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TECHNICAL MEMORANDUM

DATE: May 13, 2011 **Project 605.31**

TO: Greg Ghidotti
RESOLUTION COPPER MINING LLC

FROM: Heather Gluski, Janis Blainer-Fleming, Ed Peacock, Kate Duke, and Todd Keay
MONTGOMERY & ASSOCIATES

SUBJECT: RESULTS OF DRILLING, CONSTRUCTION, EQUIPPING, AND TESTING AT HYDROLOGIC TEST WELL DHRES-06, RESOLUTION COPPER MINING, PINAL COUNTY, ARIZONA

In accordance with a request from Mr. Greg Ghidotti, Resolution Copper Mining LLC (RCM), Montgomery & Associates (M&A) has prepared this Technical Memorandum to summarize results of drilling, construction, equipping, and testing at hydrologic test well DHRES-06. The well was installed to characterize hydrogeologic conditions in the deep groundwater system south of the South Boundary Fault and to provide a monitoring point for the deep groundwater system during dewatering of existing mine workings. Monitoring data obtained from DHRES-06 will be incorporated into the RCM hydrologic monitoring program.

SUMMARY

A summary of drilling, construction, and testing operations and results is provided below:

1. Hydrologic test well DHRES-06 is located on land owned by the State of Arizona, in Township 2 South, Range 13 East, in the NE ¼ of the SW ¼ of the SW ¼ of Section 8 ((D-2-13)08cca) in Hackberry Canyon.
2. Well DHRES-06 was drilled and constructed during the period February 22 through March 21, 2010.
3. Total drilled depth is 881.2 meters below land surface (bls).

4. Geologic units encountered during drilling from land surface to total depth include Tertiary Apache Leap Tuff (Tal) and Whitetail Conglomerate (Tw), Pennsylvanian Naco Formation (Pnaco), Mississippian Escabrosa Limestone (Me), Devonian Martin Formation (Dm), Cambrian Bolsa Quartzite (Cb), and younger Precambrian diabase (pCdiab).
5. An intermediate casing string and four grouted-in vibrating wire pressure transducers were installed in the upper part of the borehole in the interval drilled through the Tal and Tw.
6. The well was completed in Paleozoic sedimentary units and uppermost pCdiab with one perforated interval from 498.7 to 807.4 meters bls; non-pumping water level is approximately 242 meters bls. Groundwater in the Paleozoic units is confined by the overlying Tw.
7. A 2-hour open borehole airlift pumping test was conducted in the Pnaco and upper Me during drilling operations; analysis of recovery data yields an estimated transmissivity of 1 meter squared per day (m^2/d) and an estimated hydraulic conductivity of 8 x 10^{-6} centimeters per second (cm/s).
8. A 12-hour airlift test and a 24-hour constant-rate pumping test were conducted in the cased well; results of these tests indicate transmissivity of approximately 10 m^2/d and an average hydraulic conductivity of 2 x 10^{-5} cm/s in the Paleozoic sedimentary units and uppermost pCdiab. No response to pumping in the deep groundwater system was observed in the overlying units (Tal or Tw) in the vicinity of DHRES-06.
9. Water samples were collected for laboratory chemical and isotopic analyses during drilling, near the end of each airlift test, and near the end of the 24-hour constant-rate pumping test.

INTRODUCTION

Hydrologic test well DHRES-06 was drilled and constructed during the period February 22 through March 21, 2010. Well DHRES-06 was drilled to:

- evaluate groundwater conditions in Paleozoic and Precambrian units below the Tal and Tw south of the South Boundary Fault
- characterize lithology south of the proposed block-cave zone
- provide a groundwater level and groundwater quality monitoring point in the deep regional groundwater system during dewatering of existing mine workings

The well was drilled into the pCdiab and completed to permit hydrologic testing within the Paleozoic rocks and the uppermost portion of the pCdiab. Hydrologic test well DHRES-06 is located on land owned by the State of Arizona, in Township 2 South, Range 13 East, in the NE ¼ of the SW ¼ of the SW ¼ of Section 8 ((D-2-13)08cca) in Hackberry Canyon. Well DHRES-06 is located about 13.6 meters northeast of well HRES-08. The location is shown on **Figure 1**. A schematic diagram summarizing well construction details is shown on **Figure 2**. Other data summarized on the schematic diagram include: hydrogeologic units, drilling

penetration rate, water production rate during air drilling operations, and drilling methods. A detailed lithologic log for the test well is provided in **Appendix A**.

