1	0.11	0.11	0.13	0.17	0.17	0.11	0.12	0.17	0.17	0.14	0.17	0.13	0.11	0.1	0.12	0.13	0.2	0.1	0.12	0.11	
Magnesium	mg/l	81.3		95.8		152		110		139		123		105		112		97.6		59.6		84.3	
Mercury	mg/l	ND	ND	ND	ND	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	ND	ND	ND		
Potassium	mg/l	8.6		9.6		14.8		13.8		14.2		12.6		10.2		8.4		8		4.5		6.8	
Silica	mg/l	18.2	17.8	15.1	20.1	19	22.8	15.2	21	15.1	19.2	16.7	19.6	14.9	18.1	11.9	17.4	17.7	16.7	19.7	12.7	16.6	
Silicon	mg/l	8.5	8.3	7	9.4	8.8	10.7	7.1	9.8	7	8.9	7.8	9.1	6.9	8.4	5.5	8.1	8.2	7.8	9.2	5.9	7.7	
Sodium	mg/l	86.8		115		192		140		159		158		110		120		114		73.6		108	
Strontium	mg/l	1.49	1.4	1.61	1.66	2.1	2.61	1.61	1.76	1.67	1.73	1.43	1.8	1.5	1.51	1.55	1.55	1.45	1.63	1.94	0.9	1.48	
Tin	mg/l	ND	ND	ND	ND	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	ND	ND	ND	
Titanium	mg/l	ND	ND	ND	ND	0.003	0.005	0.003	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	ND	ND	0.006	
Antimony	mg/l	0.0012	0.0011	0.0012	0.0013	0.0014	0.0016	0.0008	0.0007	0.0004	0.024	0.0007	0.001	0.0008	0.0012	0.0008	0.0008	0.0007	0.0009	0.0011	0.0007	0.0009	
Arsenic	mg/l	0.023	0.0264	0.023	0.025	0.026	0.0207	0.0203	0.0206	0.024	0.023	0.0241	0.0248	0.0204	0.0191	0.0162	0.0154	0.0234	0.018	0.0082	0.02	0.0218	
Barium	mg/l	0.116	0.117	0.103	0.113	0.166	0.183	0.121	0.132	0.087	0.077	0.106	0.119	0.11	0.124	0.077	0.064	0.059	0.058	0.046	0.039	0.051	
Cadmium	mg/l	0.0003	0.0004	0.0002	ND	0.0009	0.0004	0.0007	0.0001	0.0008	0.0006	0.0007	0.0004	0.0003	0.0005	0.0005	0.0002	0.0003	ND	ND	0.0002		
Chromium	mg/l	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	ND	ND		
Cobalt	mg/l	ND	ND	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	ND	ND		
Copper	mg/l	ND	ND	ND	ND	0.01	0.05	0.03	0.02	0.65	0.01	0.11	0.06	0.01	0.02	0.01	0.01	0.01	0.01	0.02	0.03	ND	
Lead	mg/l	ND	ND	ND	ND	0.0007	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	ND	0.0001	ND		
Manganese	mg/l	ND	ND	0.008	ND	0.01	0.005	0.005	0.011	0.005	0.009	0.005	0.005	0.005	0.022	0.005	0.005	0.005	ND	0.019	ND		
Molybdenum	mg/l	1.78	1.41	3.08	3.22	6.74	7.77	5.23	5.98	12.1	13.3	6.3	8.13	5.46	8.34	7.33	9.01	2.42	4.24	3.79	1.55	2.87	
Nickel	mg/l	ND	ND	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	ND	ND	
Selenium	mg/l	0.0094	0.0116	0.0109	0.0161	0.0187	0.0162	0.0168	0.0173	0.0178	0.0157	0.0184	0.0145	0.0136	0.0107	0.0112	0.0089	0.0112	0.0097	0.0054	0.0093	0.009	
Silver	mg/l	ND	ND	ND	ND	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	ND	ND	
Thallium	mg/l	ND	ND	ND	ND	0.0004	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	ND	ND	ND		
Uranium	mg/l	0.0124	0.0101	0.0106	0.0108	0.0108	0.0146	0.005	0.005	0.0058	0.007	0.0088	0.0067	0.0068	0.0108	0.0106	0.0135	0.0157	0.0234	0.0088	0.0166	0.017	
Vanadium	mg/l	0.012	0.01	ND	ND	0.03	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.012	0.005	0.007	0.005	0.01	ND	0.018	0.018	
Zinc	mg/l	0.02	ND	ND	ND	0.01	0.01	0.16	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	ND	ND	ND		
Acidity	mg/l	ND	ND	10		10		10		10		10		10		10		10		ND		ND	
Alkalinity as C	mg/l	217	183	194	176	178	213	212	206	214	167												
Chloride	mg/l	71	166	170	106	130	116	76	92	80	44												
Fluoride	mg/l	0.9	1.5	1.5	1.3	1.3	1.3	1.2	1	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.6	0.6	0.9				
Orthophosphpha	mg/l																						
Sulfate	mg/l	470	1060	1080	810	840	690	630	660	600	340												
Total Dissolve	mg/l	1080	2040	2150	1580	1790	1600	1320	1340	1270	680												
Lab pH	pH units	8.3	8.4	8.5	8.4	8.4	8.2	8.3	8.3	8.4	8.4												
Phosphorus	mg/l	0.02	0.02	0.04	0.05	0.04	0.04	0.02	0.02	0.02	0.01								ND	0.03			
<b>FIELD PARAMETERS</b>																							
Field pH	pH units	8.16	7.12	7.79	7.84	7.67	7.88	7.75	7.61	8.09	8.12									8.05			
Temperature	Celsius	21.9	25.3	35.1	38.9	36.5	30.2	25.1	12	13.6	13.7									8.3			
Conductivity	µS/cm	1384	2280	2210	1556	1821	1906	1560	1243	1626	1640									1447			

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Parameter	Units	Barrel 11 - Cyclone												Barrel 11 - Cyclone												
		Mar-11		Apr-11		May-11		Jun-11		Jul-11		Aug-11		Sep-11		Oct-11		Nov-11		Dec-11		Jan-12				
		Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	
Aluminum	mg/l	ND	ND	0.05	ND	ND	ND	0.09	ND	0.03	0.05	0.1	ND	ND	ND	0.05	ND	0.03	0.03	0.36	0.03	0.36	0.03	0.03		
Beryllium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0003	ND	ND	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		
Bismuth	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.08	0.04	0.04	0.04	0.04	0.04		
Boron	mg/l	0.12	0.11	0.07	0.1	0.1	0.07	0.11	0.1	0.11	0.12	0.15	0.11	0.11	0.11	0.1	0.16	0.16	0.07	0.06	0.06	0.07	0.06	0.07		
Calcium	mg/l	112		93.8		87.6		111		108		127		127		136		129		51		74.5				
Hardness	Calc																									
Iron	mg/l	ND	ND	0.1	ND	ND	ND	0.04	ND	0.17	ND	0.04	ND	0.12	ND	ND	ND	ND	0.03	0.02	0.16	0.02				
Lithium	mg/l	0.14	0.13	0.09	0.08	0.14	0.09	0.14	0.15	0.11	0.12	0.19	0.14	0.11	0.13	0.13	0.15	0.17	0.16	0.08	0.06	0.06	0.08			
Magnesium	mg/l		93.7			81.2		73.3		89.2		81		104		103		106		114		50.2		50.5		
Mercury	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002		
Potassium	mg/l		8.3			8.6		7.4		10.1		8.5		10.5		8.3		7.9		7.4		4.3		3.9		
Silica	mg/l	17.4	19.5	16.1	19.6	19.2	19.4	19.3	23	19.1	20.1	18.9	21.3	18.6	17.4	19.1	17.3	17.1	11.5	15	16.6	16.6				
Silicon	mg/l	8.1	9.1	7.5	9.1	8.9	9	9	10.8	8.9	9.4	8.8	9.9	8.5	8.6	8.1	8	5.5	6.1	7.8	7.8					
Sodium	mg/l		99.1			67.6		68.1		97.5		98.8		127		119		129		129		50.4		63.1		
Strontium	mg/l	1.54	1.52	1.17	1.5	1.57	1.18	1.46	1.41	1.34	1.41	2.02	1.66	1.44	1.59	1.26	1.72	1.65	1.57	0.87	0.7	1.02	0.96			
Tin	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1	0.1	0.1	0.1	0.1	0.1		
Titanium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.005	0.005	0.009	0.005				
Antimony	mg/l	0.0008	0.001	0.0009	0.001	0.0007	0.0007	ND	0.0008	0.0008	0.0006	0.0007	0.0007	0.0008	0.0008	0.0006	0.0006	0.0009	0.0008	0.0004	0.0004	0.0004	0.0004			
Arsenic	mg/l	0.0282	0.0273	0.0234	0.0249	0.0256	0.0257	0.0262	0.0249	0.024	0.0265	0.0248	0.0259	0.0228	0.0245	0.0233	0.0234	0.0206	0.0204	0.0147	0.0136	0.0162	0.0181			
Barium	mg/l	0.07	0.07	0.07	0.07	0.07	0.07	0.067	0.049	0.128	0.126	0.096	0.099	0.16	0.123	0.092	0.101	0.068	0.098	0.079	0.075	0.035	0.026	0.047	0.042	
Cadmium	mg/l	ND	ND	0.0004	0.0002	0.0001	ND	0.0003	ND	ND	0.0002	0.0008	0.0002	0.0006	0.0004	ND	0.0006	0.0001	0.0003	0.0001	0.0001	0.0001	0.0001			
Chromium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Cobalt	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Copper	mg/l	ND	ND	0.04	0.01	ND	ND	0.01	ND	0.02	ND	ND	ND	ND	ND	ND	ND	ND	0.03	0.0	0.01	0.03	0.01	0.01		
Lead	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Manganese	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Molybdenum	mg/l	0.7	1.18	3.49	3.43	2.57	0.73	2.06	2.25	1.7	1.74	7.6	3.8	5.09	4.52	2.37	3.23	2.64	2.38	1.07	0.68	0.55	0.46			
Nickel	mg/l	0.02	ND	ND	ND	ND	ND	ND	ND	0.01	0.01	0.01	0.01													
Selenium	mg/l	0.0094	0.011	0.0078	0.0082	0.0093	0.0067	0.0101	0.0102	0.0078	0.009	0.0130	0.0116	0.0086	0.0091	0.0077	0.0098	0.0063	0.0069	0.0031	0.0028	0.0025	0.0025			
Silver	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	0.01	0.01	0.01			
Thallium	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0004	ND	0.0001	0.0001	0.0001		
Uranium	mg/l	0.0149	0.0171	0.0139	0.0165	0.0091	0.0051	0.0074	0.0074	0.0111	0.012	0.0171	0.0124	0.0079	0.0095	0.0126	0.0229	0.0116	0.0171	0.0102	0.0075	0.0237	0.0173			
Vanadium	mg/l	0.005	0.007	0.02	0.025	0.019	0.008	0.008	0.009	0.009	0.022	0.073	0.05	ND	0.005	0.006	0.011	ND	ND	0.005	0.005	0.005	0.005			
Zinc	mg/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		
Acidity	mg/l	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		
Alkalinity as C	mg/l	227		120		235		223		196		183		148		193		135		109		82				
Chloride	mg/l	68		55		80		71		71		96		104		116		97		36		52				
Fluoride	mg/l	0.9		0.9		1		1.1		1.1		1.1		1.1		1		1		1.1		0.8		0.8		
Orthophosphpha	mg/l																									
Sulfate	mg/l	480		400		610		480		490		670		640		680		680		270		340				
Total Dissolve	mg/l	1070		860		1210		1110		1070		1370		1250		1380		1310		590		670				
Lab pH	pH units	8.4		8.3		8.4		8.4		8.4		8.3		8.3		8.4		8.2		8.4		8.3				
Phosphorus	mg/l	0.02		0.02		ND		0.02		0.03		0.03		0.09		0.07		0.02		0.01		0.02				
FIELD PARAMETERS																										
Field pH	pH units	7.85		7.99		8.02		6.68		7.88		7.21		7.78		8.14		8.17		7.66		7.11				
Temperature	Celsius	23.3		23.4		22.3		35.5		31.7		31.5		24.1		26.5		14.3		3		3.5				
Conductivity	µS/cm	1453		1273		1495		1283		1452		1738		1783		1815		1537		1235		1055				

Table 1: Barrel Test Analytical Results (May 2009 - January 2013)

Barre; 11 - Cyclone																													
Parameter	Units	Feb-12		Mar-12		Apr-12		May-12		Jun-12		Jul-12		Aug-12		Sep-12		Oct-12		Nov-12		Dec-12		Jan-13					
		Total	Dissolved																										
Aluminum	mg/l	0.22	0.07	0.03	0.03	0.04	0.03	0.03	0.03	0.06	0.05	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03				
Beryllium	mg/l	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000				
Bismuth	mg/l	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04				
Boron	mg/l	0.09	0.09	0.1	0.1	0.09	0.08	0.11	0.08	0.07	0.08	0.09	0.07	0.07	0.09	0.07	0.09	0.07	0.06	0.12	0.06	0.06	0.13	0.05	0.07	0.07			
Calcium	mg/l	99.3		105	106	101				121			107			128			134			127			119		121	88.9	
Hardness	Calc																												
Iron	mg/l	0.38	0.02	0.04	0.02	0.13	0.02	0.19	0.02	0.02	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02		
Lithium	mg/l	0.1	0.1	0.13	0.12	0.1	0.1	0.12	0.13	0.1	0.11	0.11	0.11	0.1	0.13			0.13	0.12	0.12	0.12	0.17	0.14	0.09	0.09	0.09	0.09		
Magnesium	mg/l	68.3		82.8	72.8	70.3				86.6			75.5			84.6						95.7			88.2		122	64.6	
Mercury	mg/l	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002		
Potassium	mg/l	4.2		6.6		6.7		8.2		#N/A	10		7.2			8.3						7.1			6.4			6.6	4.5
Silica	mg/l	17.8	16.5	19.6	21	17.7	21.9	19.7	22.5	19.6	24.2	22.4	22.3	17.7	23			19.9	20.4	15.2	19.7	20.2	18.2	15.1	16.3				
Silicon	mg/l	8.3	7.7	9.2	9.8	8.3	10.2	9.2	11.3	10.5	10.4	8.3	10.8					9.3	9.5	7.1	9.2	9.4	8.5	7.1	7.6				
Sodium	mg/l	84		90.2		66.8		98.5			74.4			97.2			111					106			85.9		129	65.3	
Strontium	mg/l	1.21	1.28	1.42	1.5	1.28	1.21	1.44	1.51	1.26	1.34	1.57	1.49	1.21	1.58			1.5	1.45	1.46	1.41	1.74	1.53	1.15	1.15	1.15	1.15		
Tin	mg/l	0.1	0.1	0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		
Titanium	mg/l	0.009	0.005	0.008	0.005	0.005	0.005	0.006	0.005	0.005	0.005	0.005	0.005	0.006	0.006			0.005	0.005	0.005	0.005	0.006	0.005	0.015	0.005	0.005	0.005		
Antimony	mg/l	0.0004	0.0007	0.0006	0.0004	0.0004	0.0004	0.0009	0.0008	0.0004	0.0004	0.0004	0.0004	0.0004	0.0005			0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0006	0.0006	0.0006	0.0006		
Arsenic	mg/l	0.0173	0.0182	0.0217	0.0216	0.0209	0.0208	0.0163	0.0161	0.0206	0.0195	0.02	0.021	0.0174	0.0184			0.0181	0.0186	0.0176	0.0176	0.0193	0.0184	0.0129	0.0121	0.0121	0.0121		
Barium	mg/l	0.055	0.053	0.073	0.064	0.066	0.063	0.046	0.048	0.085	0.096	0.089	0.087	0.067	0.093			0.097	0.088	0.066	0.062	0.064	0.056	0.045	0.037				
Cadmium	mg/l	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003	0.0005	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			0.0004	0.0002	0.0002	0.0001	0.0003	0.0002	0.0001	0.0001	0.0001	0.0001		
Chromium	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Cobalt	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Copper	mg/l	0.03	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Lead	mg/l	0.0003	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001			0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		
Manganese	mg/l	0.005	0.005	0.002	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005			0.005	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.005		
Molybdenum	mg/l	0.54	0.62	0.7	0.64	0.92	0.95	4.45	4.76	0.71	1.04	0.91	0.85	1.48	2.74			5.77	3.44	3.05	2.86	3.36	3.09	1.03	0.99				
Nickel	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Selenium	mg/l	0.0027	0.003	0.0038	0.0037	0.0036	0.0037	0.0157	0.0177	0.0051	0.0052	0.0044	0.0048	0.0037	0.0054			0.0058	0.0056	0.0038	0.0039	0.0059	0.0047	0.0025	0.0024				
Silver	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
Thallium	mg/l	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0006			0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001		
Uranium	mg/l	0.0212	0.0237	0.0194	0.0195	0.0191	0.0179	0.0013	0.0014	0.0063	0.0057	0.0079	0.0087	0.0133	0.0153			0.0088	0.0096	0.0195	0.02	0.0253	0.0246	0.0211	0.0202				
Vanadium	mg/l	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005			0.01	0.014	0.005	0.019	0.005	0.01	0.005	0.005	0.005	0.005	0.005	
Zinc	mg/l	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01			0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	
Acidity	mg/l	10		10		10		10		10		10		10				10		10		10		10		10		10	
Alkalinity as C	mg/l	201		211		224		214		216		193		196					224		208		212		162				
Chloride	mg/l	63		71		55		72		58		76		58					79		66		120		55				
Fluoride	mg/l	0.8		1		1		1.5		1		1		1															
Orthophosphorus	mg/l																												
Sulfate	mg/l	450		500		400		560		380		560		410					520		520		780		430				
Total Dissolve	mg/l	910		1030		870		1150		930		1200		940					1170		1080		1580		850				
Lab pH	pH units	8.4		8.3		8.3		8.4		8.2		8.2		8.3					8.3		8.3		8.3		8.2				
Phosphorus	mg/l	0.02		0.01		0.01		0.01		0.02		0.01		0.02					0.01		0.02		0.01		0.1				
FIELD PARAMETERS	#N/A		#N/A		#N/A		#N/A		#N/A		#N/A		#N/A					#N/A		#N/A		#N/A		#N/A					
Field pH	pH units	6.63		7.69		7.95		7.																					

Table 2: Modeled Leachate Water Qualities - Cleaner Tailings

Parameters	Units	Barrel 2 - Cleaner tailings																					
		Jan-12		Feb-12		Mar-12		Apr-12		May-12		Jun-12		Jul-12		Aug-12		Oct-12		Nov-12		Dec-12	
		w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC
pH	s.u.	6.3	8.2	2.6	2.5	2.4	2.4	2.4	2.4	4.2	4.1	3.6	3.5	4.9	4.2	1.8	1.7	6.1	4.3	6.1	4.3	1.6	1.6
<b>Major Ions</b>																							
Alkalinity	mg/L as CaCO <sub>3</sub>	135	52	0	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	3	0	0	0
Calcium	mg/L	104	73	228	228	227	227	185	185	169	169	171	171	130	130	570	294	136	136	120	120	573	261
Chloride	mg/L	34	34	36	36	40	40	35	35	37	37	37	37	35	35	100	100	39	39	36	36	170	160
Fluoride	mg/L	1.2	1.2	50	50	30	30	30	30	0.8	0.8	4.5	4.5	3.0	3.0	180	180	0.6	0.6	0.8	0.8	0	0
Magnesium	mg/L	43	43	115	115	105	105	101	101	77	77	75	75	54	54	550	550	51	51	48	48	497	312
Potassium	mg/L	3.0	3.0	0.3	0.3	0.3	0.3	0.3	0.3	3.0	3.0	2.9	2.9	2.8	2.8	0.3	0.3	3.0	3.0	2.9	2.9	0.3	0.3
Sodium	mg/L	40	40	29	29	40	40	39	39	42	25	46	46	41	35	30	30	43	43	40	75	75	98
Sulfate	mg/L	360	360	3,100	3,075	3,000	2,983	2,300	2,285	1,600	1,218	1,250	1,214	630	580	47,000	45,132	530	530	500	473	33,000	32,258
<b>Dissolved Metals</b>																							
Aluminum	mg/L	0.2	0.07	162	162	113	113	92	92	33	16	18	18	1.4	1.4	1360	1361	0.3	0.3	0.6	0.6	1070	1070
Antimony	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	<0.001	<0.001	0.01	0.01	0.009	0.009	<0.001	<0.001	0.002	0.002	<0.001	<0.001	<0.001	<0.001	0.3	0.3	<0.001	<0.001	2.4	2.4	0.7	0.7
Barium	mg/L	0.01	0.007	0.003	0.0025	0.003	0.003	0.003	0.003	0.01	0.007	0.02	0.008	0.012	0.011	0.003	<0.001	0.01	0.01	0.007	0.007	0.003	<0.001
Beryllium	mg/L	<0.001	<0.001	0.01	0.01	0.009	0.009	0.01	0.01	0.002	0.003	0.001	0.001	<0.001	<0.001	0.07	0.07	<0.001	<0.001	0.06	0.06	0.03	0.03
Boron	mg/L	0.05	0.05	0.05	0.05	0.03	0.03	0.02	0.02	0.06	0.06	0.05	0.05	0.05	0.05	0.01	0.01	0.06	0.05	0.05	0.01	0.01	0.3
Cadmium	mg/L	<0.001	<0.001	0.006	0.006	0.004	0.004	0.004	0.004	0.002	0.002	<0.001	<0.001	<0.001	<0.001	0.02	0.02	<0.001	<0.001	0.02	0.02	0.01	0.01
Chromium	mg/L	0.01	0.01	2.3	2.3	1.5	1.5	1.0	1.0	0.1	0.1	0.04	0.04	0.01	0.01	33	33	0.01	0.01	0.01	0.01	37	20
Cobalt	mg/L	0.02	0.02	0.9	0.9	0.7	0.7	0.7	0.7	0.4	0.4	0.3	0.3	0.1	0.1	10	10	0.09	0.09	0.1	0.1	9.2	4.3
Copper	mg/L	0.3	0.01	112	112	80	80	81	81	51	51	34	34	5.2	5.2	886	887	0.5	0.5	1.8	1.8	726	404
Iron	mg/L	4.7	<0.001	823	801	615	600	583	570	408	127	219	188	52	0.8	15,200	14,130	6.0	0.1	30	0.3	13,900	13,903
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.04	0.04	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.1	0.1	1.8	1.8	1.2	1.2	1.2	1.2	0.6	0.6	0.3	0.3	0.1	0.1	8.4	8.4	0.1	0.1	0.05	0.05	3.7	2.9
Mercury	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.01	0.01	0.4	0.4	0.01	0.01
Nickel	mg/L	0.03	0.03	1.4	1.4	1.0	1.0	1.0	1.0	0.6	0.6	0.3	0.4	0.1	0.1	9.5	9.5	0.07	0.07	0.07	0.07	7.4	3.7
Selenium	mg/L	<0.001	<0.001	0.009	0.009	0.008	0.008	0.007	0.007	0.004	0.004	0.003	0.003	0.002	0.002	0.2	0.2	0.003	0.003	0.007	0.007	0.8	0.3
Silver	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.8	0.8	0.01	0.01	0.01	0.01	1.0	0.4
Silicon	mg/L	8.0	8.0	18	18	20	20	17	17	8.9	8.9	8.7	8.7	8.0	8.0	122	44	7.3	7.3	8.1	8.1	96	28
Strontium	mg/L	0.8	0.8																				