DRILLING OPERATIONS

Hydrologic test well DHRES-06 was drilled and constructed by Boart Longyear Drilling Services (Boart Longyear) of Salt Lake City, Utah, using a Lang LM-140 (Rig LK35A) top-head drive rotary drill rig. The well was drilled in accordance with technical specifications prepared by M&A. Mr. Jeff Hacking of Boart Longyear supervised drilling, construction, and airlift testing activities at the drill site. RCM personnel coordinated drilling contractor activities and purchase of well construction materials. Daily drilling reports were prepared by Boart Longyear personnel and were submitted to RCM for review. M&A personnel described drill cuttings samples and provided on-site monitoring during critical phases of drilling and construction of the well. RCM provided daily summaries of drilling progress. Daily summary data are provided in **Appendix B**.

Well DHRES-06 was drilled and constructed in two stages. During the first stage, the borehole was drilled to 384.7 meters bls, and then casing and instrumentation were installed and cemented in place. During the second stage, the borehole was drilled to total depth, and blank and perforated casing were installed to the designed depth. Final completion of the well was designed by Mr. Todd Keay and Ms. Kate Duke of M&A based on review of lithologic and hydrologic conditions encountered during drilling operations, and results of borehole geophysical logs.

Drilling Method

The borehole for well DHRES-06 was drilled using the conventional air rotary drilling method for the surface casing borehole, the conventional mud rotary method for the intermediate borehole, and the dual-wall air reverse circulation and air-assisted flooded reverse circulation methods for the production interval of the borehole. Depths, drilling methods, and bit types and sizes are summarized in **Table 1**.

TABLE 1. SUMMARY OF DRILLING METHODS AND BOREHOLE DIAMETERS HYDROLOGIC TEST WELL DHRES-06

Depth Interval (meters bls)	Drilling Method	Bit Type	Borehole Diameter (inches)
0 – 12.2	conventional air rotary	tricone	19
12.2 – 384.7	conventional mud rotary	tricone	12-¼
384.7 – 592.8	dual-wall air reverse	hammer	6-¾
592.8 – 881.2	air-assisted flooded reverse	tricone	6-½

The conventional mud rotary drilling method was used for the intermediate borehole for the depth interval from 12 to 385 meters bls to ensure a well-conditioned borehole for installation and cementing of casing and annular vibrating-wire piezometers. For the production portion of the borehole, the dual-wall air reverse circulation method was initially used to allow for measurement of groundwater production during drilling. However, at a depth of 593 meters bls slow drilling progress and fluid management issues necessitated change to the air-assisted flooded reverse circulation drilling method for the remainder of the drilling operation.

Drilling Fluid and Drill Cuttings Management

Air, water, and polymer/bentonite-based drilling fluids were used during drilling operations. When air methods were used, the drilling fluids were discharged to a cyclone to separate air from the fluid stream. The remaining drilling fluid and cuttings then flowed through a vibrating screen to remove coarse cuttings. All drilling fluids and formation fluids produced during drilling and airlift testing were contained in portable tanks, removed from the site using vacuum trucks, and then deposited at a designated storage facility at the RCM West Plant site. Drill cuttings from the Tal and Paleozoic rock units were collected in the bucket of a back-hoe, stored on site, and then spread on site after well construction was complete. Drill cuttings from the Tw and pCdiab were contained in portable tanks, removed from the site using vacuum trucks, and then deposited at the West Plant site.