Table 3: Modeled Leachate Water Qualities – Scavenger Tailings

Parameters	Units	Barrel 5 - Scavenger tailings																					
		Jan-12		Feb-12		Mar-12		May-12		Jun-12		Jul-12		Aug-12		Oct-12		Nov-12		Dec-12			
		w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC		
pH	s.u.	5.4	8.3	5.3	8.0	7.4	8.0	7.4	8.0	7.5	8.0	8.3	8.0	7.0	8.0	7.2	8.2	7.9	8.3	5.9	8.2	7.1	8.4
<b>Major Ions</b>																							
Alkalinity	mg/L as CaCO <sub>3</sub>	238	69	88	41	105	31	148	31	65	28	37	29	94	32	216	45	236	60	180	63	176	89
Calcium	mg/L	104	36	236	214	229	197	160	113	149	134	128	125	166	141	112	44	106	36	106	59	71	36
Chloride	mg/L	34	34	73	73	67	67	59	59	98	98	85	85	130	130	36	36	36	70	70	59	59	59
Fluoride	mg/L	0.2	0.2	5.6	2.8	5.6	3.0	4.8	4.2	4.6	4.5	3.5	3.5	3.5	3.5	0.4	0.4	0.5	0.5	2.3	2.3	2.0	2.0
Magnesium	mg/L	41	41	84	84	50	50	65	65	86	86	0	0	105	105	44	44	43	43	43	43	60	60
Potassium	mg/L	3.3	3.3	27	27	22	22	17.9	17.9	18.5	18.5	15	15	14.4	14.4	3.5	3.5	3.6	3.6	3.6	3.6	5.0	5.0
Sodium	mg/L	41	41	73	73	86	86	103	103	123	123	102	102	150	150	43	43	42	42	42	42	56	56
Sulfate	mg/L	250	250	930	930	740	740	520	520	720	720	660	660	900	900	240	240	240	240	680	680	510	510
<b>Dissolved Metals</b>																							
Aluminum	mg/L	0.06	0.06	0.03	0.02	0.05	0.05	0.03	0.03	0.05	0.05	0.03	0.03	0.07	0.07	0.03	0.03	0.07	0.07	0.03	0.03	0.03	0.03
Antimony	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.007	0.007	<0.001	<0.001	<0.001	<0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.007	0.007	0.009	0.009	0.009	0.009	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.02	0.009	0.03	0.004	0.03	0.007	0.05	0.01	0.05	0.01	0.06	0.009	0.06	0.008	0.024	0.017	0.05	0.01	0.05	0.004	0.03	0.00
Beryllium	mg/L	0.02	0.02	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.05	0.05	0.07	0.07	0.05	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.05	0.05	0.06	0.06	0.05	0.05	0.05	0.05	0.07	0.07
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cobalt	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Copper	mg/L	0.04	0.007	0.2	0.006	0.1	0.01	0.09	0.02	0.03	0.02	0.02	0.02	0.05	0.02	0.01	0.03	0.01	0.03	0.01	0.02	0.005	0.005
Iron	mg/L	0.04	<0.001	0.05	<0.001	0.08	<0.001	0.07	<0.001	0.06	<0.001	0.02	<0.001	0.2	<0.001	0.02	<0.001	0.06	<0.001	0.06	<0.001	0.1	<0.001
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.005	0.005	0.1	0.1	0.06	0.06	0.01	0.01	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Mercury	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	mg/L	0.01	0.01	2.8	2.8	3.8	3.8	3.2	3.2	3.9	3.9	3.2	3.2	4.5	4.5	0.1	0.1	0.1	0.1	0.1	0.1	0.8	0.8
Nickel	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Selenium	mg/L	<0.001	<0.001	0.004	0.004	0.003	0.003	0.004	0.004	0.004	0.004	0.005	0.005	0.006	0.006	<0.001	<0.001	0.002	0.001	0.002	0.001	0.003	0.003
Silver	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Silicon	mg/L	9.1	9.1	6.0																			

**Table 4: Modeled Leachate Water Qualities – Cyclone Sands**

Parameters	Units	Barrel 9 - Cyclone sands																							
		Jan-12		Feb-12		Mar-12		Apr-12		May-12		Jun-12		Jul-12		Aug-12		Oct-12		Nov-12		Dec-12		Jan-13	
		w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC
pH	s.u.	6.9	8.2	6.4	8.2	7.5	8.2	7.9	8.2	7.4	8.2	7.6	8.2	7.8	8.1	7.7	8.1	7.5	8.2	7.1	8.2	6.2	8.3	5.6	8.8
<b>Major Ions</b>																									
Alkalinity	mg/L as CaCO <sub>3</sub>	144	58	181	68	211	53	203	45	227	43	209	40	191	39	175	38	215	43	192	57	223	63	201	53
Calcium	mg/L	100	65	103	58	112	49	113	50	124	50	126	58	129	68	127	72	141	72	101	47	112	48	103	53
Chloride	mg/L	65	65	65	65	75	75	43	43	42	42	66	66	71	71	76	76	88	88	42	42	66	66	46	46
Fluoride	mg/L	0.8	0.8	1.0	1.0	1.2	1.2	1.0	1.0	1.1	1.1	1.4	1.4	1.3	1.3	1.0	1.0	1.9	1.9	1.0	1.0	0.7	0.7	1.4	1.4
Magnesium	mg/L	63	63	73	73	89	89	65	65	90	90	81	81	83	82	94	94	111	111	62	62	73	73	61	61
Potassium	mg/L	4.4	4.4	4.4	4.4	7.7	7.7	5.7	5.7	8.4	8.4	9.2	9.2	7.0	7.0	8.6	8.6	8.4	8.4	4.6	4.6	4.1	4.1	4.0	4.0
Sodium	mg/L	67	67	85	85	98	98	59	59	103	103	86	86	90	90	103	103	120	120	54	54	70	70	55	55
Sulfate	mg/L	410	410	460	460	570	570	320	320	350	350	470	470	540	540	620	620	680	680	350	350	500	500	460	460
<b>Dissolved Metals</b>																									
Aluminum	mg/L	0.03	0.03	0.03	0.03	0.03	0.03	0.05	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.04	0.07	0.07	0.08	0.08	0.03	0.03	0.04	0.04
Antimony	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.015	0.015	0.01	0.01	0.01	0.01
Barium	mg/L	0.04	0.007	0.04	0.006	0.05	0.009	0.04	0.01	0.05	0.02	0.08	0.01	0.06	0.01	0.06	0.01	0.07	0.01	0.03	0.009	0.03	0.007	0.02	0.01
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.06	0.06	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.08	0.06	0.06	0.1	0.1	0.03	0.03	0.06	0.06	0.06	0.06	0.06	0.06	0.08	0.08
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cobalt	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Copper	mg/L	0.01	0.006	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.026	0.01	0.01	0.01	0.009	0.01	0.008	0.04	0.009
Iron	mg/L	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.03	<0.001	0.02	<0.001	0.02	<0.001	0.07	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Manganese	mg/L	0.005	0.00495	0.005	0.005	0.005	0.004998	0.005	0.004998	0.005	0.0049996	0.005	0.0049997	0.005	0.0049989	0.005	0.0049996	0.005	0.0049995	0.005	0.0049897	0.005	0.005	0.005	0.005
Mercury	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Molybdenum	mg/L	1.1	1.1	1.5	1.5	2.5	2.5	2.6	2.6	5.1	5.1	3.0	3.0	2.7	2.7	5.3	5.3	9.3	9.3	1.7	1.7	2.1	2.1	0.7	
Nickel	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Selenium	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01	0.007	0.007	0.005	0.004	
Silver	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Silicon	mg/L	7.2	7.2	7.0	7.0	9.2	9.2	9.6	9.6	11	11	11	11	9.6	9.6	9.8	9.8	9.2	9.2	8.4	8.4	8.3	8.3	8.5	
Strontium	mg/L	1.2	1.2	1.3	1.3	1.4	1.4	1.3	1.3	1.5	1.5	1.6	1.6	1.5	1.5	1.5	1.5	1.6	1.6	1.1	1.1	1.2	1.2	1.1	
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Tin	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Uranium	mg/L	<0.001	<0.001	<0.001	<0.001	0.002	0.002	<0.001	<0.001	0.001	0.001	0.001	<0.001	<0.001	<0.001	0.002	0.002	0.003	0.003	0.002	0.001	0.004	0.004	0.004	0.004
Vanadium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.009	0.009	0.007	0.007	0.005	0.005
Zinc	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03

## Secondary Minerals Phase Controls

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Notes:  
w/o GC: without geochemical controls

w/o GC: without geochemical  
GC: geochemical controls

GC: geochemical controls  
Shaded cells identify a decrease in concentration due to mineral precipitation

**Table 5: Modeled Leachate Water Qualities – Desulfurized Cyclone Sands**

Parameters	Units	Barrel 11 - Desulfurized cyclone sands																							
		Jan-12		Feb-12		Mar-12		Apr-12		May-12		Jun-12		Jul-12		Aug-12		Oct-12		Nov-12		Dec-12		Jan-13	
		w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC	w/o GC	GC
pH	s.u.	7.1	8.2	6.6	8.3	7.7	8.3	8.0	8.3	7.9	8.2	7.6	8.2	7.9	8.1	7.8	8.1	8.0	8.2	7.9	8.2	6.4	8.2	6.4	8.3
<strong>Major Ions</strong>																									
Alkalinity	mg/L as CaCO <sub>3</sub>	82	57	201	74	211	57	224	58	214	44	216	47	193	40	196	38	224	46	208	56	212	63	162	72
Calcium	mg/L	75	64	99	48	105	43	101	34	121	53	107	39	128	67	134	71	127	56	119	58	121	61	89	53
Chloride	mg/L	52	52	63	63	71	71	55	55	72	72	58	58	76	76	58	58	79	79	66	66	120	120	53	53
Fluoride	mg/L	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.0	1.5	1.5	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1
Magnesium	mg/L	51	50	68	68	83	83	70	70	87	87	76	75	85	85	97	96	96	96	88	88	122	122	65	65
Potassium	mg/L	3.9	3.9	4.2	4.2	6.6	6.6	6.7	8.2	8.2	10.0	10.0	7.2	7.2	8.3	8.3	7.1	7.1	6.1	6.1	6.6	6.6	4.5	4.5	
Sodium	mg/L	63	63	84	84	91	91	67	67	98	98	74	74	98	98	111	111	106	106	86	86	129	129	65	65
Sulfate	mg/L	340	340	450	450	500	500	400	400	560	560	380	380	560	560	410	410	520	520	520	520	780	780	430	430
<strong>Dissolved Metals</strong>																									
Aluminum	mg/L	0.03	0.03	0.07	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.06	0.06	0.05	0.05	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Antimony	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01
Barium	mg/L	0.04	0.01	0.05	0.005	0.06	0.009	0.06	0.01	0.05	0.01	0.1	0.02	0.09	0.01	0.003	0.003	0.09	0.01	0.06	0.01	0.06	0.01	0.06	0.01
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	0.1	0.1	0.09	0.09	0.1	0.1	0.08	0.08	0.08	0.08	0.08	0.08	0.09	0.09	0.09	0.09	0.06	0.06	0.06	0.06	0.06	0.06	0.1	0.07
Cadmium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Cobalt	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Copper	mg/L	0.01	0.006	0.01	0.005	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.009	0.01	0.008	0.01
Iron	mg/L	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001	0.02	<0.001
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	0.005	0.00498	0.005	0.0049	0.005	0.004999	0.005	0.004997	0.005	0.004999	0.009	0.008999	0.005	0.004999	0.005	0.00498	0.005	0.004998	0.005	0.00499	0.005	0.0049996	0.005	0.004999
Mercury	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	mg/L	0.5	0.5	0.6	0.6	0.6	0.6	0.9	0.9	4.8	4.8	1.0	1.0	0.8	0.8	2.7	2.7	5.4	5.4	2.9	2.9	3.1	3.1	1.0	1.0
Nickel	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Selenium	mg/L	0.003	0.002	0.003	0.003	0.004	0.004	0.004	0.004	0.02	0.02	0.01	0.01	0.005	0.005	0.005	0.005	0.01	0.01	0.004	0.004	0.005	0.005	0.002	0.002
Silver	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Silicon	mg/L	7.8	7.8	7.7	7.7	9.8	9.8	10	10	10	11	11	10	11	11	11	9.5	9.5	9.2	9.2	8.5	8.5	7.6	7.6	
Strontium	mg/L	1.0	1.0	1.2	1.2	1.3	1.3	1.2	1.2	1.5	1.3	1.3	1.5	1.5	1.6	1.6	1.5	1.4	1.4	1.4	1.5	1.5	1.1	1.1	
Thallium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.006	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Tin	mg/L	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Uranium	mg/L	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.001	0.001	0.006	0.006	0.009	0.009	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02
Vanadium	mg/L	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Zinc	mg/L	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.06	0.02	0.02	0.08	0.08

## Secondary Minerals Phase Controls

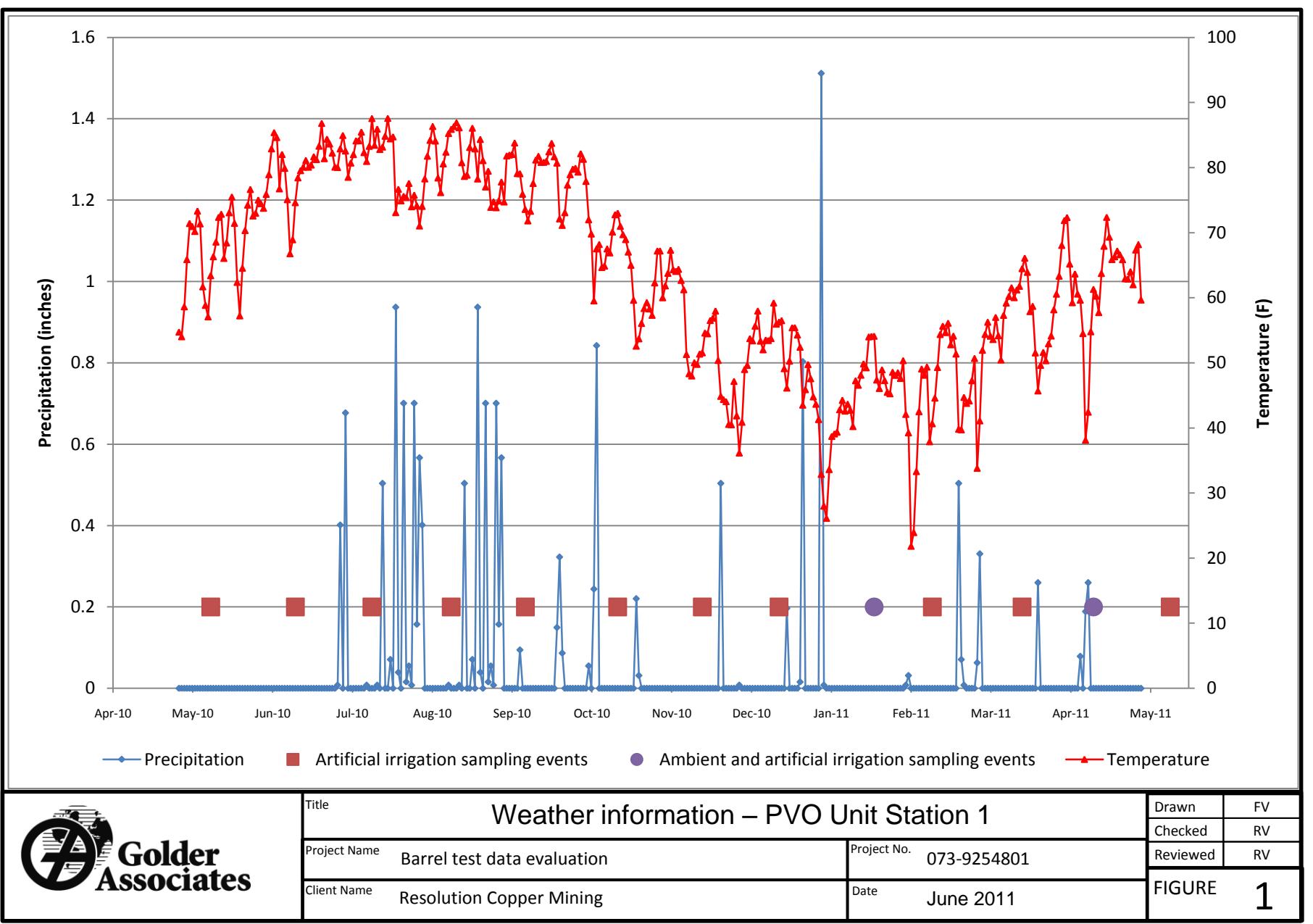
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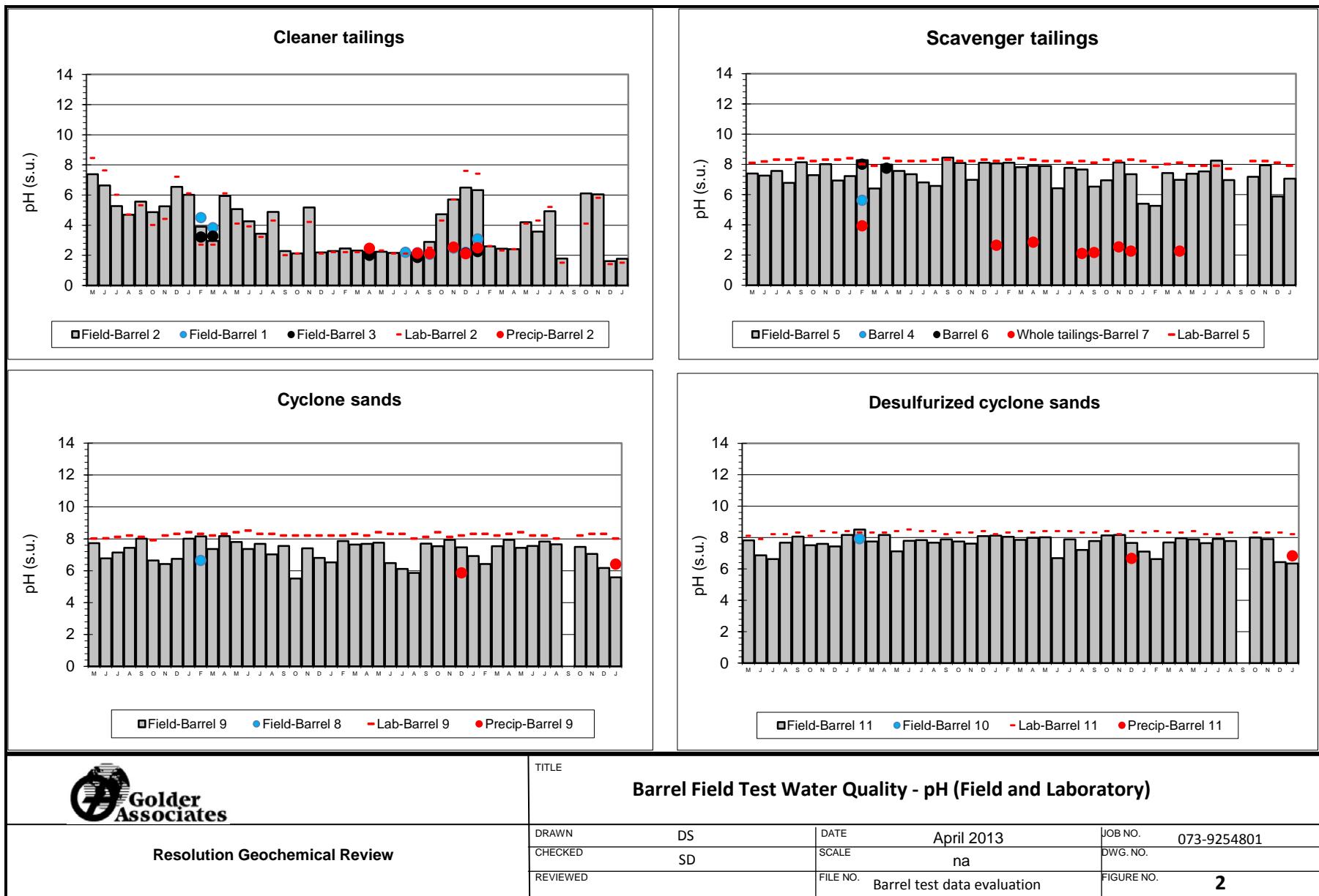
w/o GC: without geochemical controls

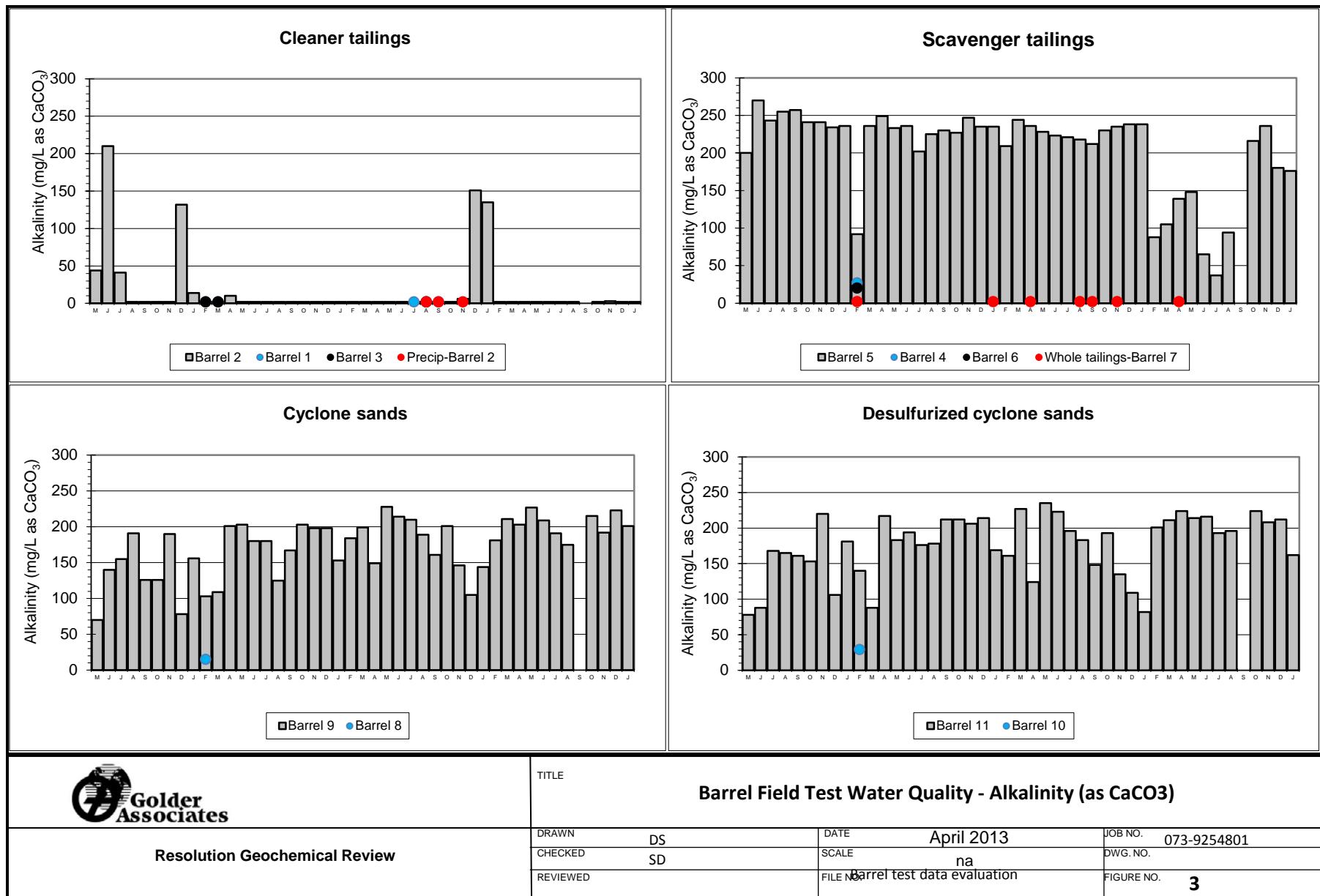
w/o GC: without geochem  
GC: geochemical controls

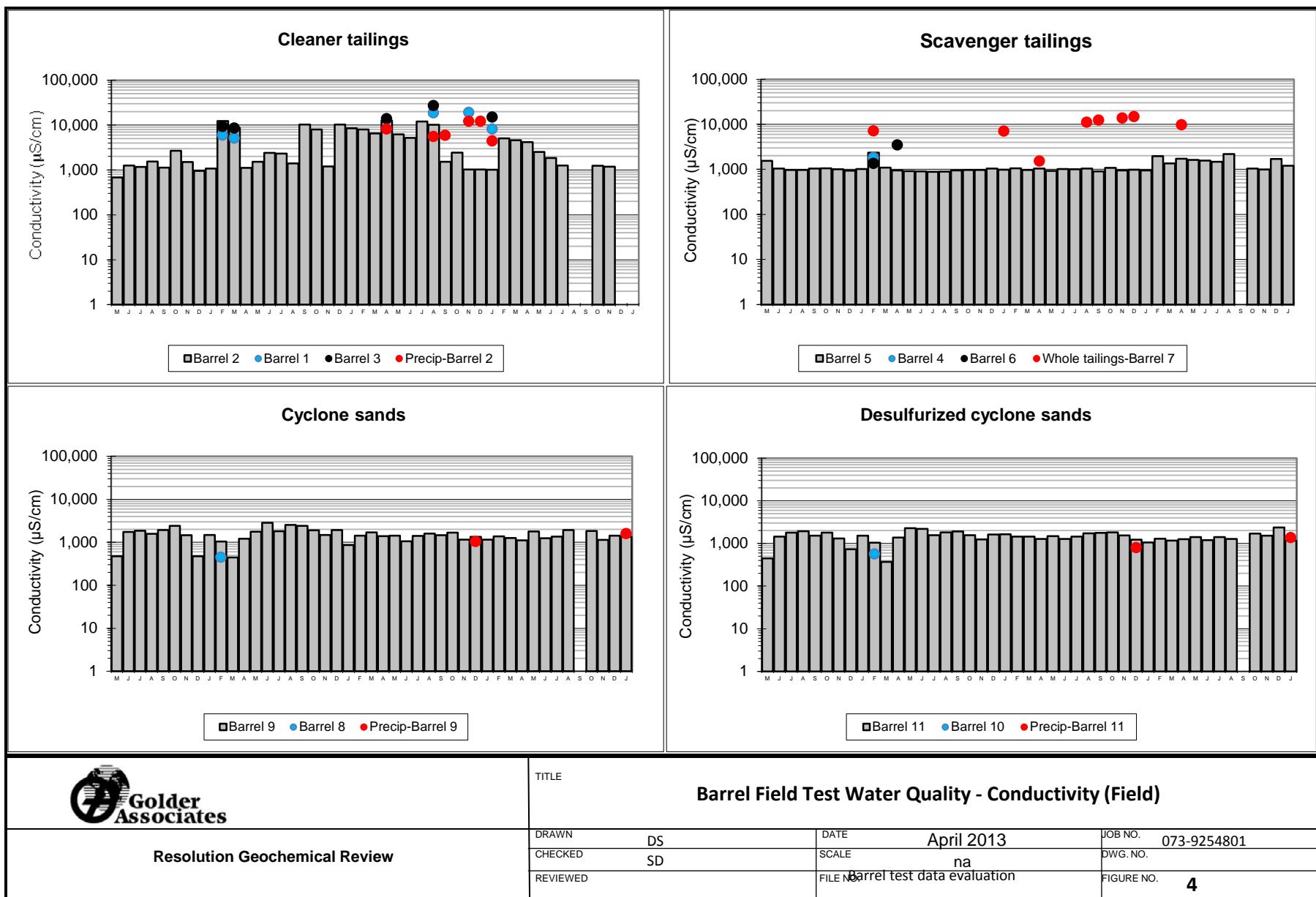
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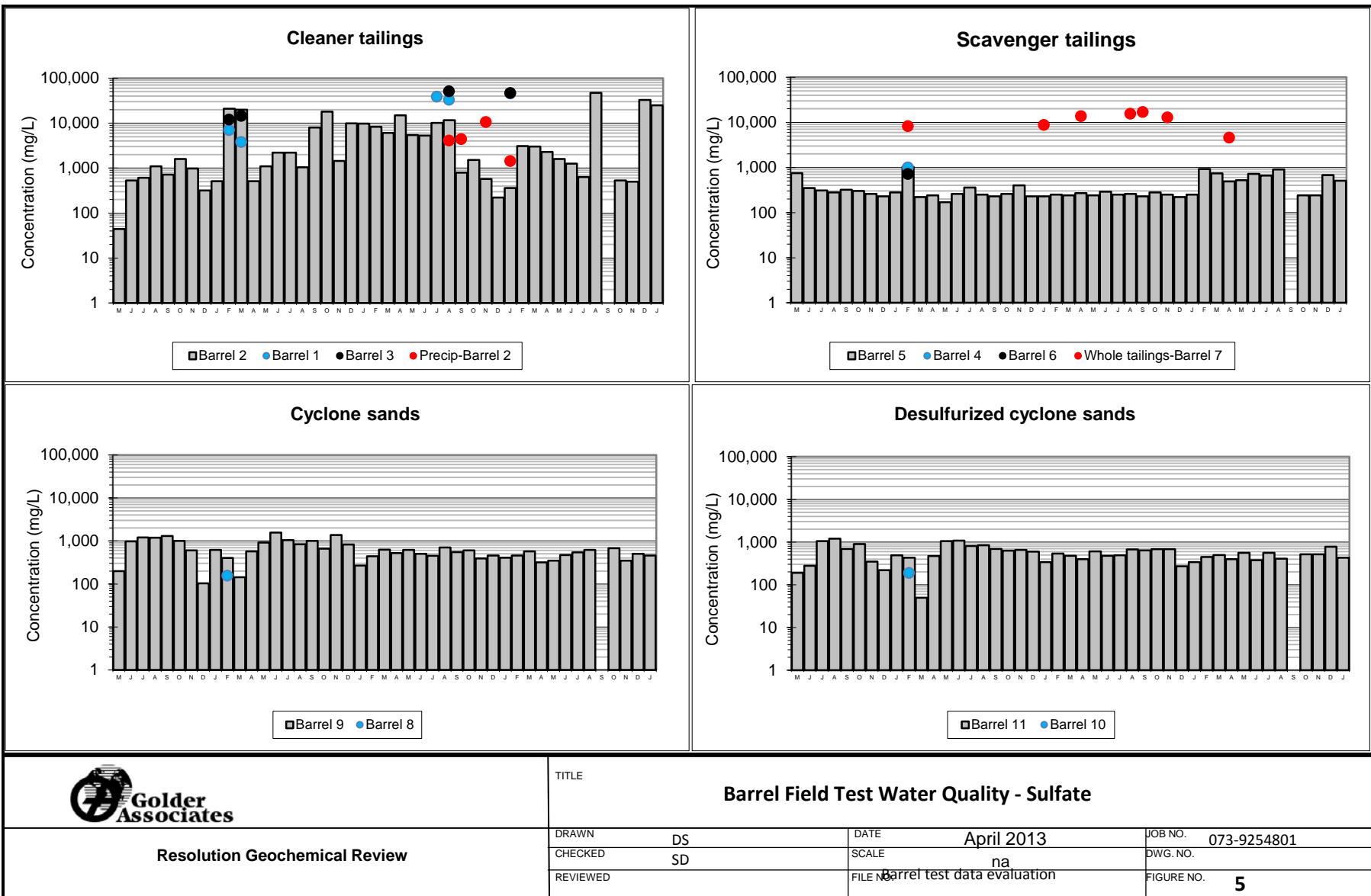
## **FIGURES**