Monitoring of Drilling Conditions

During drilling operations, drill penetration rate was monitored by Boart Longyear by recording drill start and stop times for each 6.1-meter long drill rod. A summary of drill penetration rate data is shown on **Figure 2.** In addition to drill penetration rate, rotational torque was monitored by drilling personnel, and zones of variable or increasing torque were noted as a potential indicator of fracturing. The field data recorded by Boart Longyear are on file at M&A. Borehole deviation surveys were also conducted on a regular basis using a Totco mechanical drift recorder. Borehole deviation was less than 2 degrees for the depth interval from land surface to 384 meters bls using conventional mud rotary drilling methods. Borehole deviation increased substantially from less than 2 degrees to 7 degrees for the depth interval from 384 to 500 meters bls using dual-wall air reverse circulation drilling methods. Maximum borehole deviation was 7.25 degrees at a depth of 564 meters bls. Borehole deviation decreased slightly below 655 meters bls using air-assisted flooded reverse circulation drilling methods. Inspection of the Schlumberger oriented borehole deviation logs indicates that the borehole deviated about 26 meters south and about 4 meters east of the collar at a depth of 600 meters (Schlumberger, 2010). An oriented deviation log was not obtained below a depth of 600 meters.

Monitoring of Lithologic Conditions

Drill cuttings samples were collected at 10-foot intervals and placed in labeled bags. Lithologic descriptions for each sample were prepared in the field by M&A personnel. Splits of each sample were placed in plastic chip trays and were provided to RCM. Bulk cuttings samples

have been palletized and are stored at the core storage facility at the East Plant site. The detailed lithologic descriptions are given in **Appendix A**.

Monitoring of Groundwater Conditions

When the dual-wall air reverse circulation drilling method was used, it was possible to monitor for the presence of groundwater, and to determine approximately where groundwater inflow zones were encountered. Water production could not be monitored during conventional mud rotary drilling at DHRES-06. However, during drilling at adjacent well HRES-08 in 2007, water production from the Tal, Tw, and upper part of the Pnaco was less than 0.1 liters per second (L/s).

At DHRES-06 the depth interval from 385 to 593 meters bls (the Pnaco and the uppermost portion of the Me) was drilled using the dual-wall air reverse circulation method, and observations of natural groundwater production were made after drilling out each 6.1-meter drill rod. Prior to measurement of production rate, injection water was cut off from the airstream, and air circulation was continued for 10 to 15 minutes. When discharge stabilized, discharge rate was measured using a 2-gallon bucket and stop watch, and results were recorded on the drillers' field log. Results of flow measurements made during drilling operations for well DHRES-06 are summarized on **Figure 2**. First measurable water production rate at DHRES-06 was 0.4 L/s at a depth of 503 meters bls. Measured groundwater production rate was 3.5 L/s at 584, 590, and 593 meters bls. Maximum measured groundwater production rate was 6.9 L/s at 588 meters bls. The discharge water was monitored for changes in water quality parameters including temperature, pH, specific conductance, and sand content. **Table 2** is a summary of water quality parameter measurements obtained during drilling operations.

TABLE 2. WATER QUALITY PARAMETERS OBTAINED DURING AIR DRILLING OPERATIONS AT HYDROLOGIC TEST WELL DHRES-06

Depth (meters bls)	Airlift Rate (L/s)	Temperature (degrees Celsius)	pH (standard units)	Specific Conductance (microSiemens per centimeter)
503	0.4	17.4	8.27	679.3
509	0.4	16.4	8.47	655.6
521	0.6	17.2	8.35	513.6
552	0.4	17.4	8.31	589.0
584	3.5	29.7	7.95	556.0

Fluid management constraints at the well site necessitated change to the air-assisted flooded reverse drilling method. Prior to change of drilling method, water level in the borehole was allowed to stabilize and a short duration airlift pumping test was conducted in the open borehole. Groundwater was first encountered in the Paleozoic units at about 503 meters bls, but static water level in the completed well is approximately 241meters bls. Groundwater in the Paleozoic units is confined by the overlying Tw.

BOREHOLE GEOPHYSICAL LOGGING

Borehole geophysical logging was conducted in two stages at hydrologic test well DHRES-06. The first stage of logging was conducted following drilling of the intermediate borehole to a depth of 384.7 meters bls, and the second stage of logging was conducted after drilling of the production borehole to a depth of 881.2 meters bls. Borehole geophysical logging services were provided by Schlumberger of Farmington, New Mexico.