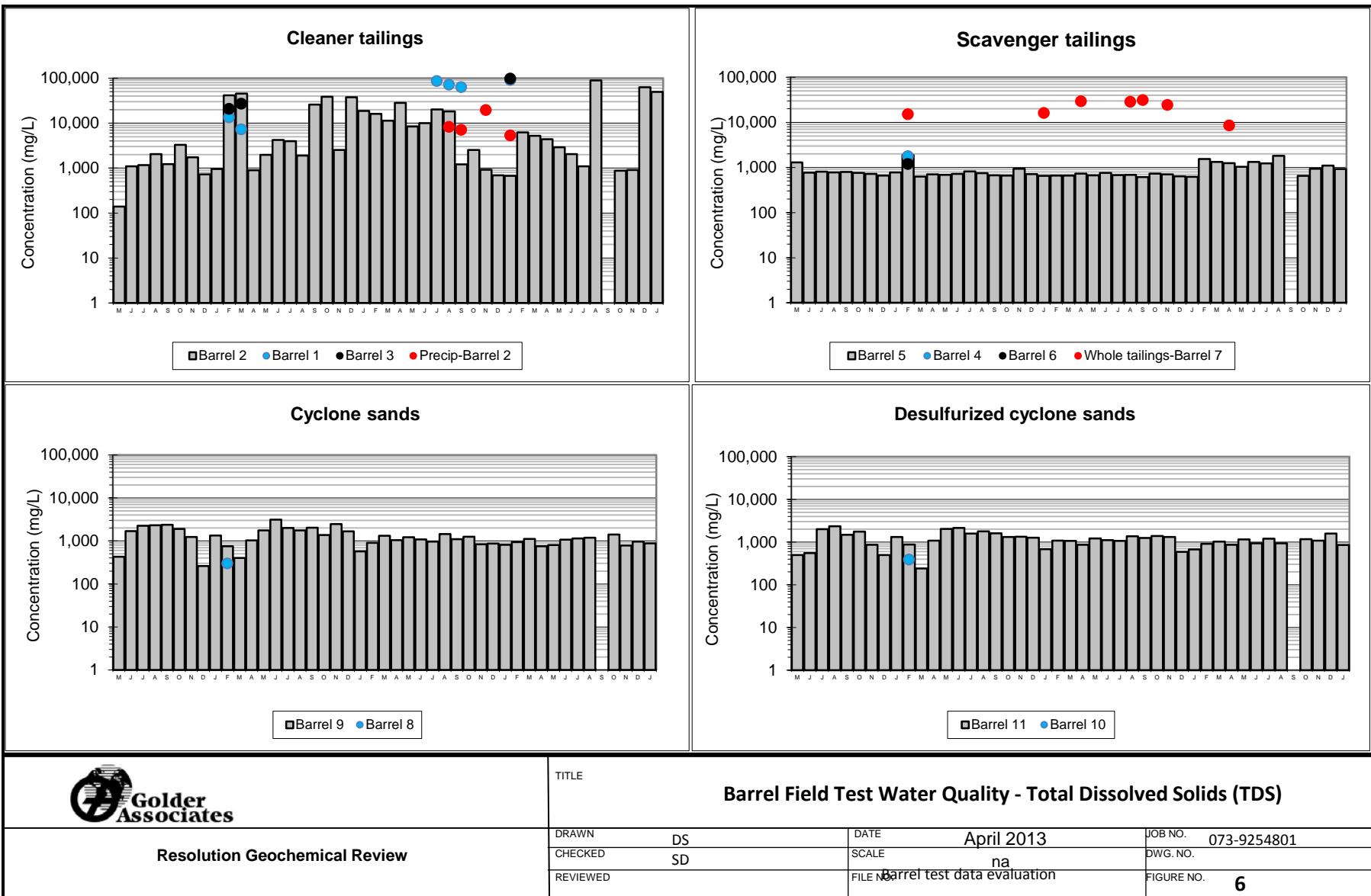


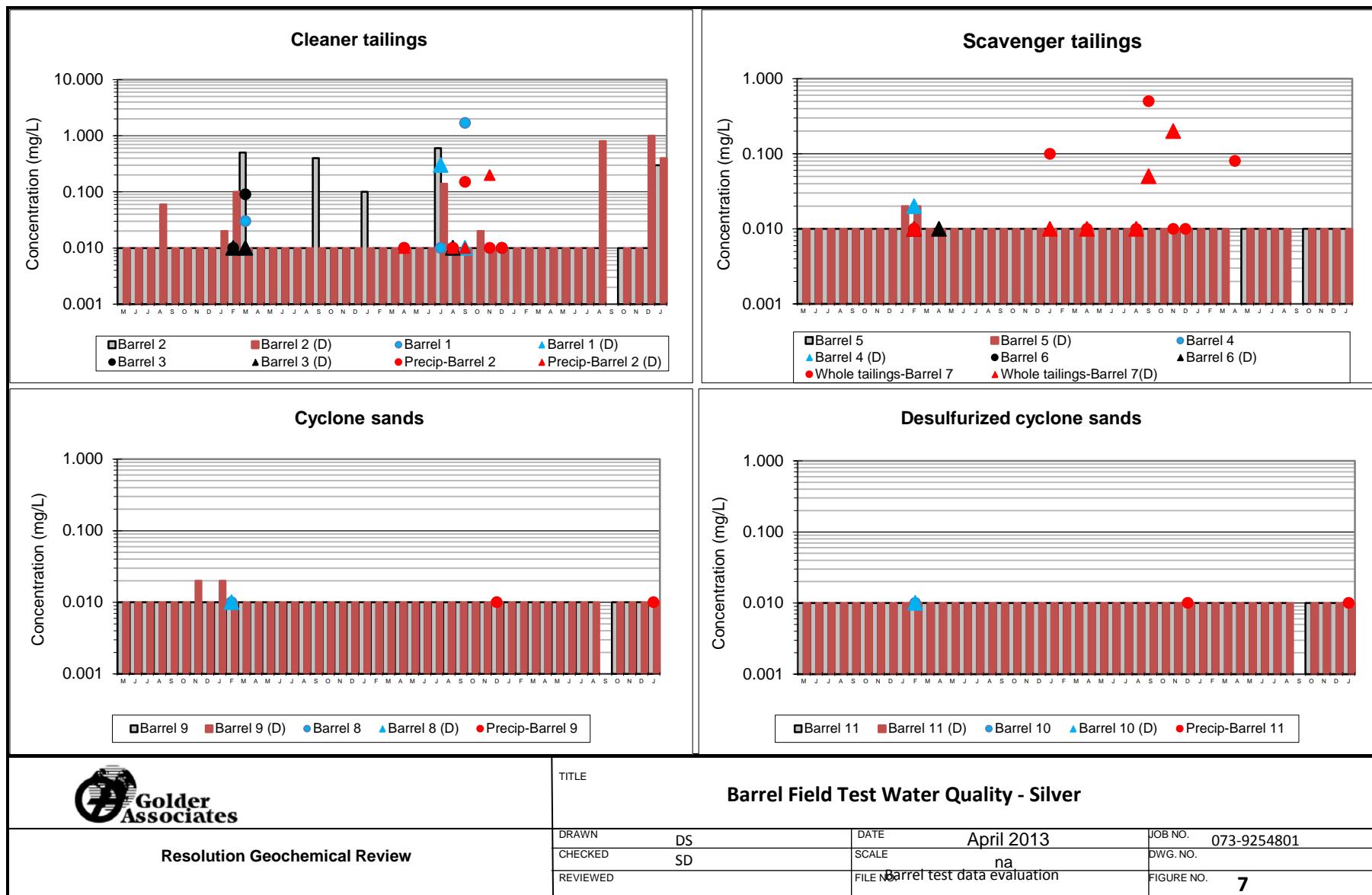


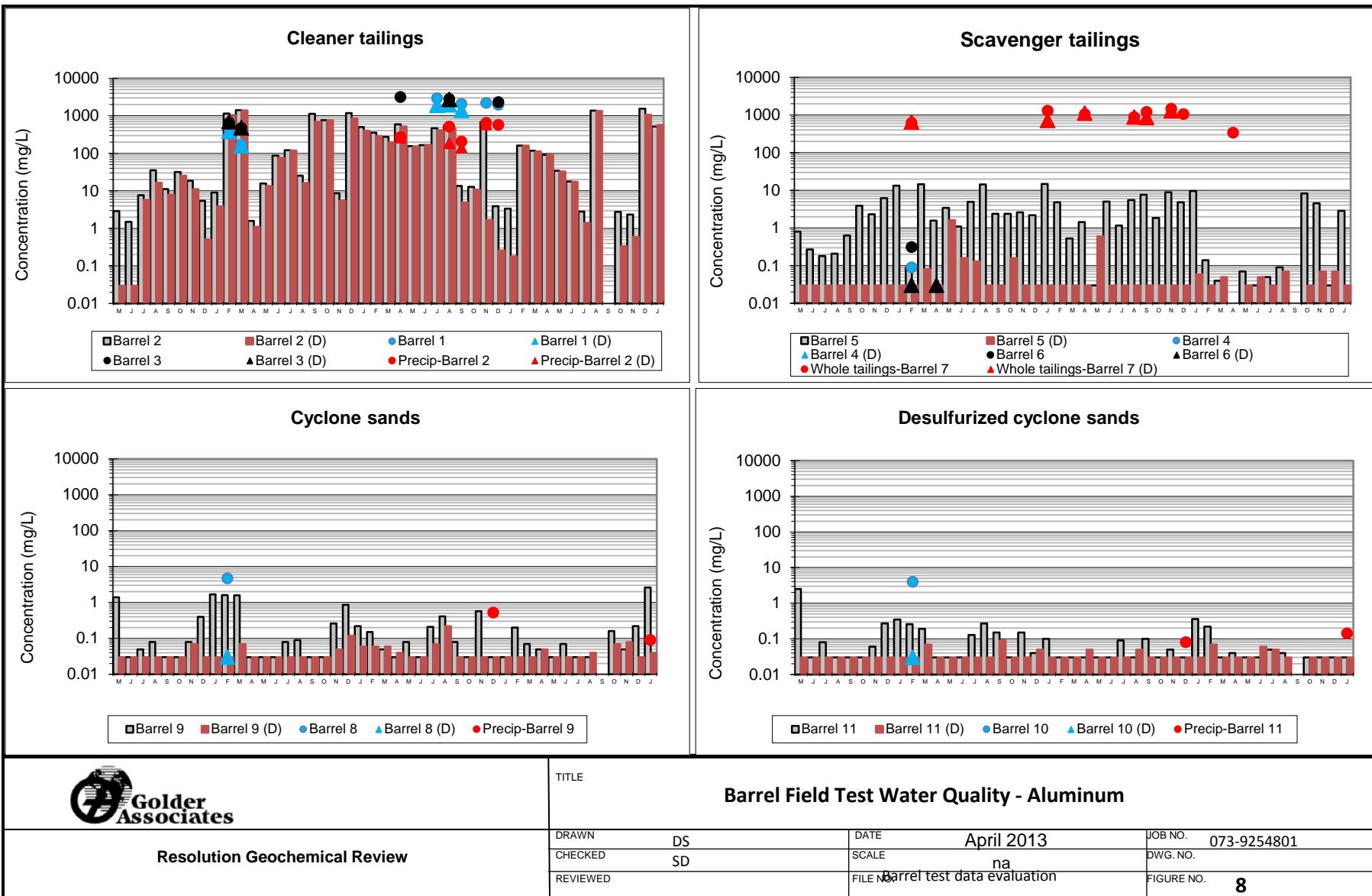


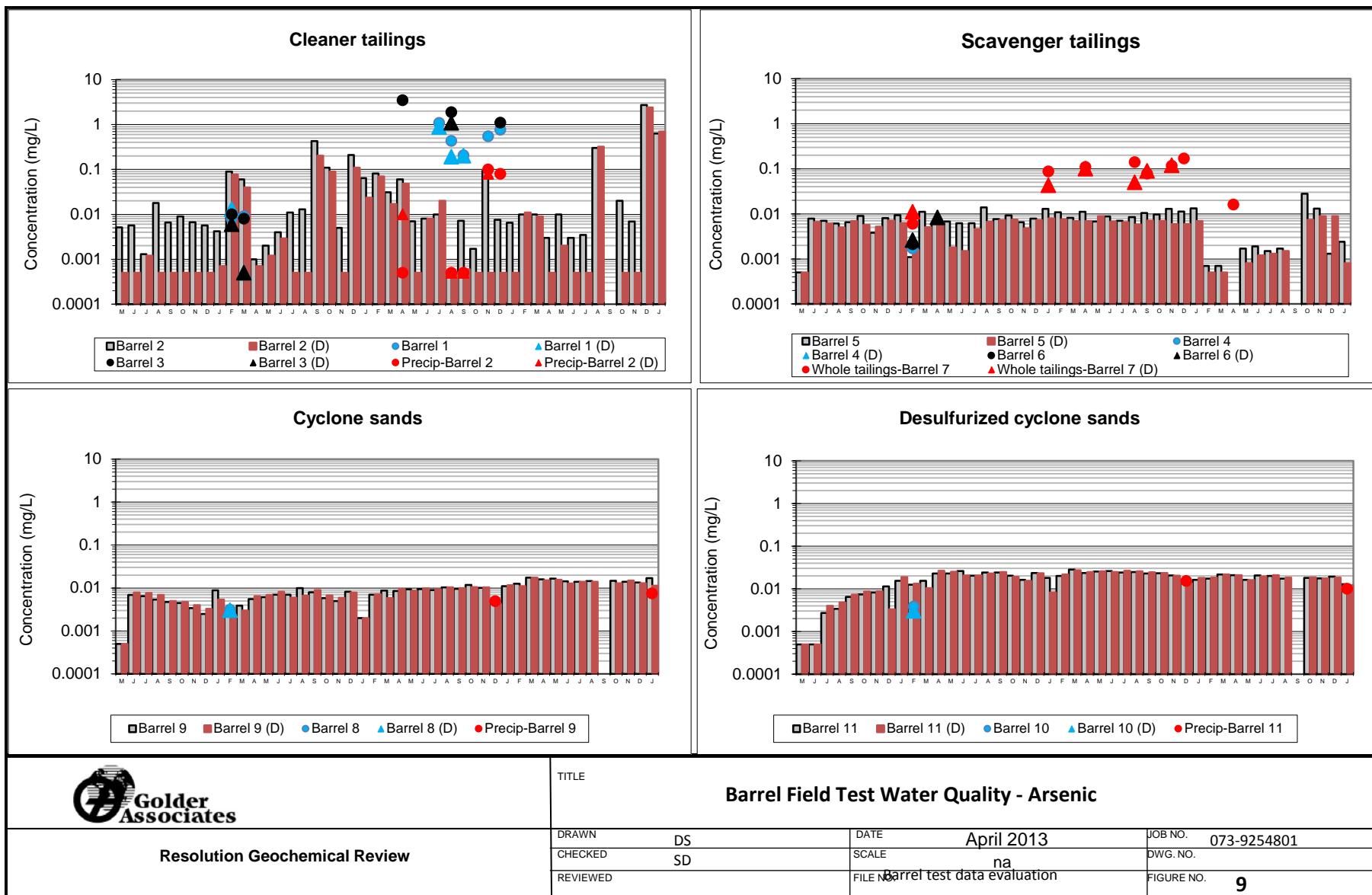


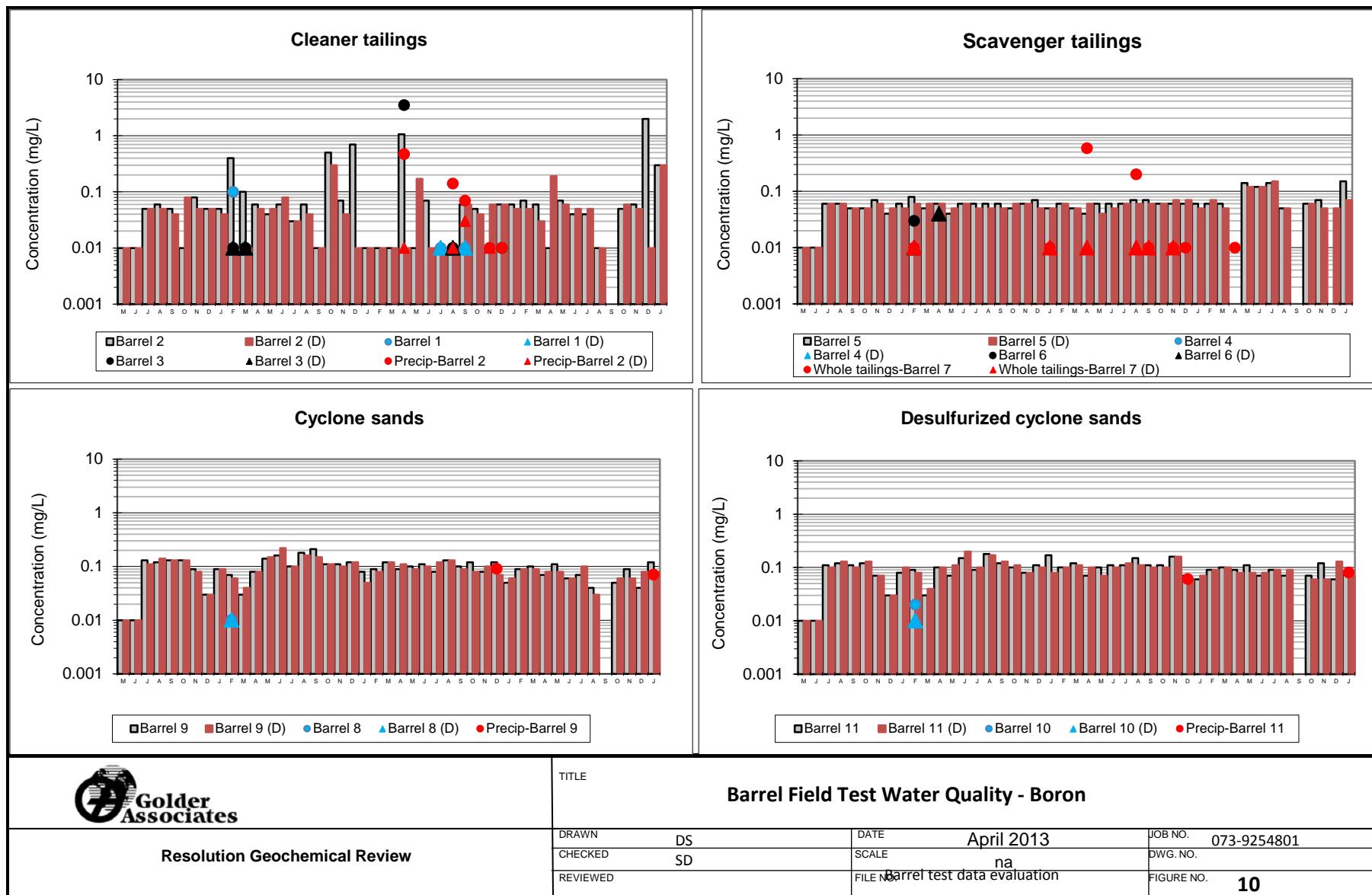


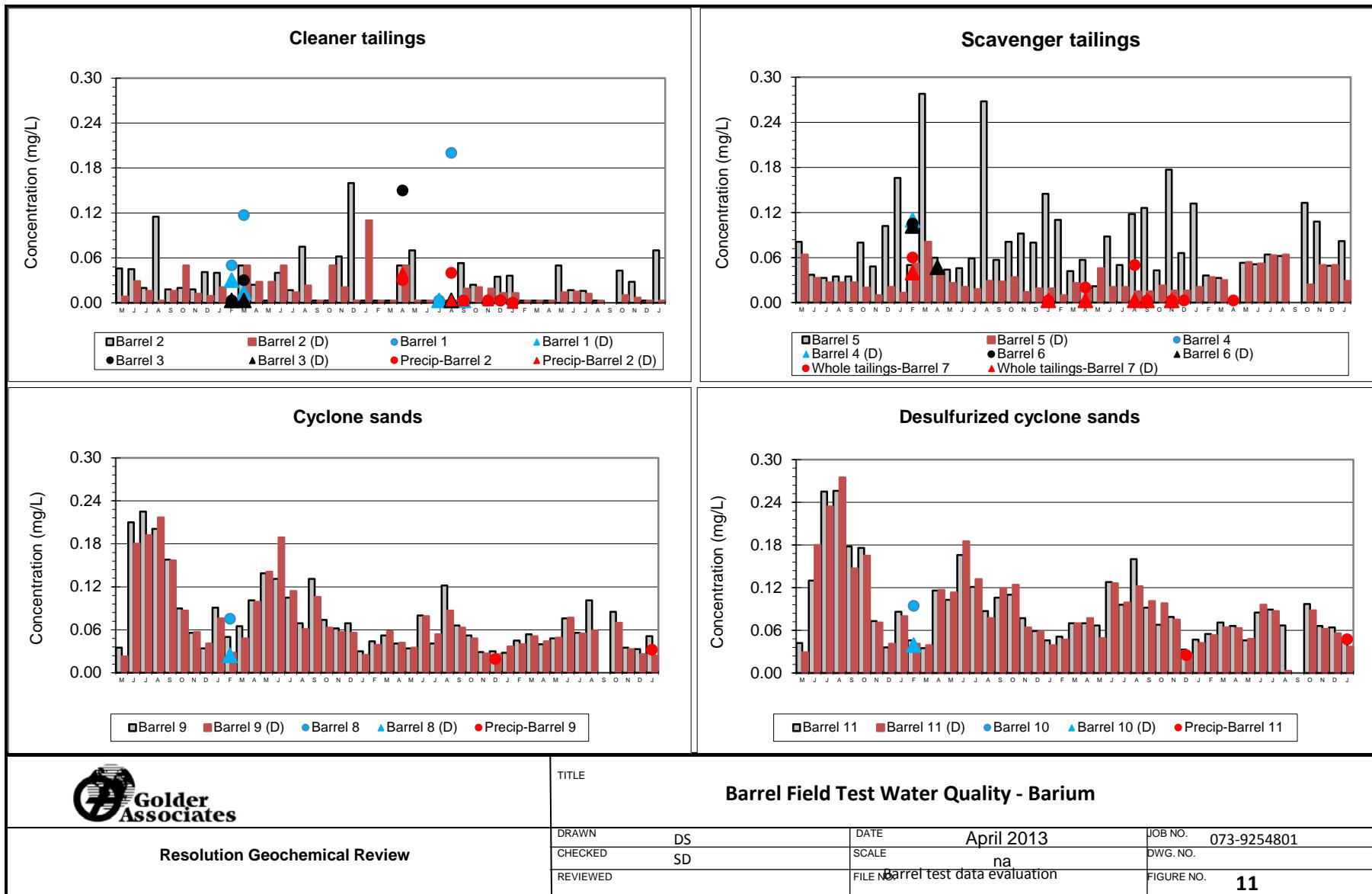


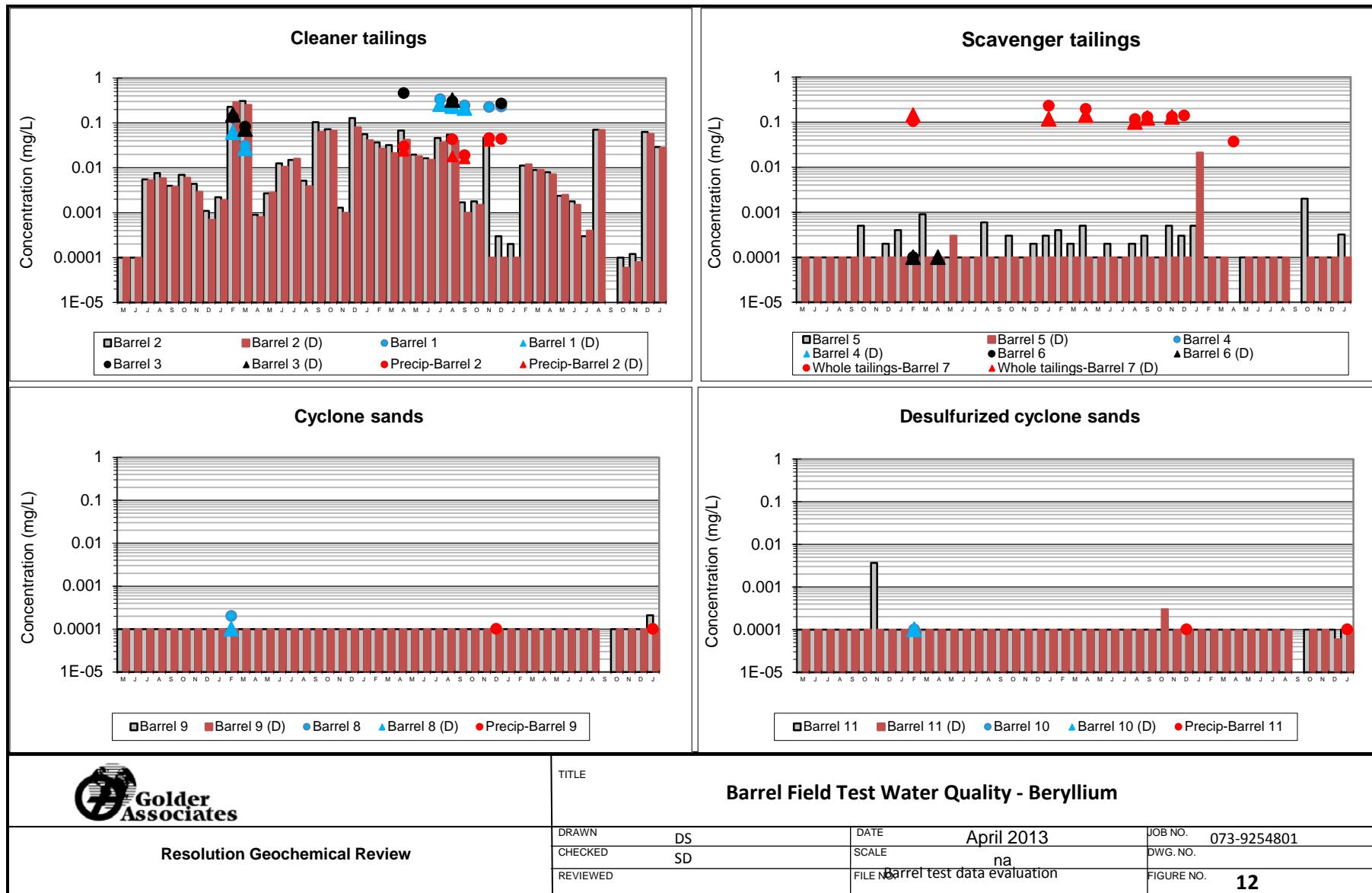


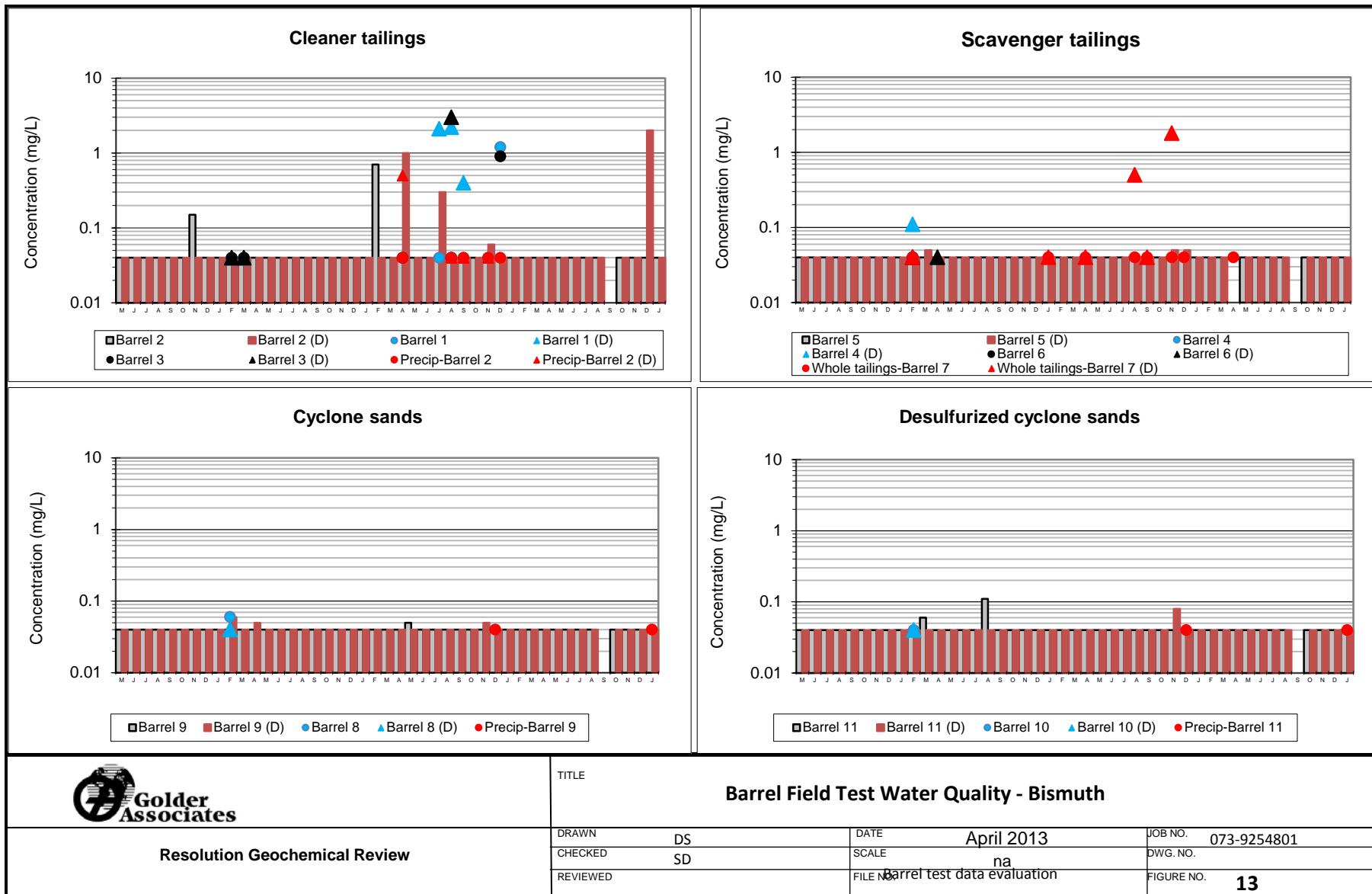


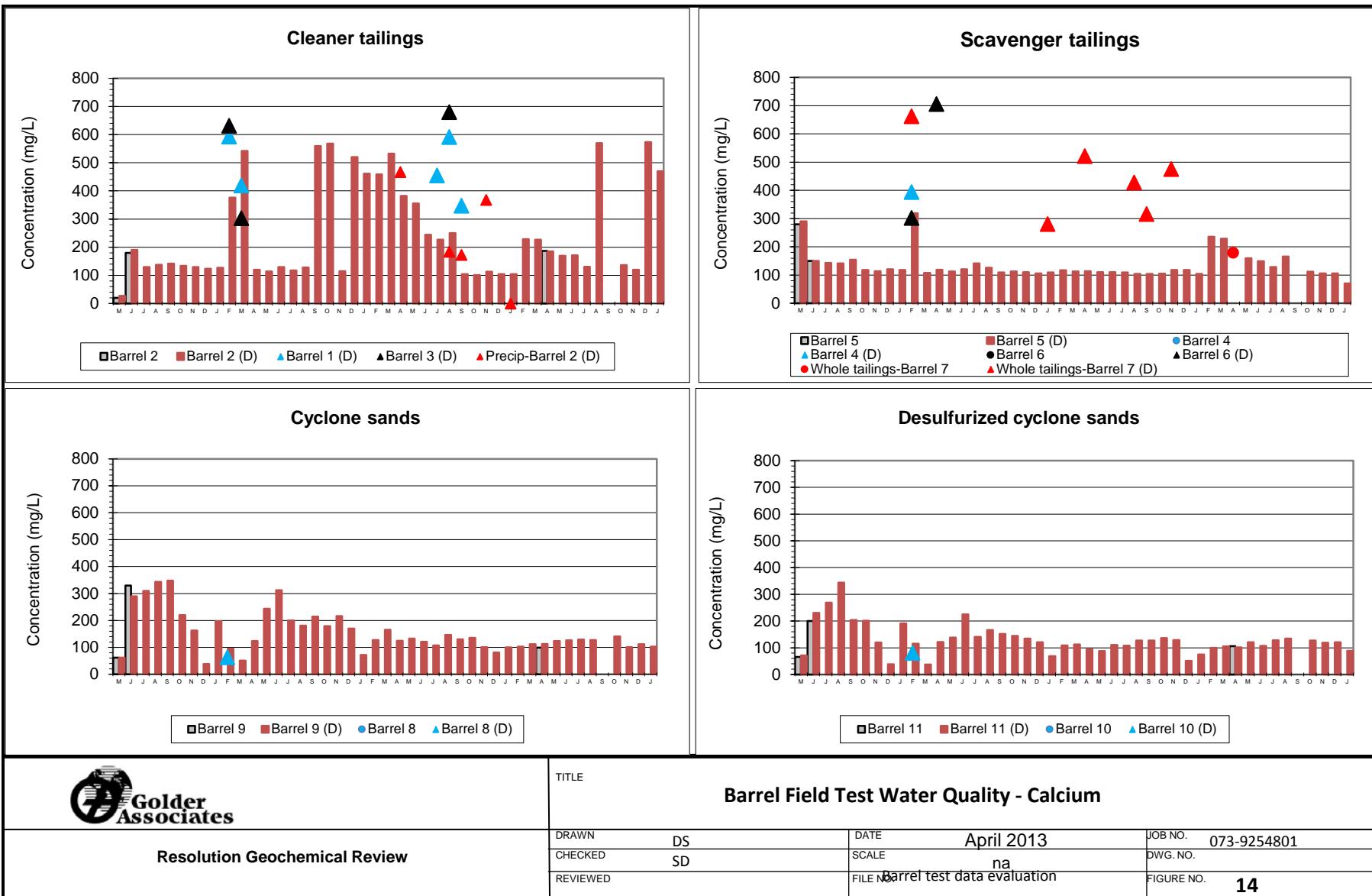


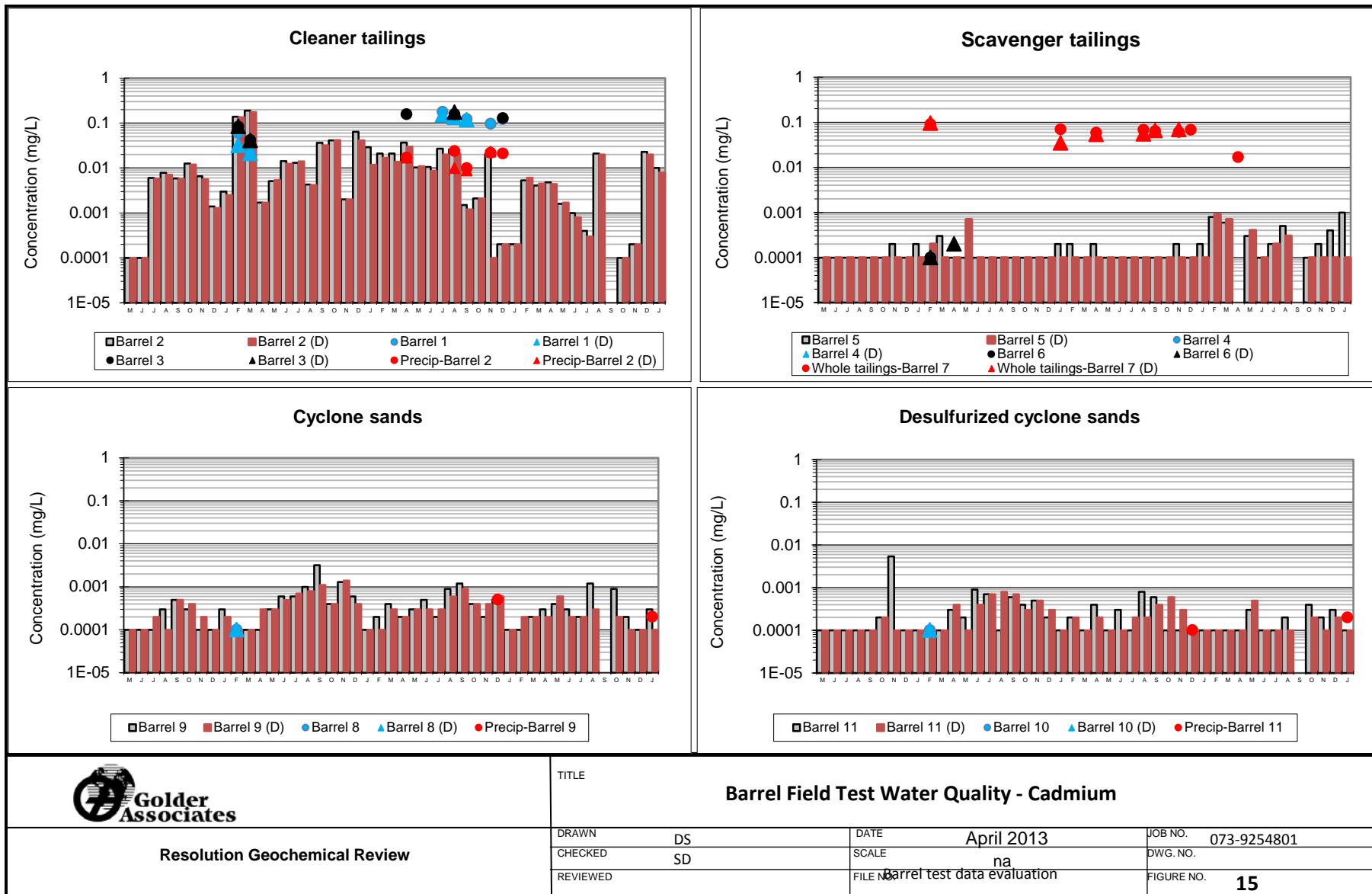


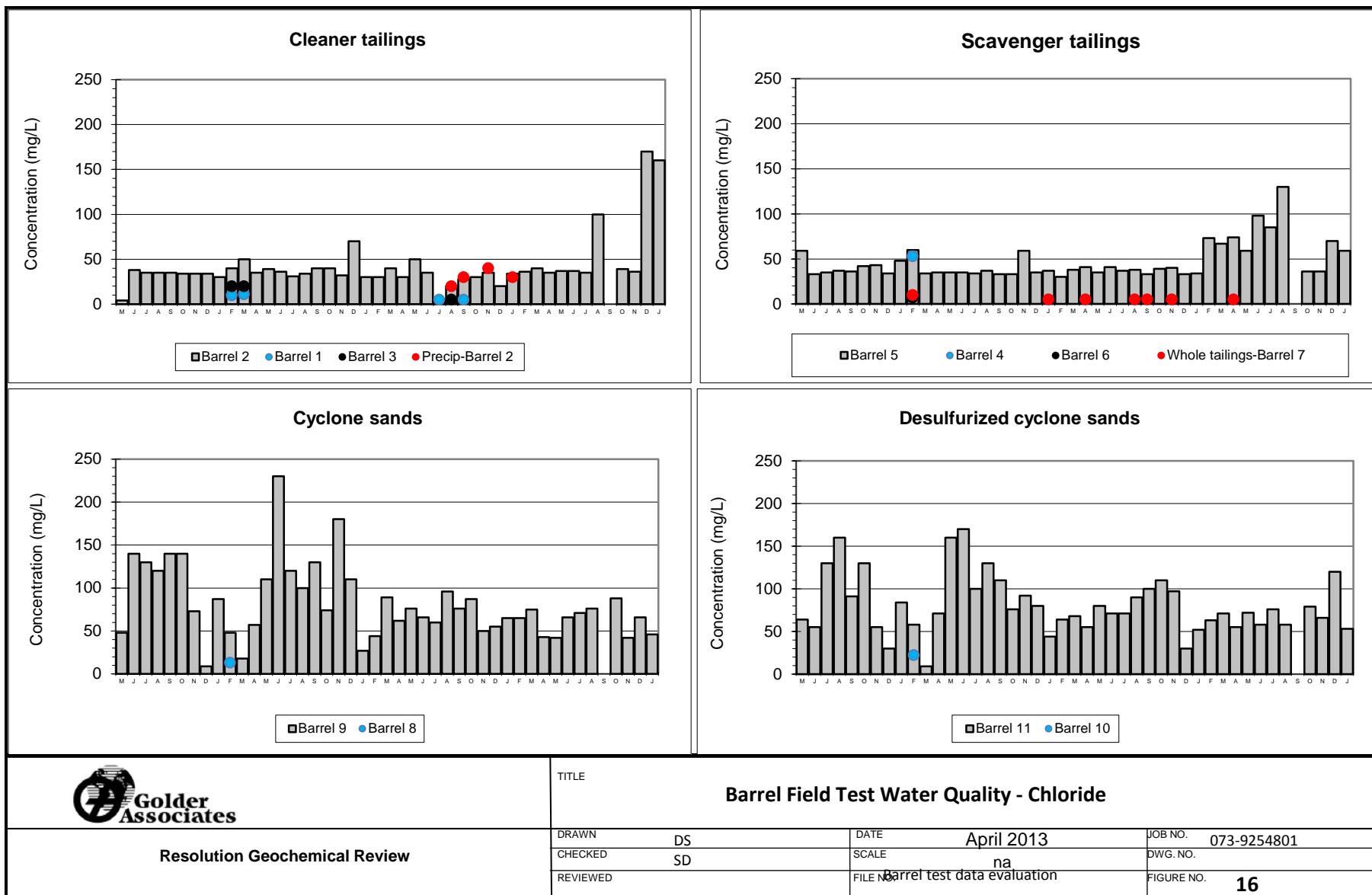


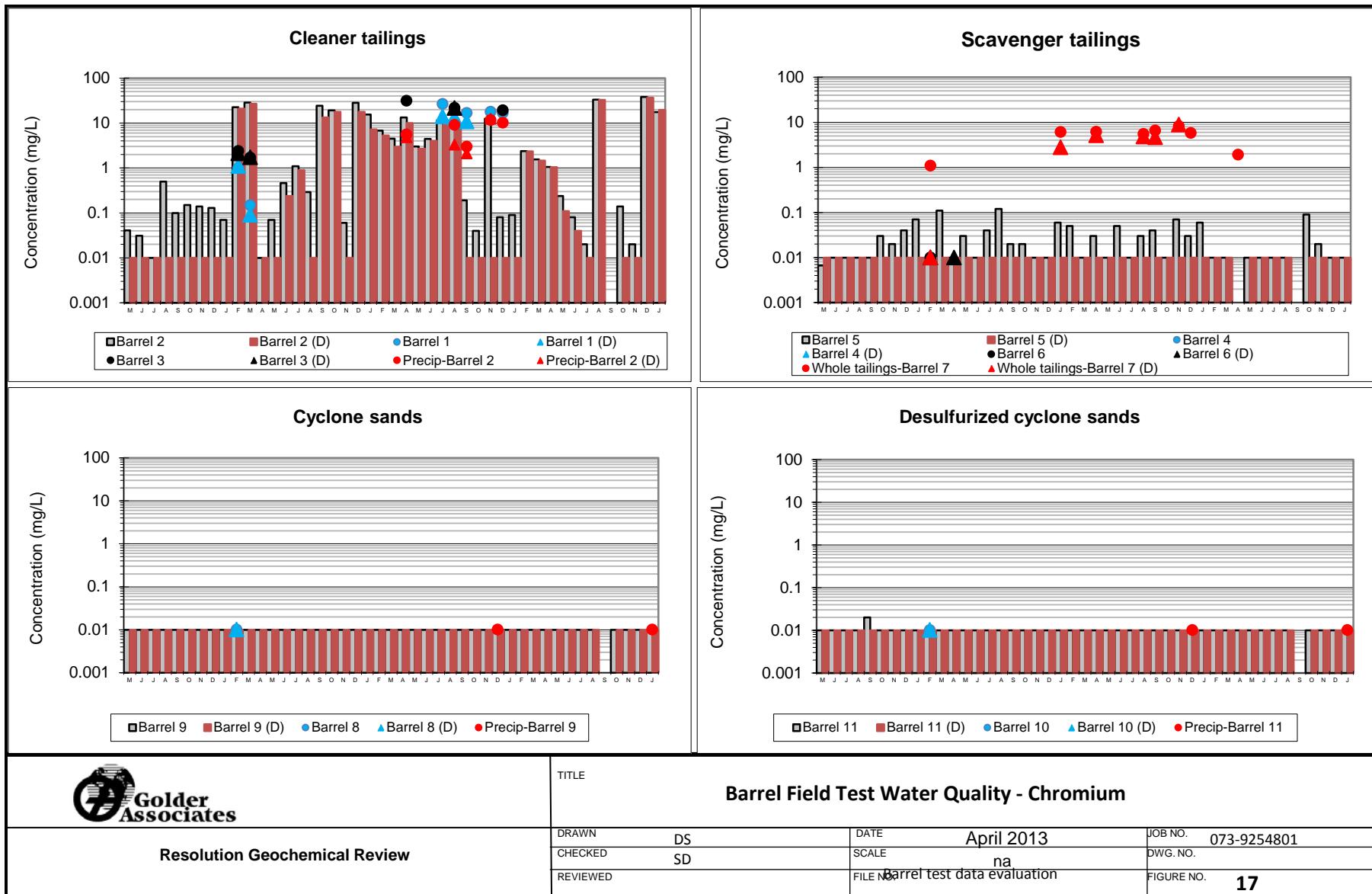


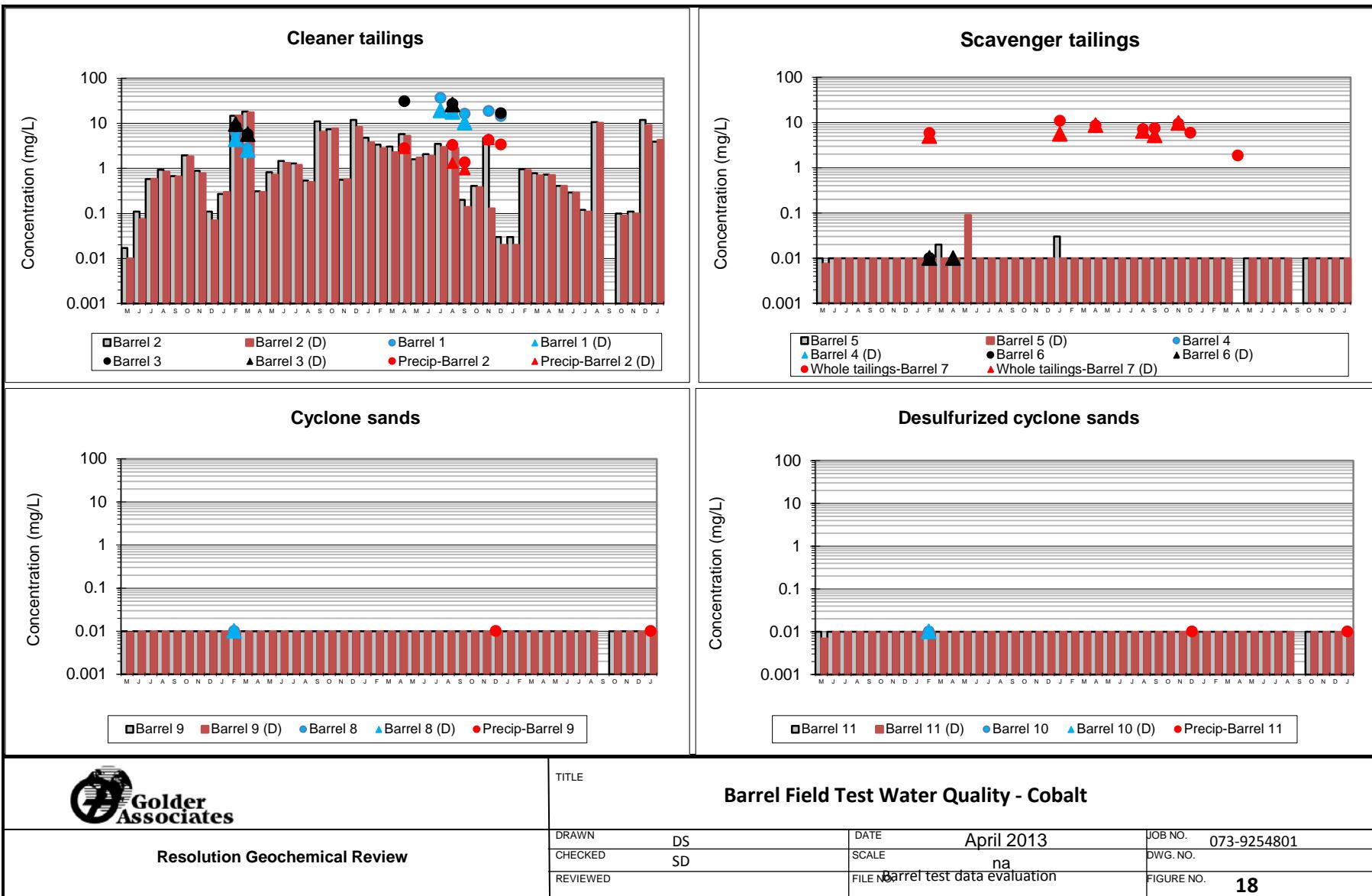


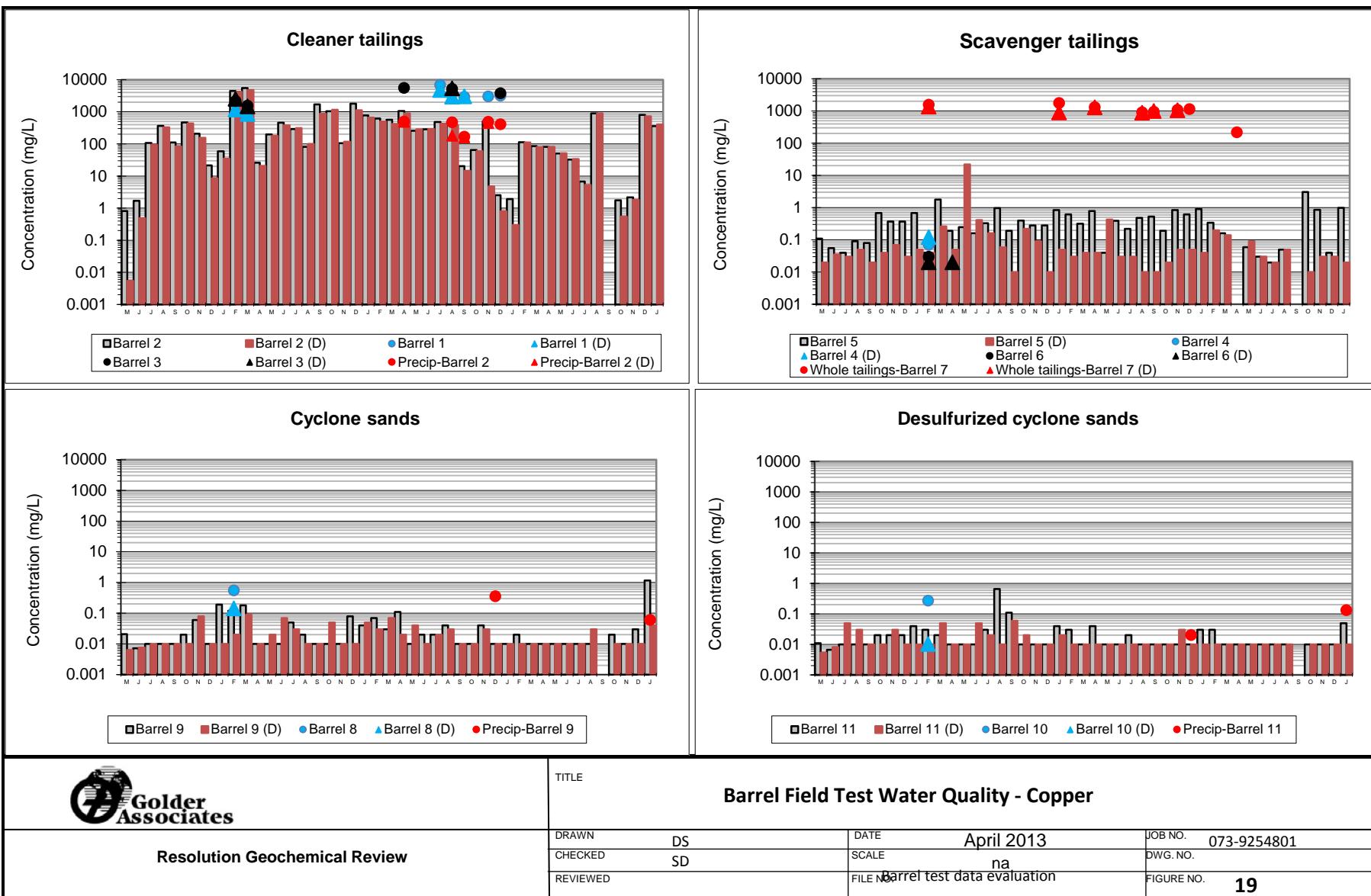


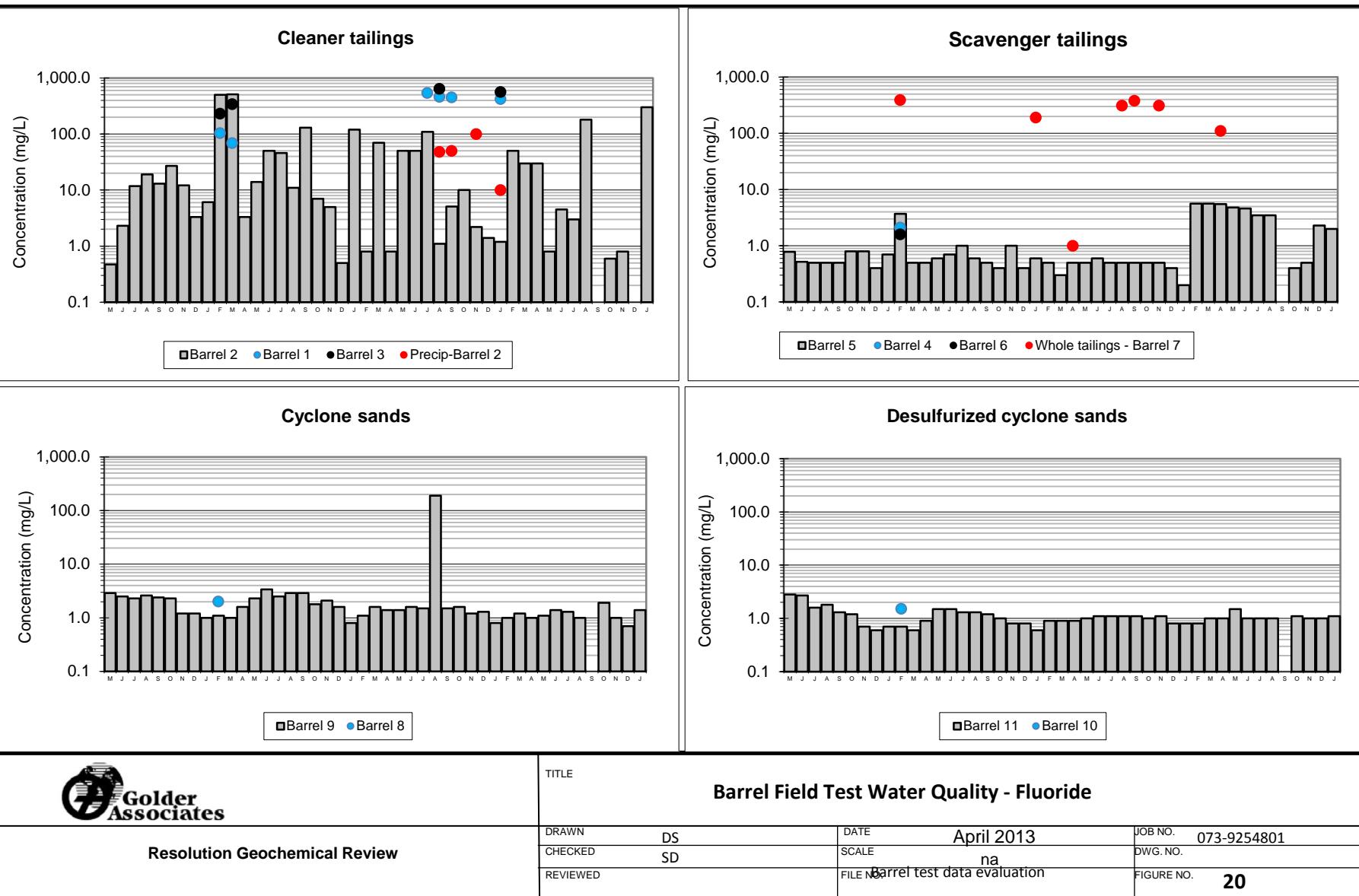


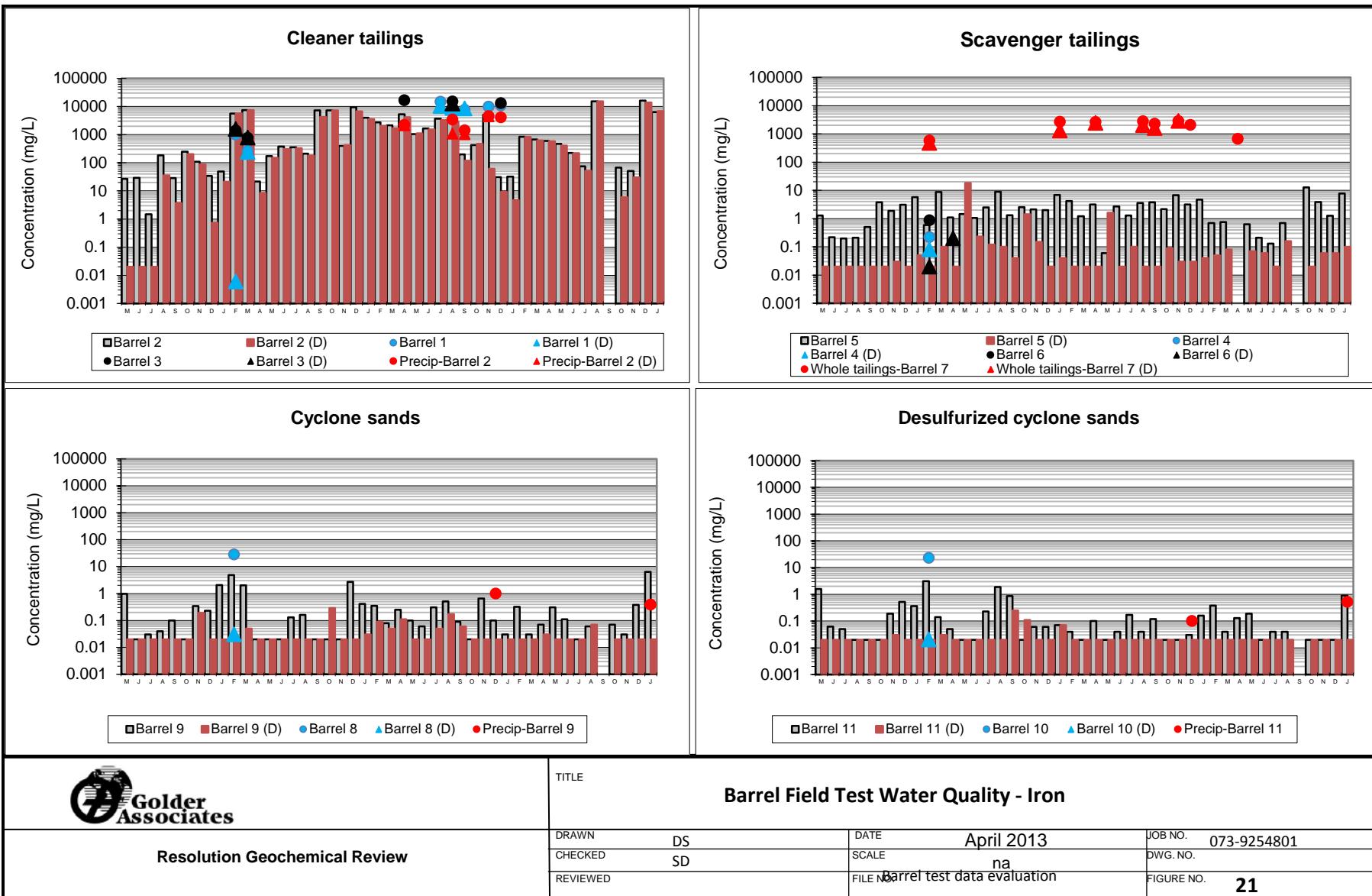


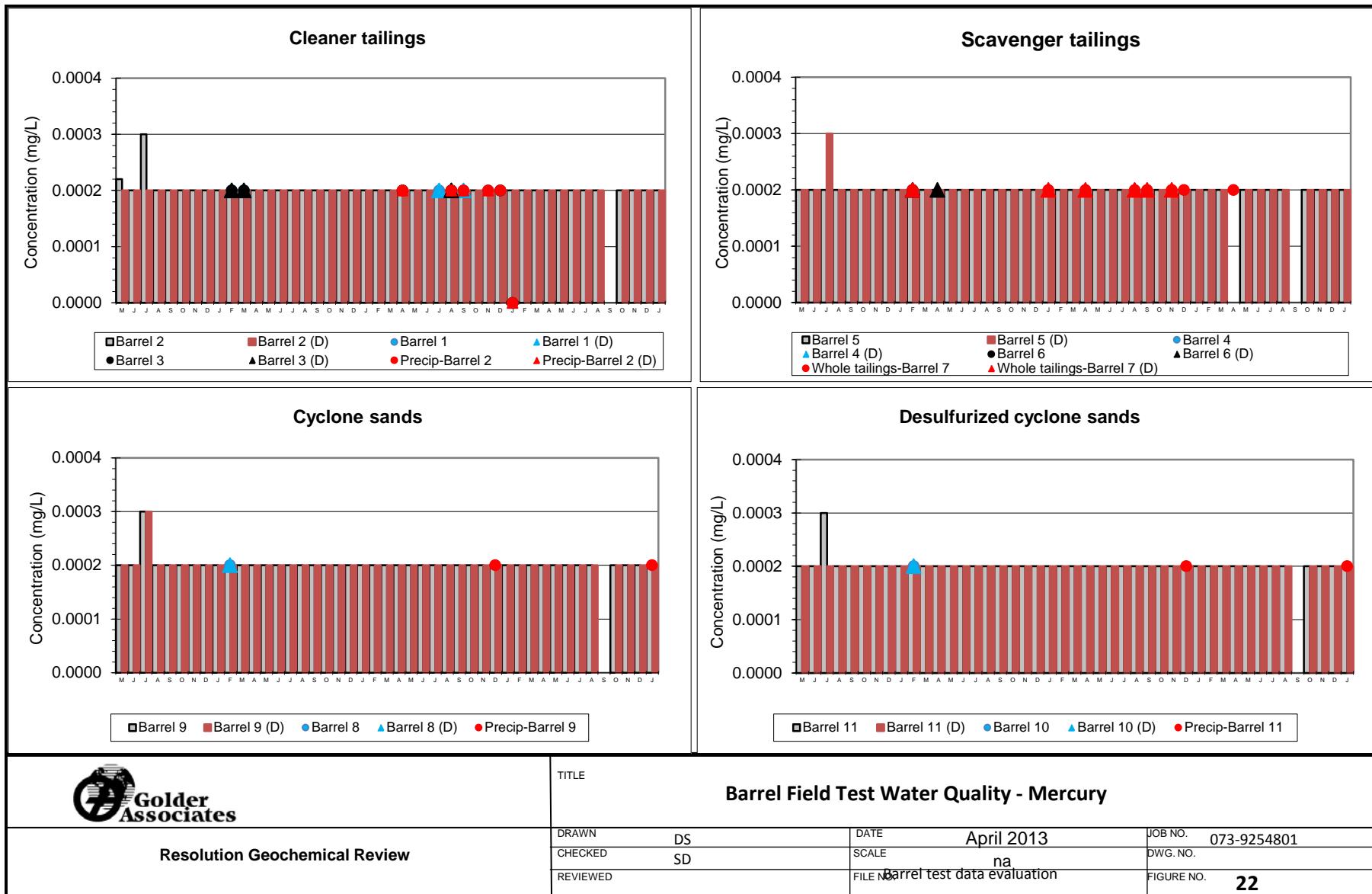








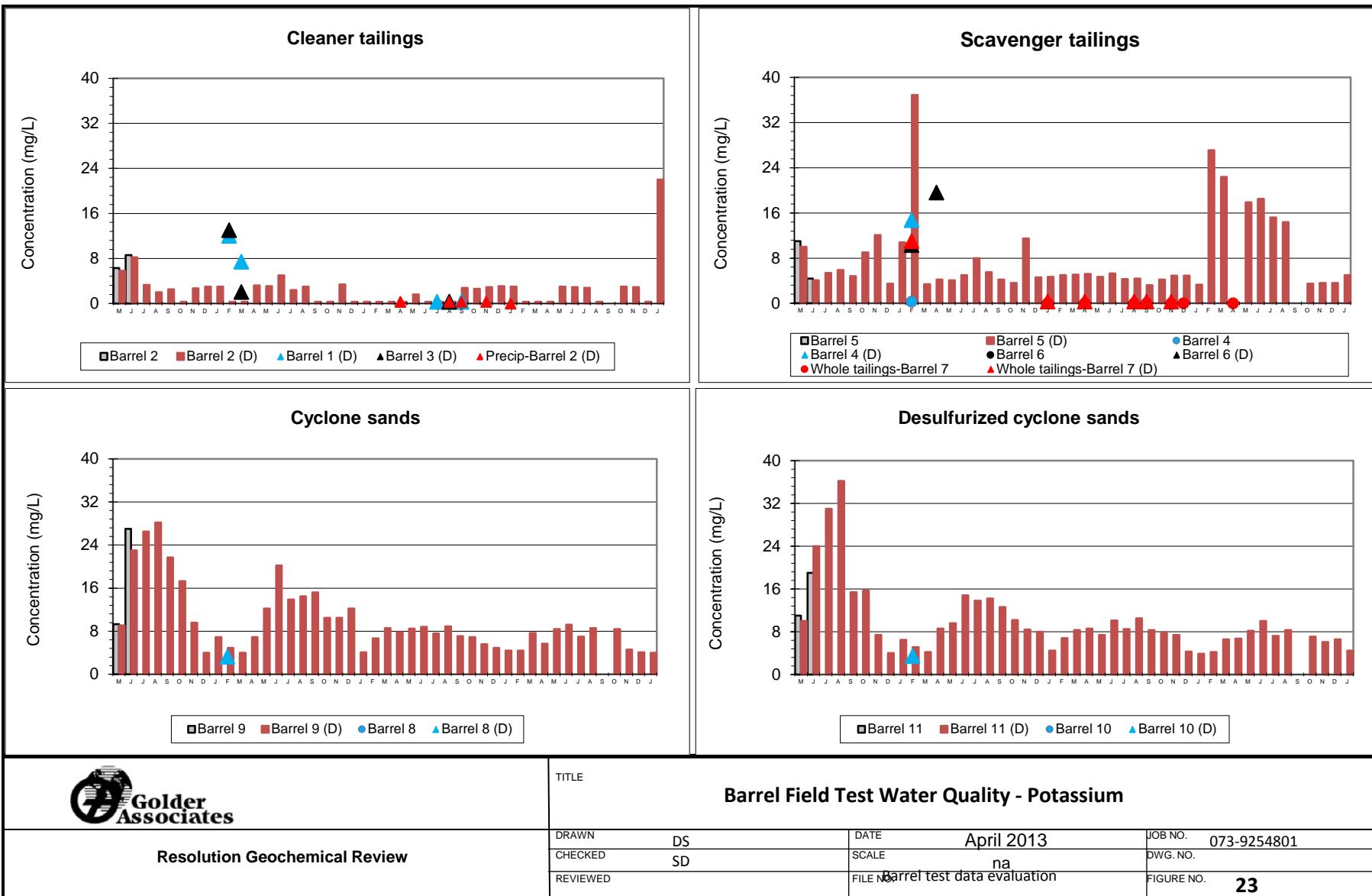


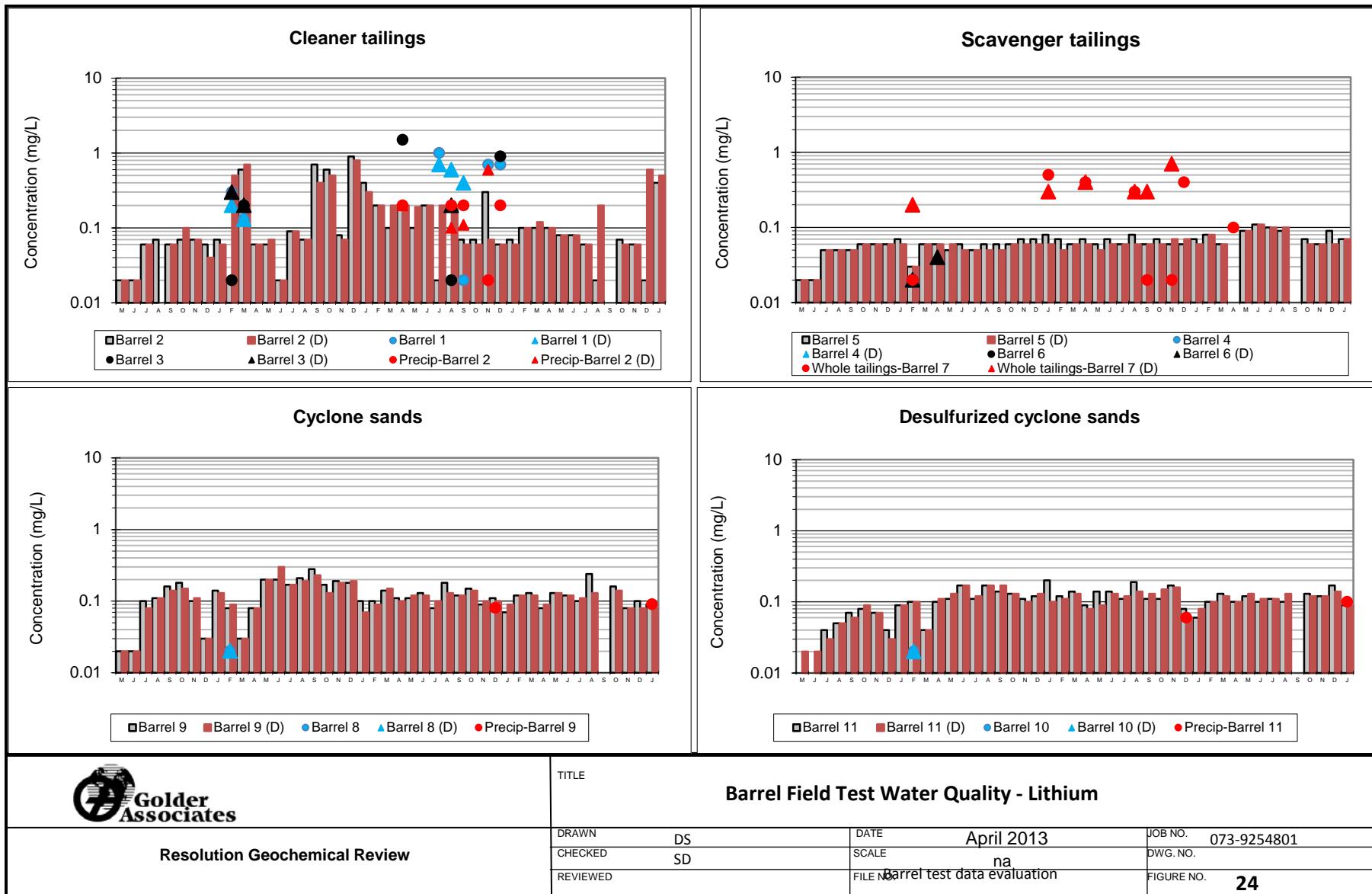


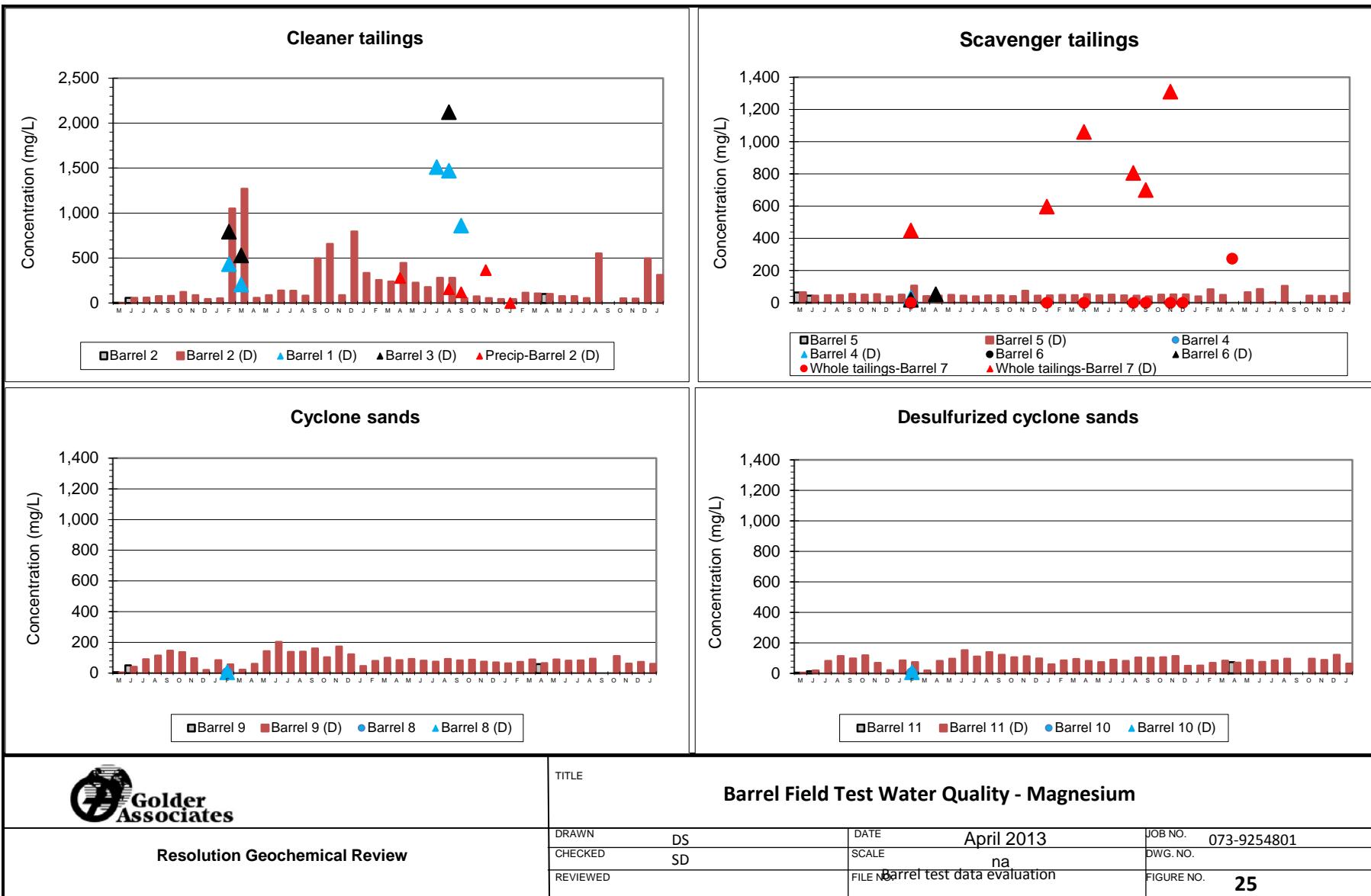
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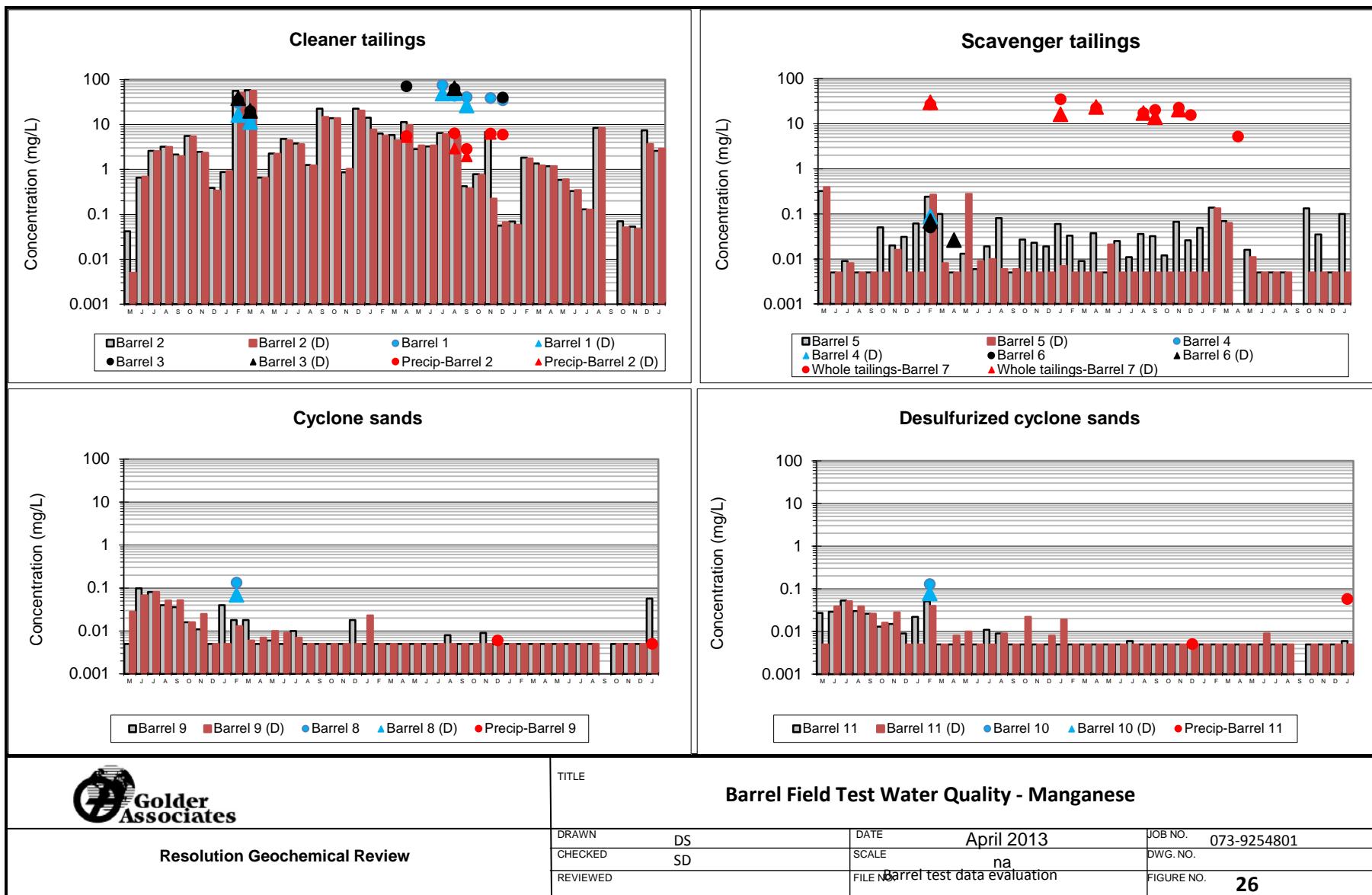
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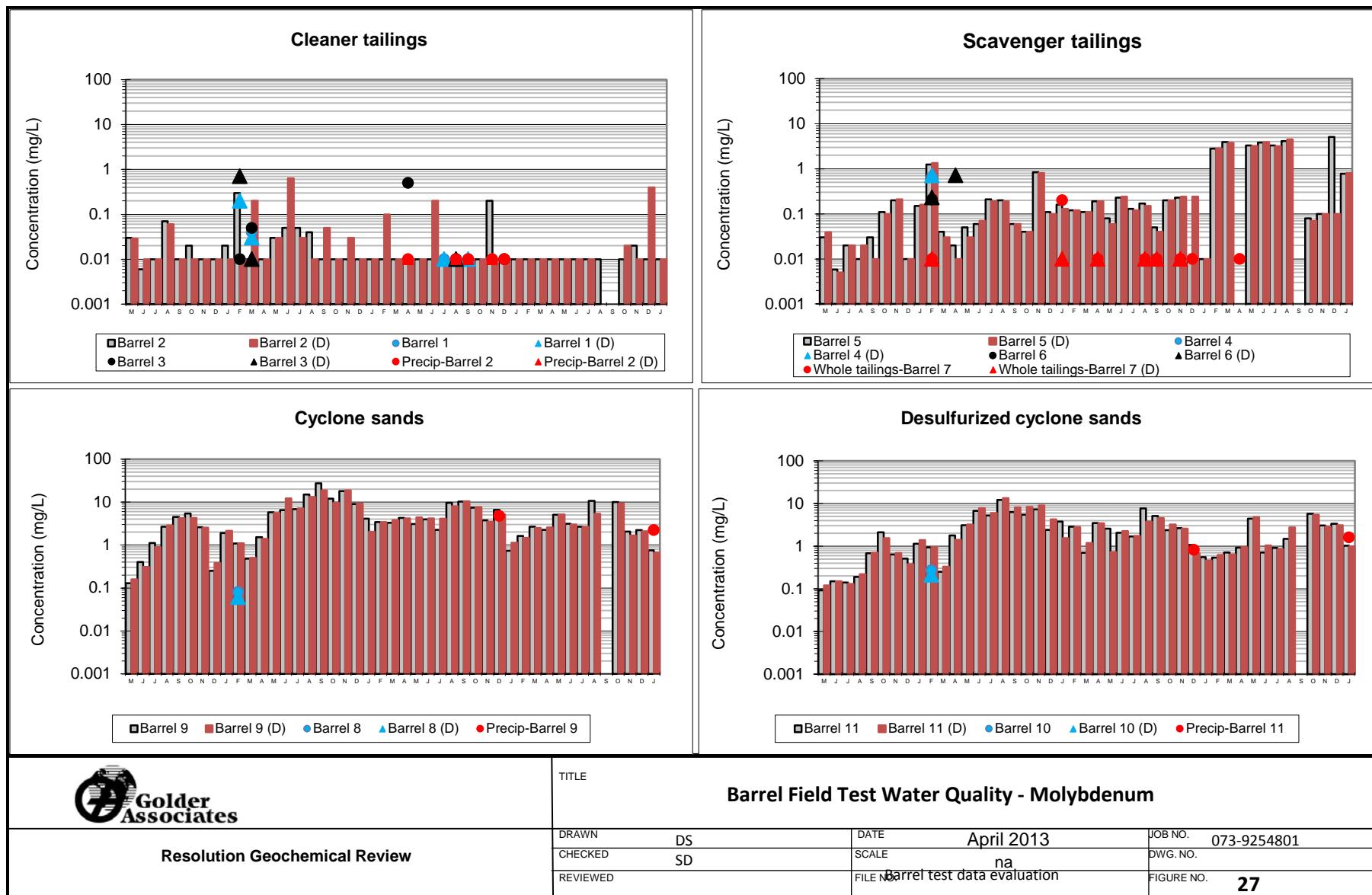
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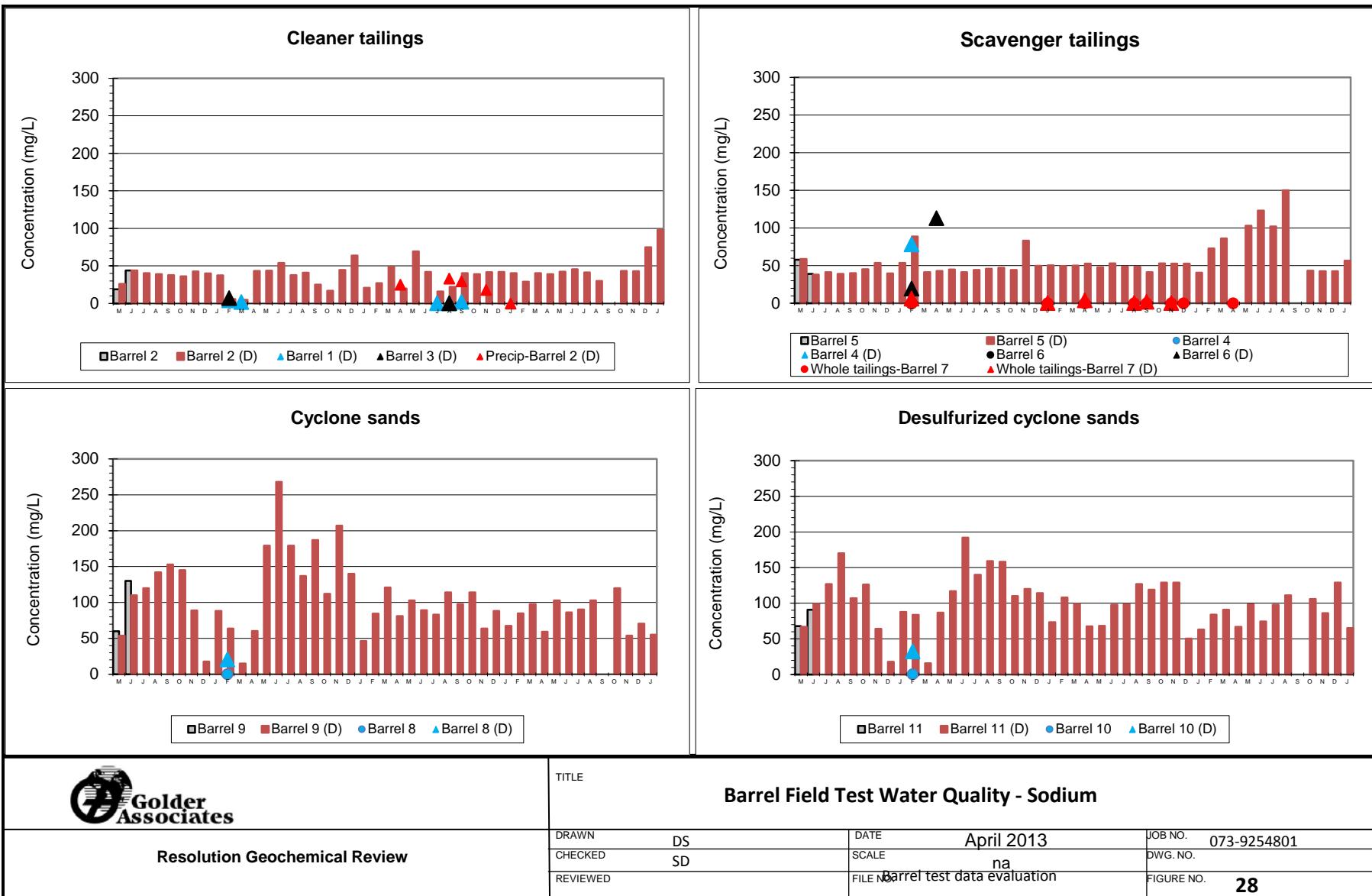










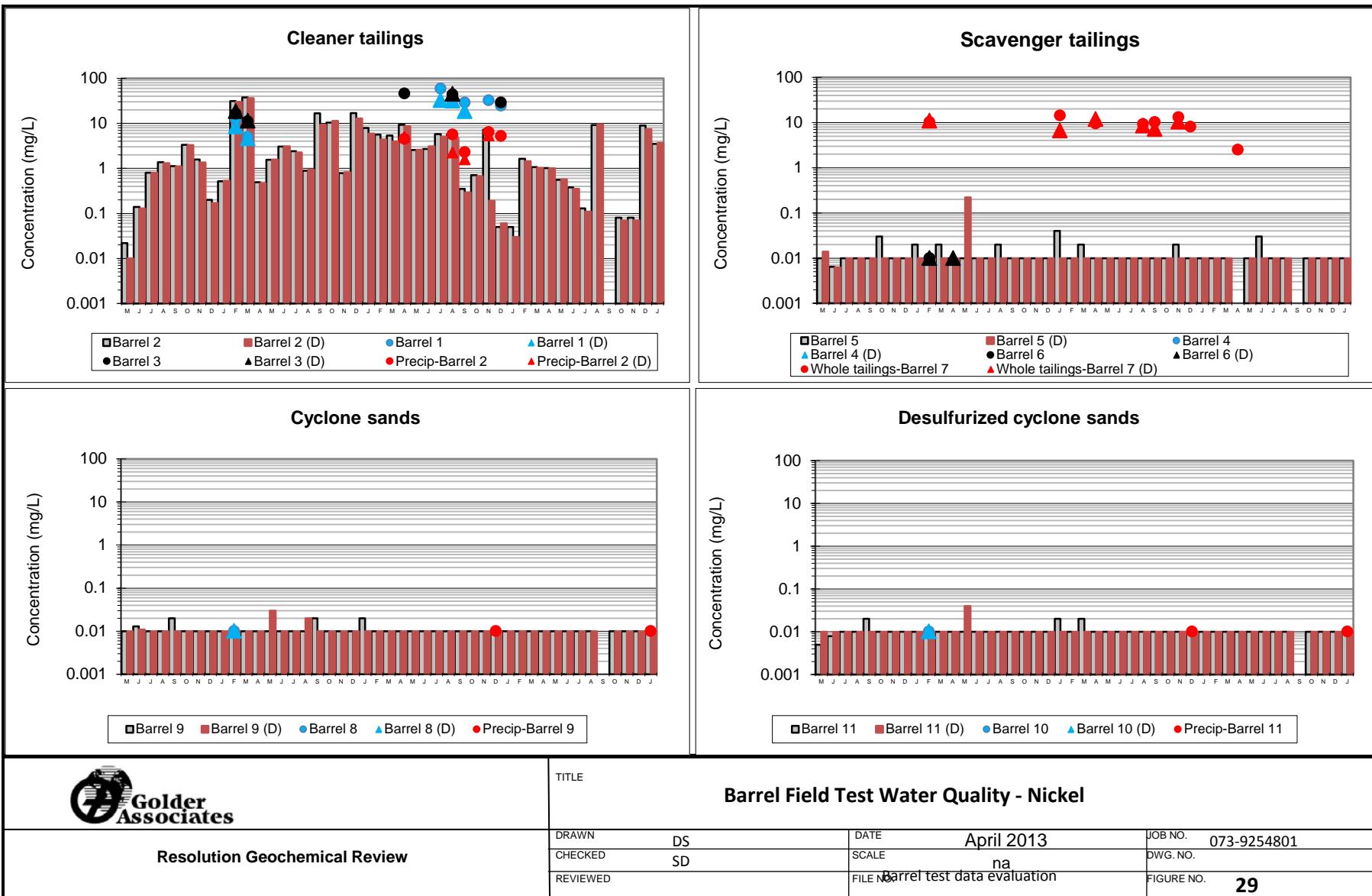


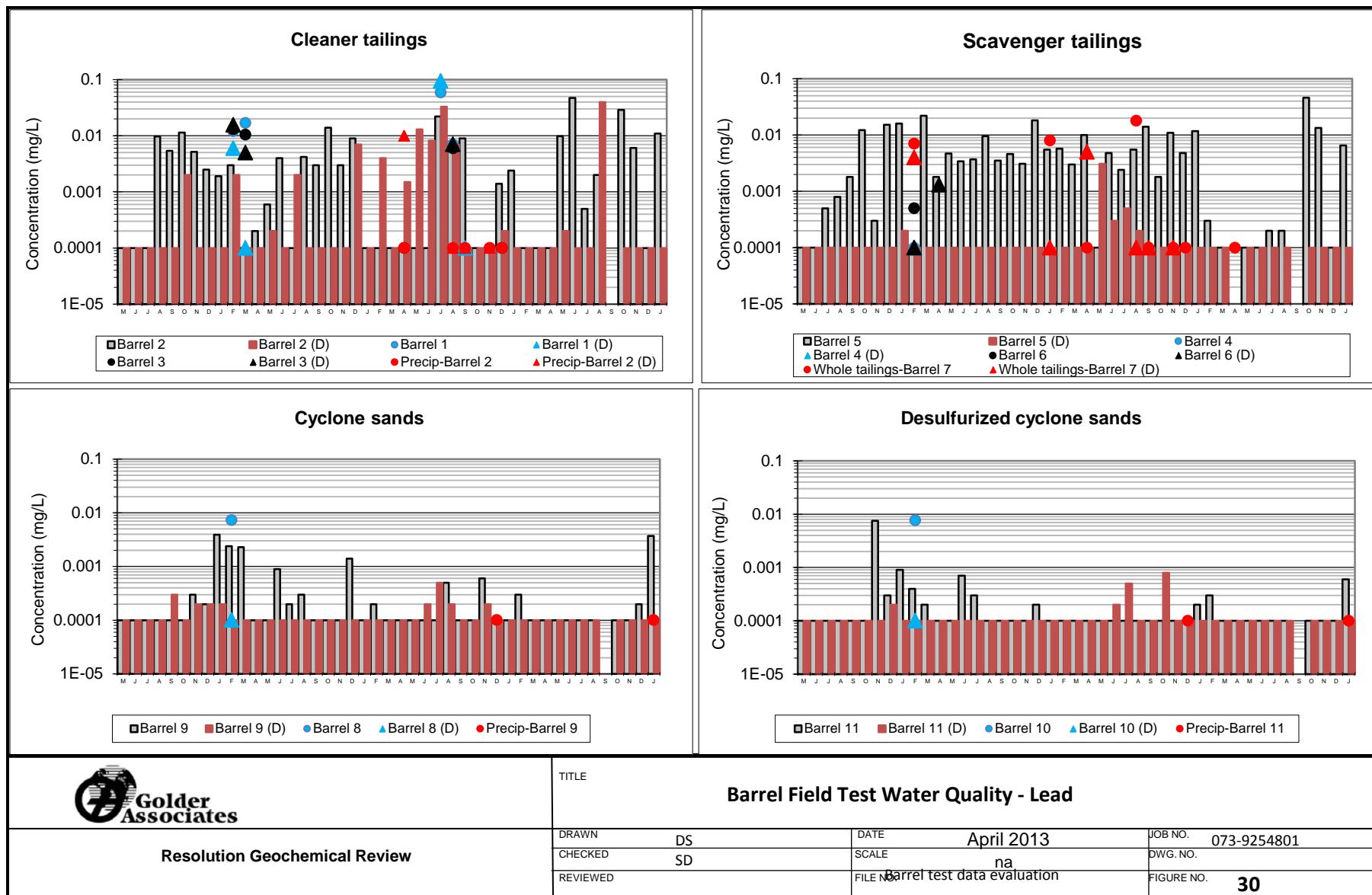
Resolution Geochemical Review

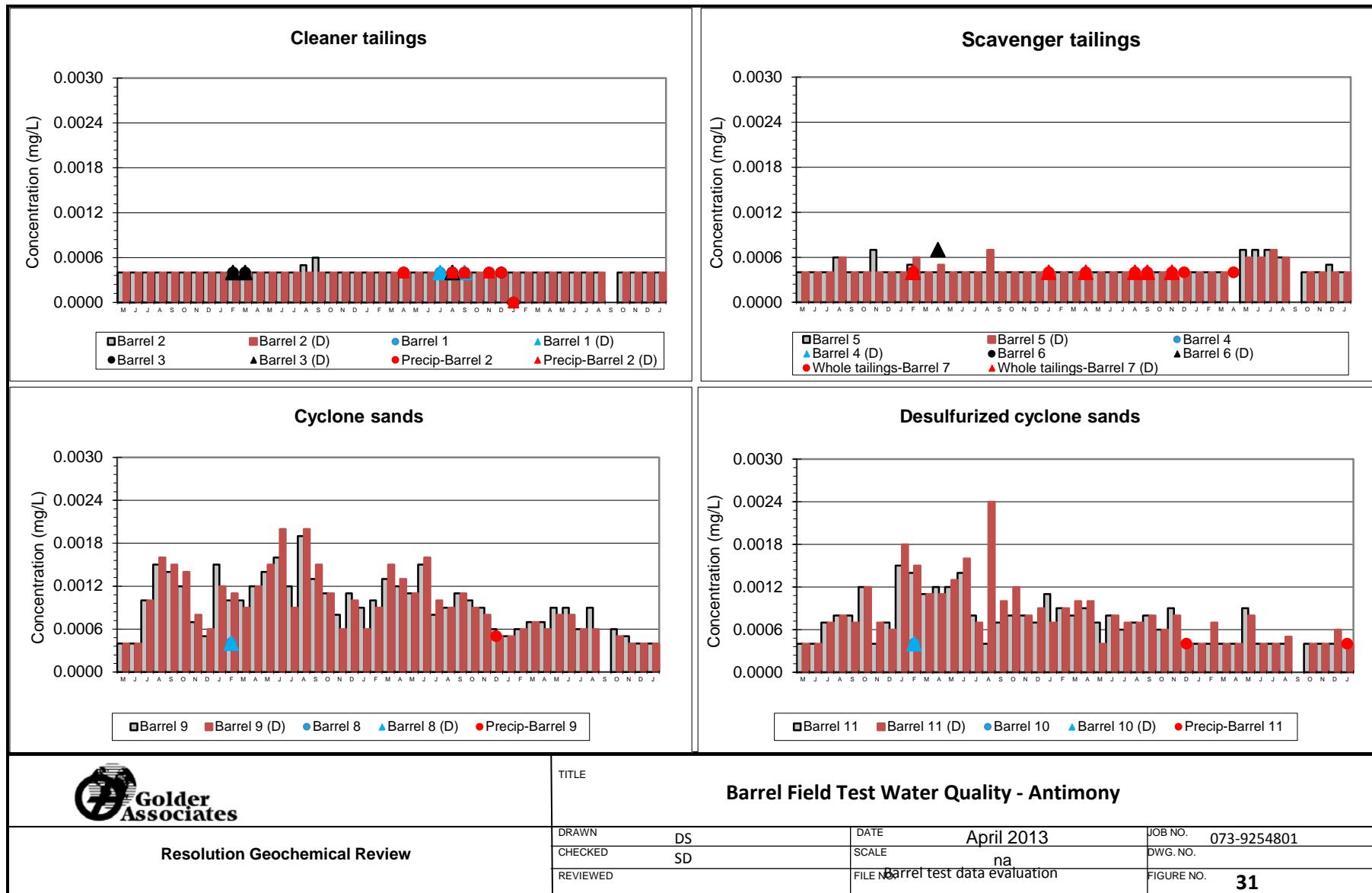
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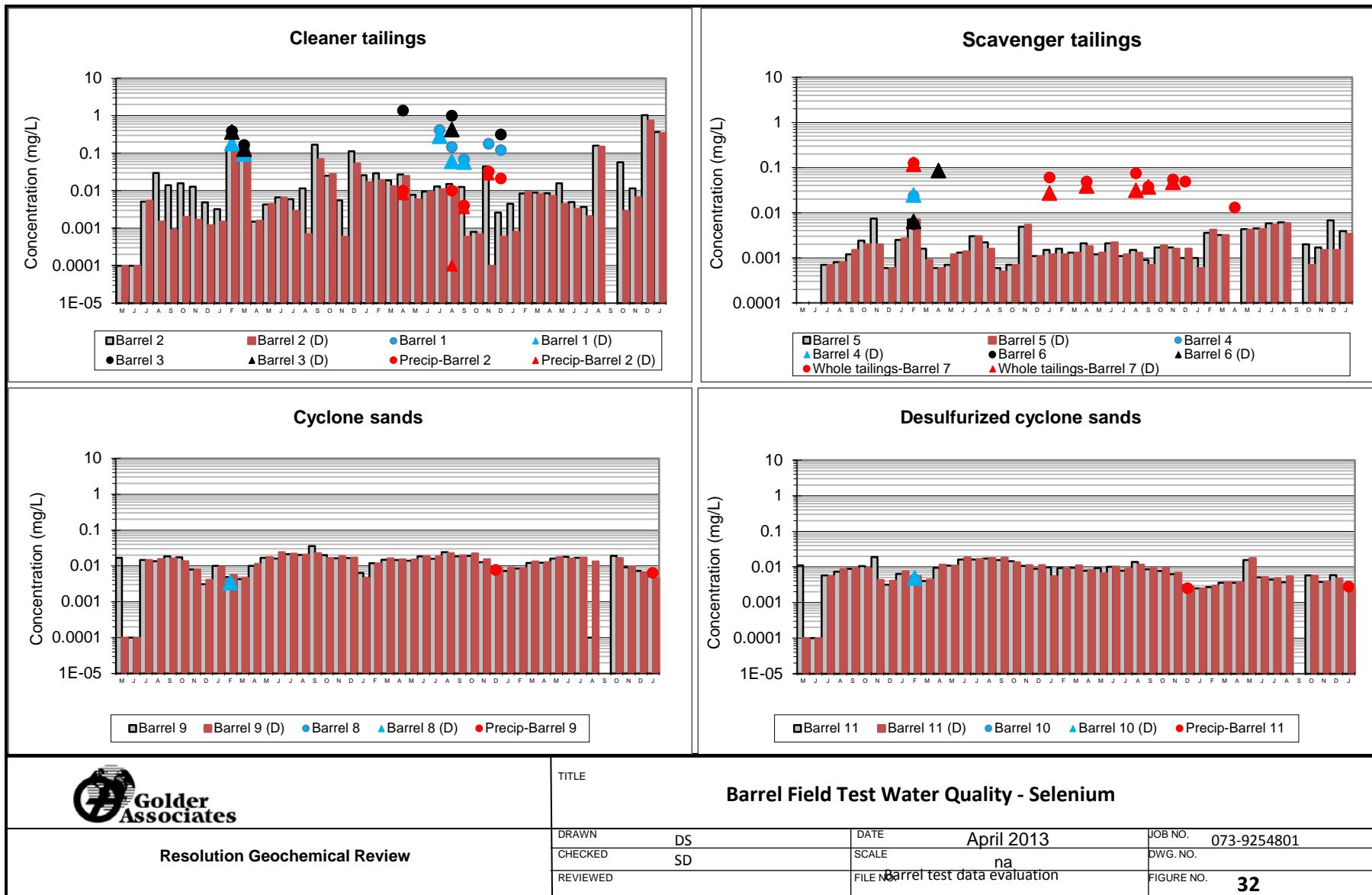
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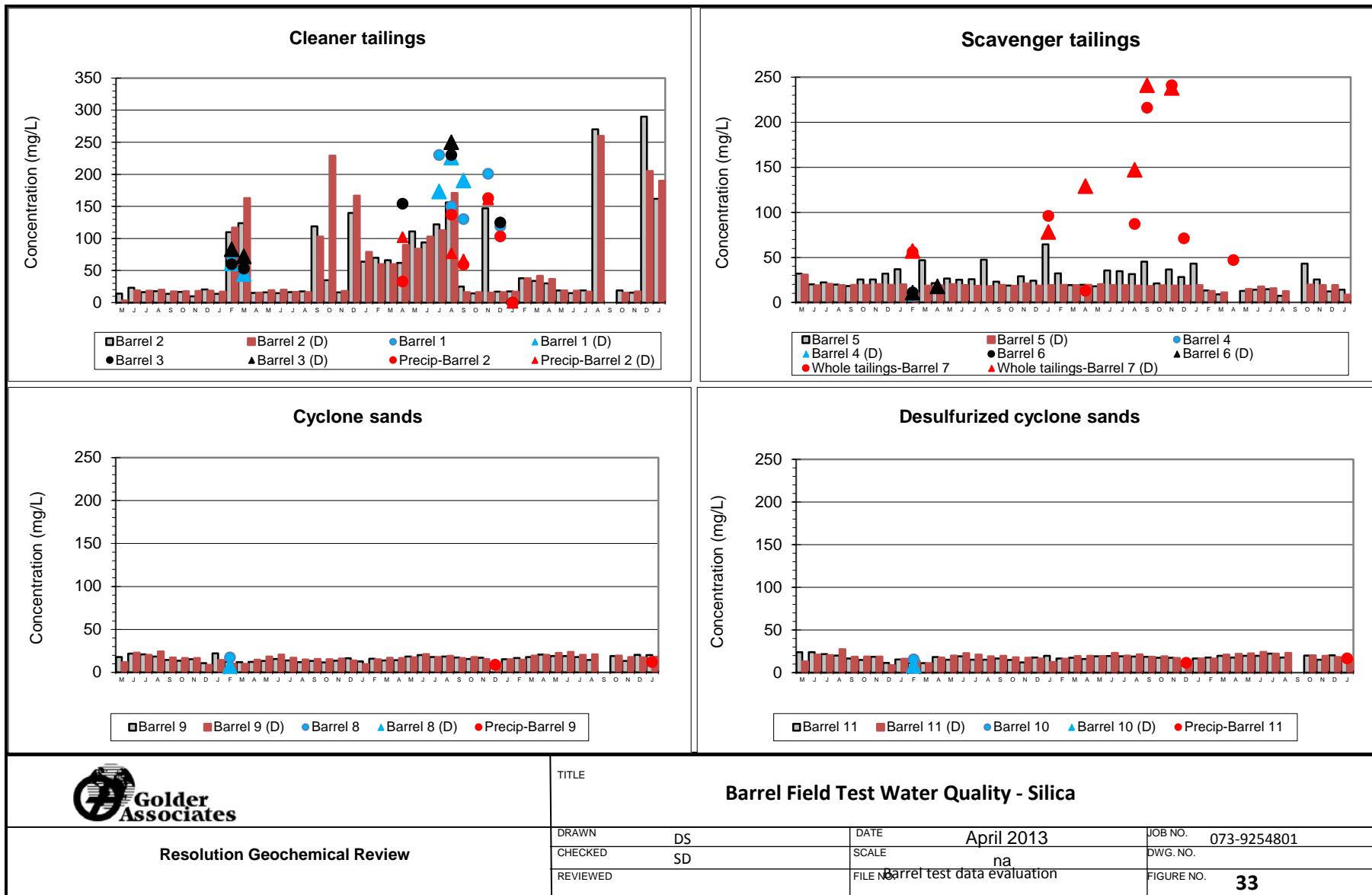
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CHECKED	SD	SCALE	na	DWG. NO.	
REVIEWED		FILE NO.	Barrel test data evaluation	FIGURE NO.	28

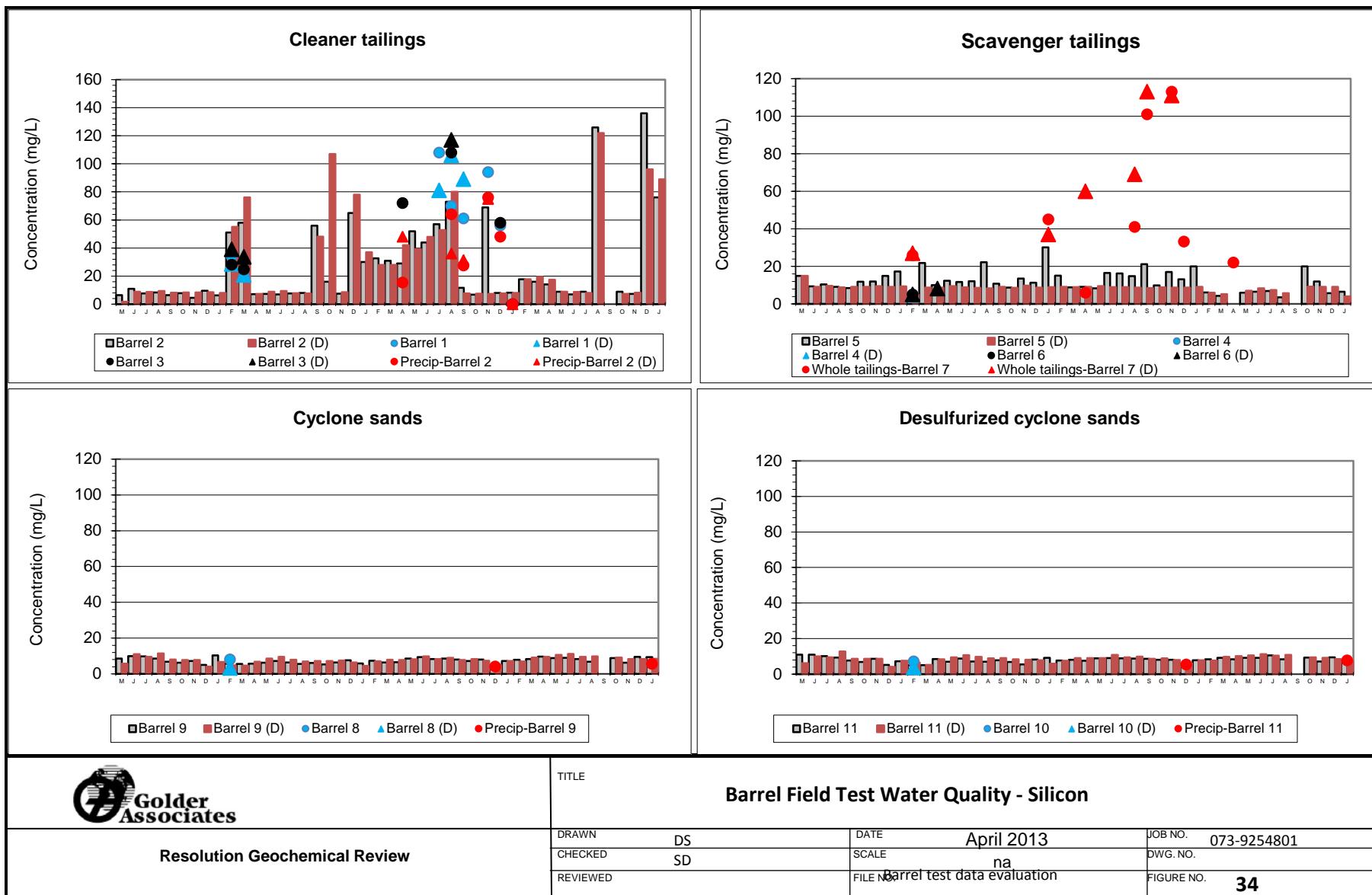


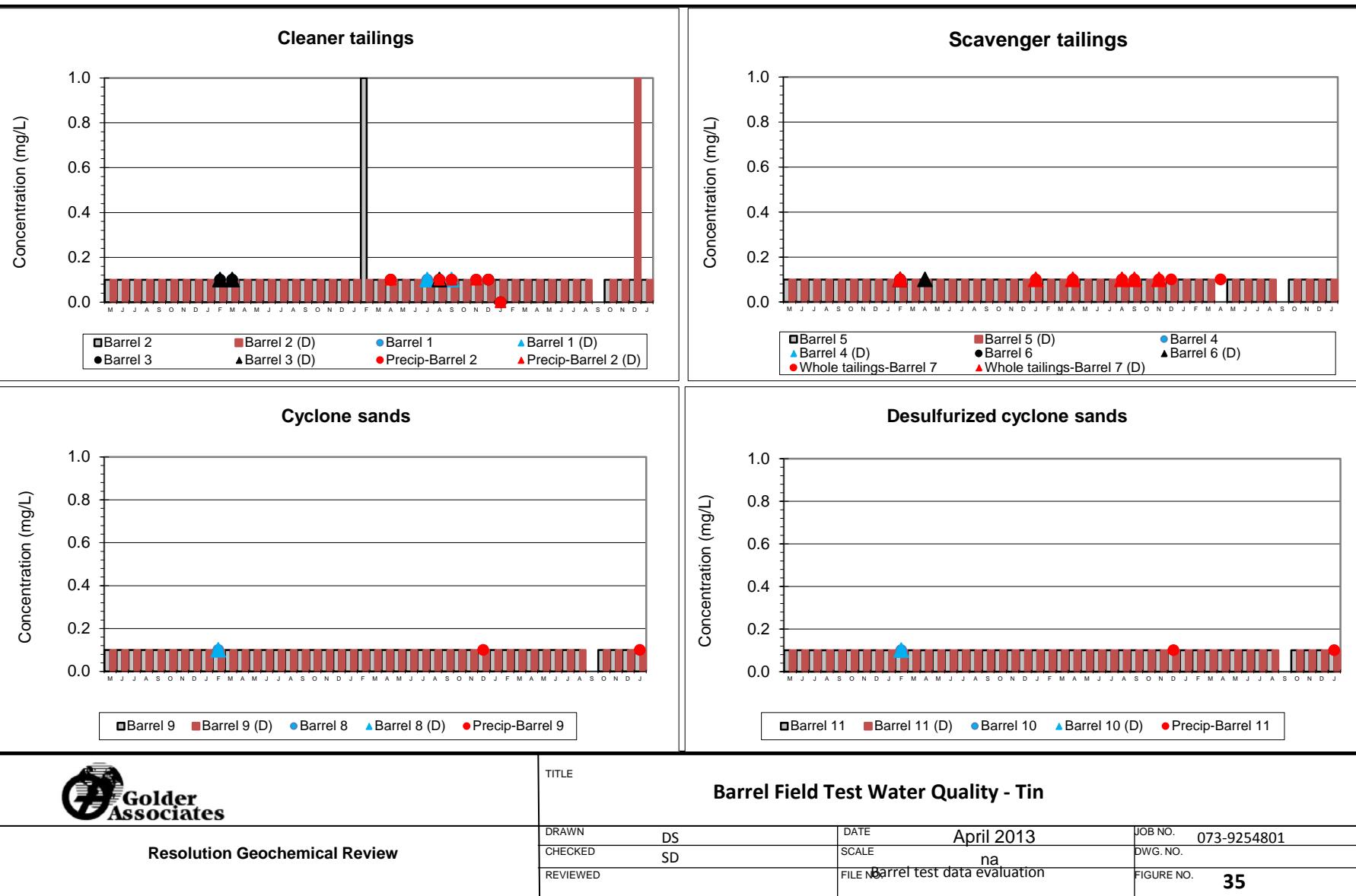


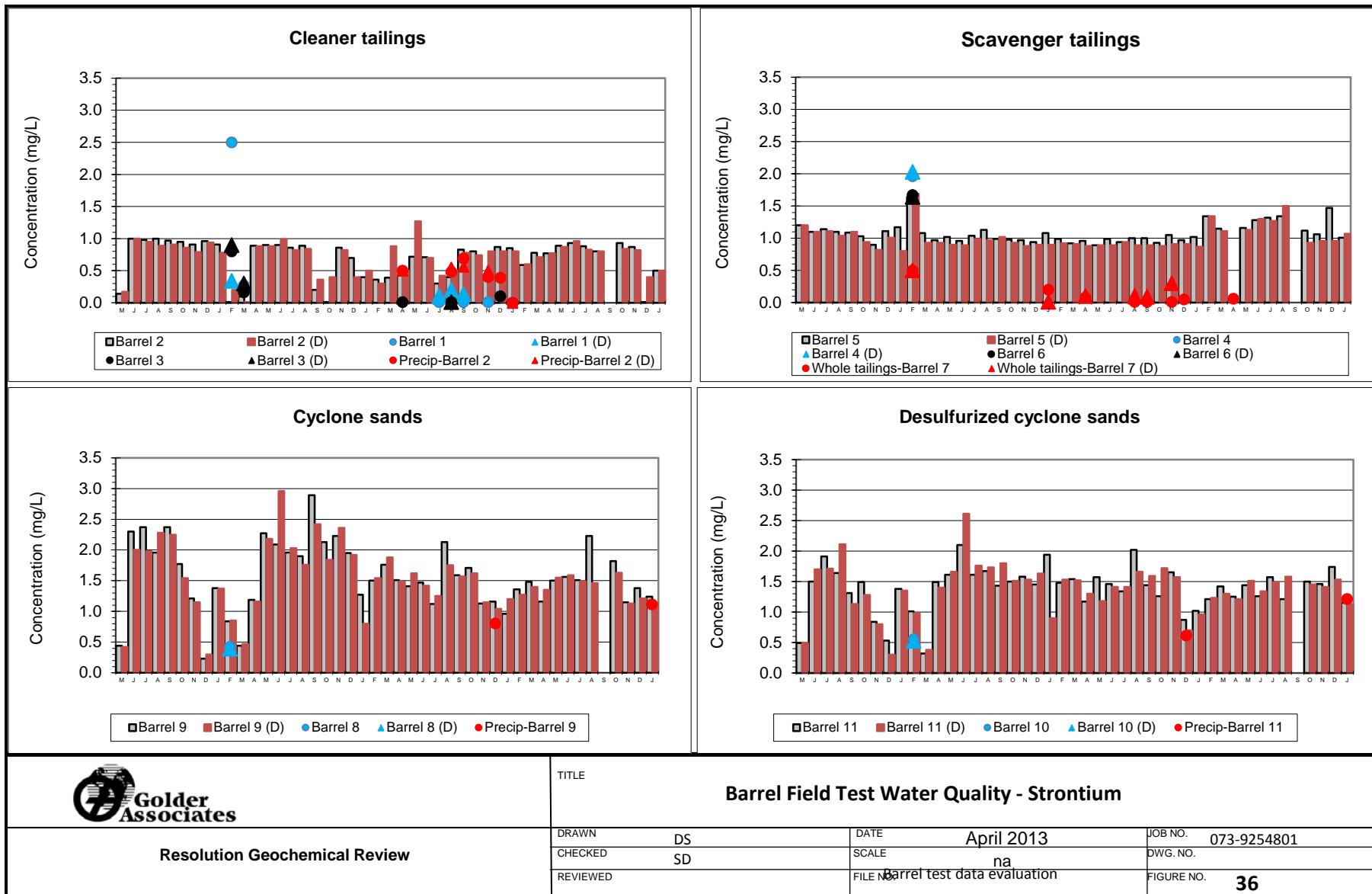


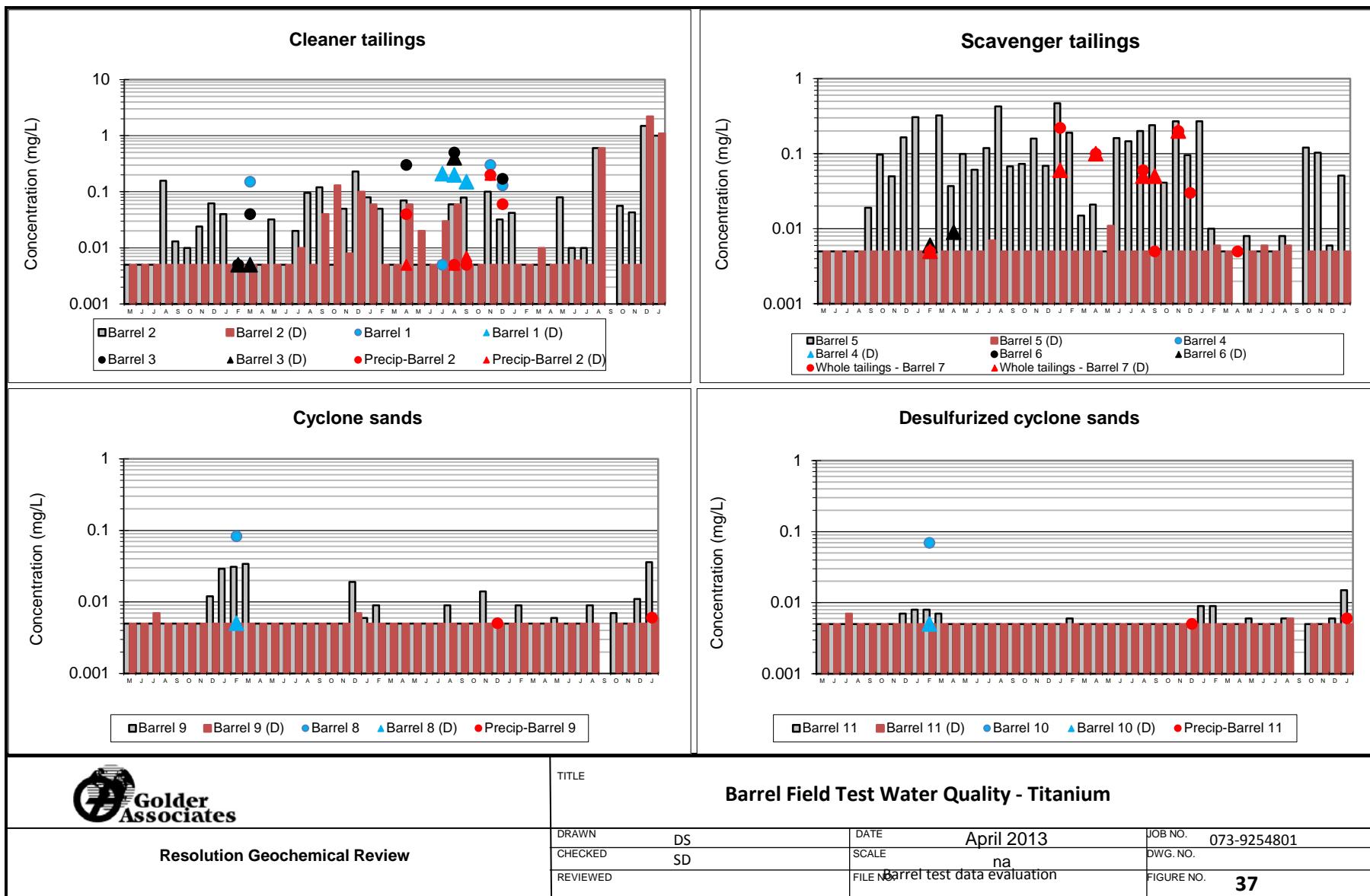


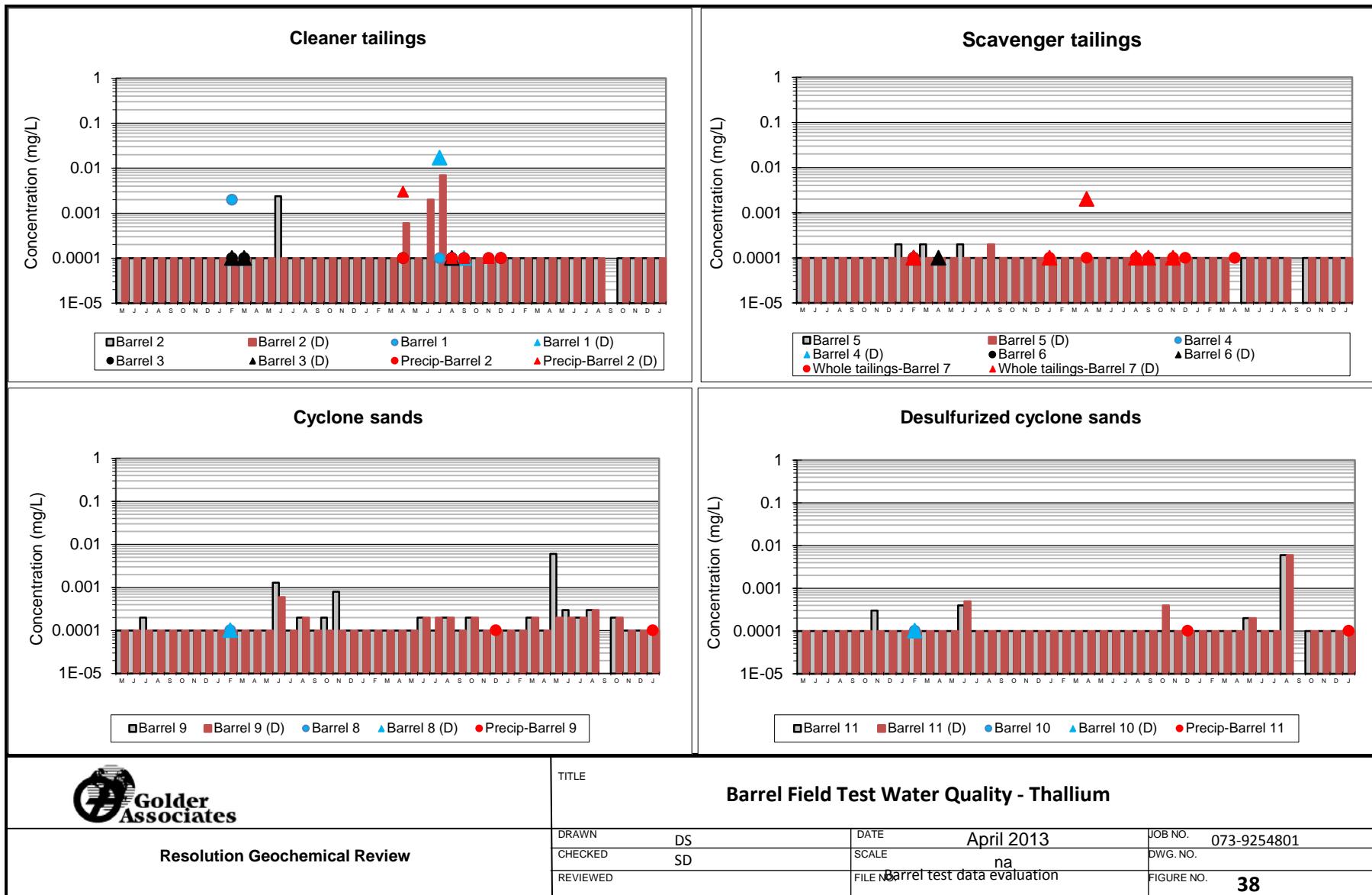


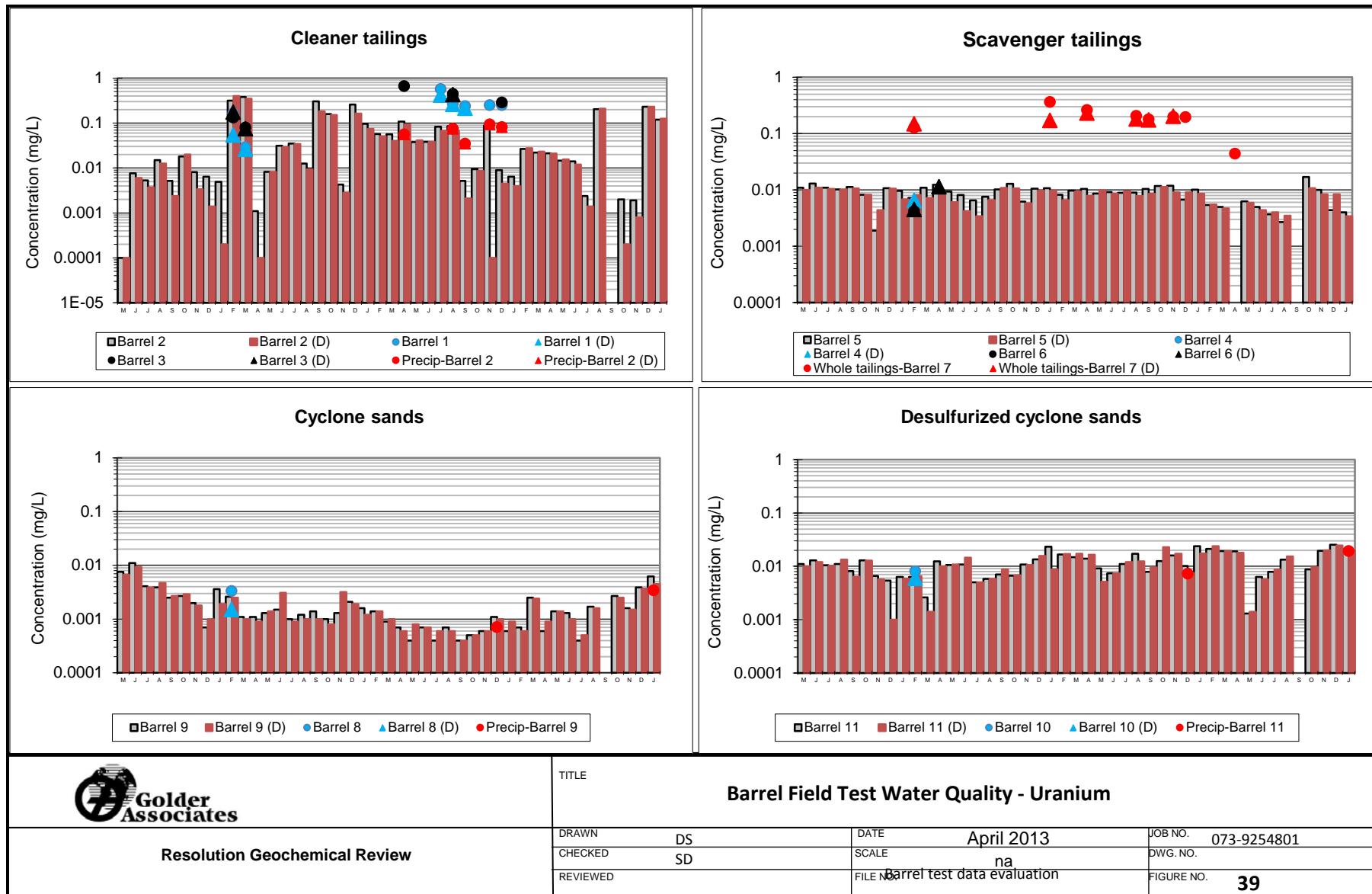


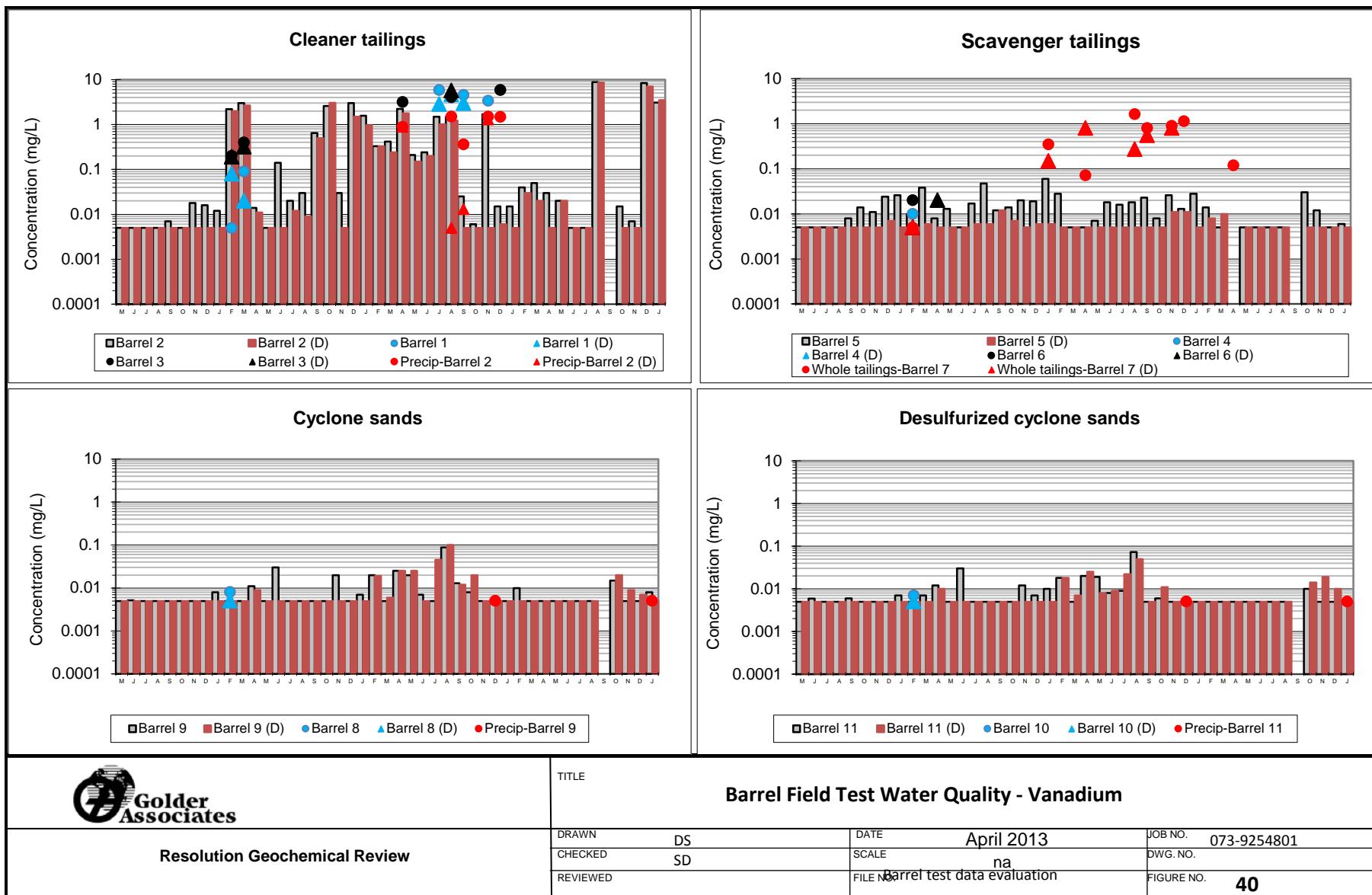


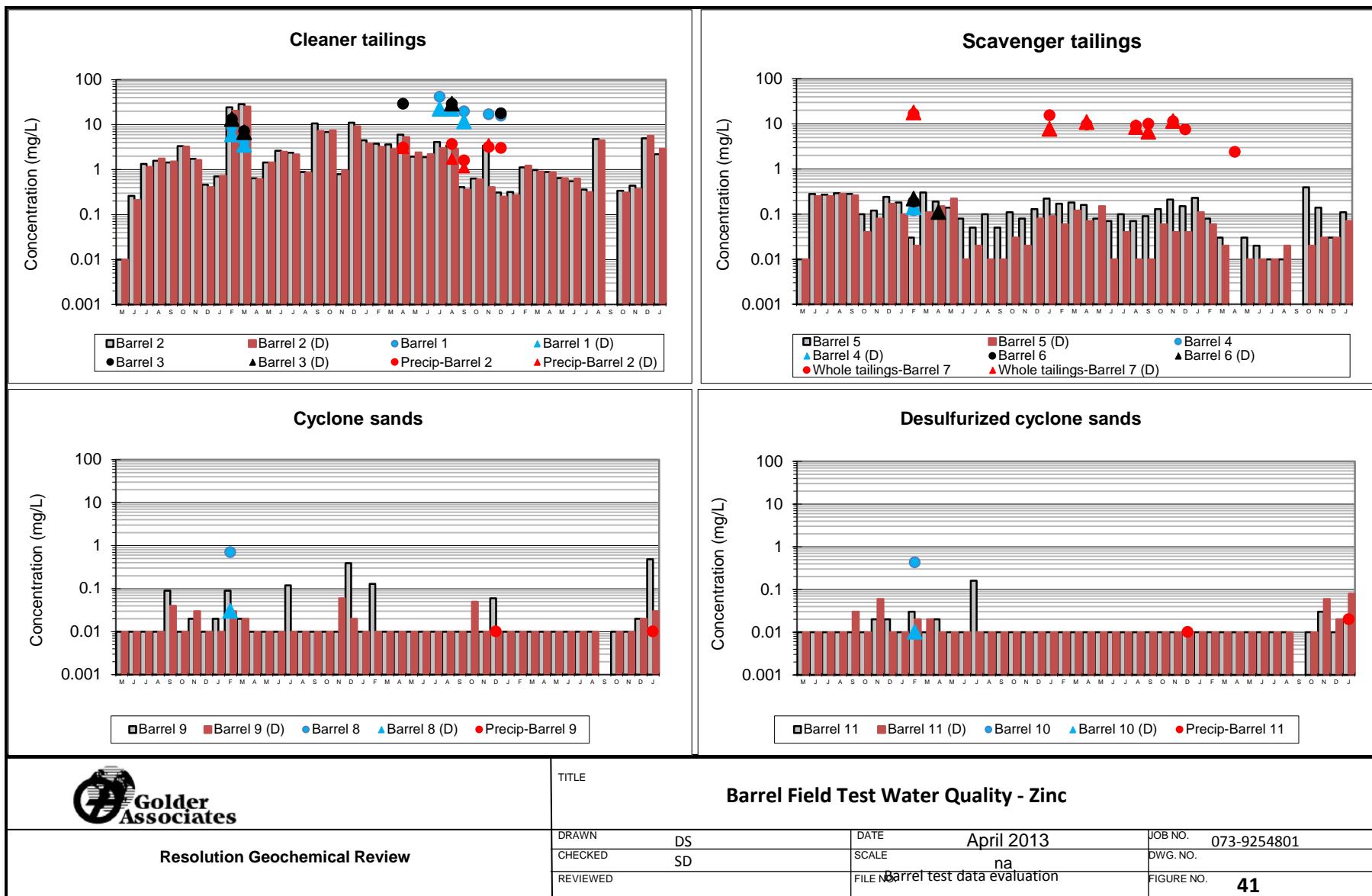


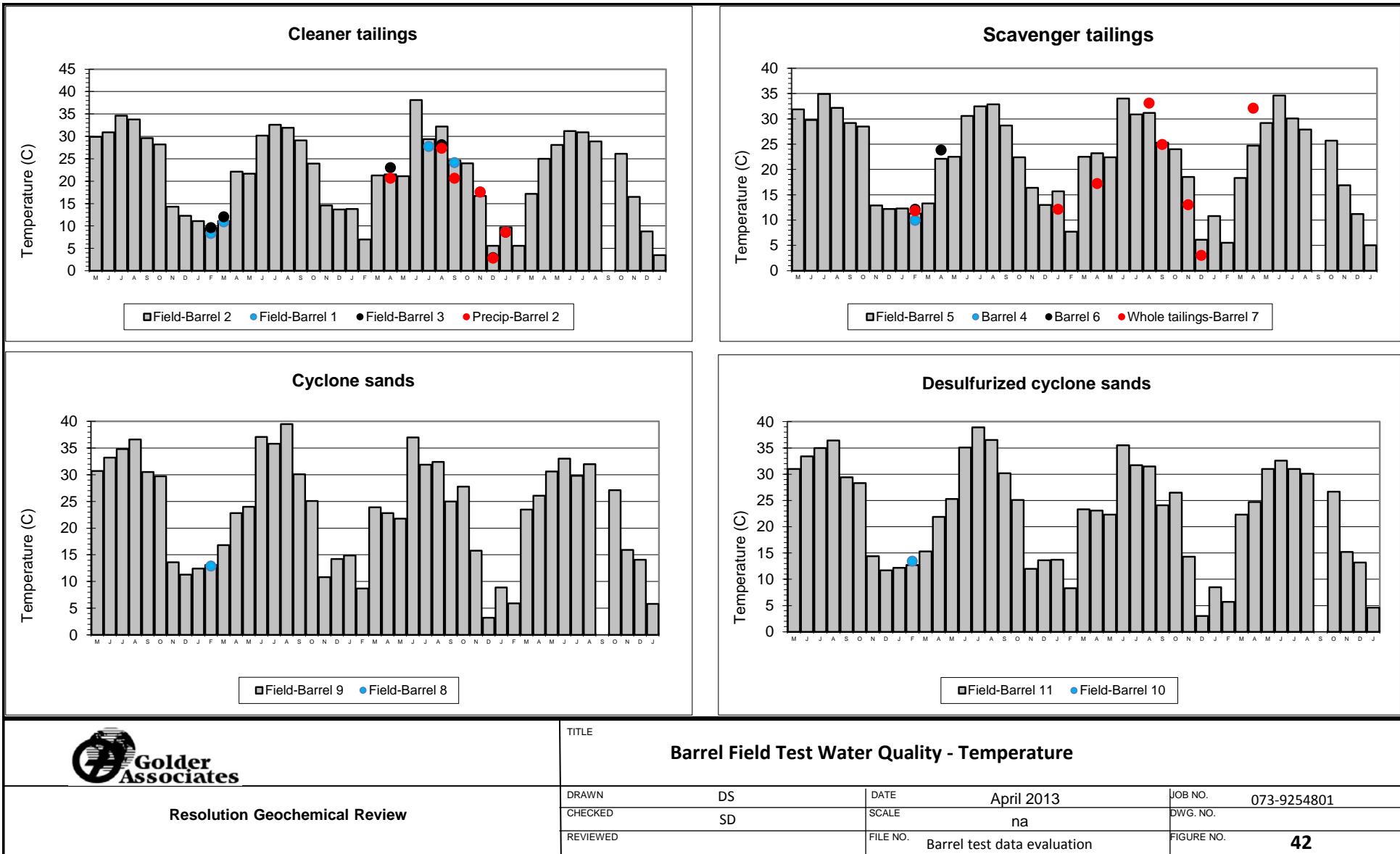












Resolution Geochemical Review

TITLE

### Barrel Field Test Water Quality - Temperature

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