The first suite of geophysical logs was obtained on March 1, 2010; logs obtained included: borehole deviation, gamma ray, 4-arm caliper, temperature, array induction (resistivity) (AIT), spontaneous potential, borehole fluid resistivity, high resolution micro-resistivity imaging (FMI), and full waveform dipole sonic (DSI). The second suite of geophysical logs was obtained on March 19, 2010; logs obtained included: borehole deviation, gamma ray, 4-arm caliper, temperature, AIT, and FMI. Sonic logs were not obtained due to equipment malfunction, and the deviation and FMI logs were incomplete because of unstable borehole conditions. **Table 3** shows logs obtained and depth intervals for each type of log. Schlumberger analyzed and interpreted the logs and prepared a separate summary report to RCM (Schlumberger, 2010).

TABLE 3. SUMMARY OF BOREHOLE GEOPHYSICAL LOGS OBTAINED AT HYDROLOGIC TEST WELL DHRES-06

LOG	DEPTH INTERVAL(S) (meters bls)
Caliper	0 – 385, 383 – 875
Temperature	0 – 385
Gamma ray	0 – 385, 383 – 875
Array induction (resistivity)	0 – 385, 383 – 875
Micro-resistivity imaging (FMI)	0 – 385, 392 – 600
Dipole sonic (DSI)	15 – 385
Borehole deviation	0 – 385, 385 – 600

ANALYSIS OF GEOLOGIC CONDITIONS

Geologic Contacts

Geologic contacts were picked based on analysis of drill cuttings samples, geophysical logs, and information obtained during drilling and airlift testing. **Table 4** is a summary of geologic contacts at DHRES-06.

TABLE 4. SUMMARY OF GEOLOGIC UNITS DRILLED FOR HYDROLOGIC TEST WELL DHRES-06	
Depth Interval (meters bls)	**Geologic Formation**
0 – 84.0	Apache Leap Tuff (Tal)
84.0 – 371.9	Whitetail Conglomerate (Tw)
371.9 – 570.5	Naco Formation (Pnaco)
570.5 – 613.1	Escabrosa Limestone (Me)
613.1 – 690.0	Martin Formation (Dm)
690.0 – 783.3	Bolsa Quartzite (Cb)
783.3 – 881.2	Precambrian Diabase (pCdiab)

Apache Leap Tuff (Tal)

The Tal at DHRES-06 is 84.0 meters thick, and consists of Brown Unit (Talb) crystal-rich tuff from land surface to a depth of 76.2 meters bls, vitrophyre (Talv) from 76.2 to 82.0 meters bls, and basal tuff (Talbt) from 82.0 to 84.0 meters bls. The Talb and Talbt are dacite porphyry tuff with phenocrysts of potassium and plagioclase feldspars, quartz, biotite, minor hornblende and dark colored opaque minerals in a glassy to aphanitic groundmass. The Talv has black glassy groundmass with the same phenocryst assemblage as the tuff. The Talbt was not noted in drill cuttings as a distinct unit between the Talv and uppermost Tw at DHRES-06 but is indicated on the borehole geophysical logs. Detailed lithologic descriptions are provided in **Appendix A**. Geophysical logs were provided in a separate report prepared by Schlumberger (Schlumberger, 2010).

The AIT log indicates low resistivity for the depth interval from 73.0 to 75.0 meters bls, and the gamma ray log indicates decreased activity for this interval (Schlumberger, 2010). Sonic logs show higher acoustic velocity, increased compressional wave slowness, and decreased shear wave slowness for this interval. This interval is interpreted to be the mega-spherulite unit. The FMI log shows a highly conductive zone for the depth interval from 73.0 to 75.5 meter bls, a slightly to moderately conductive zone from 75.5 to 82.0 meters bls, and a highly conductive zone from 82.0 to 84.0 meters bls (Schlumberger, 2010). These are interpreted to be the mega-spherulite, Talv, and Talbt units, respectively. The contact between the Tal and Tw at a depth of 84.0 meters bls was confirmed by an increase in gamma ray activity, resistivity, and spontaneous potential (Schlumberger, 2010). Detailed lithologic descriptions are provided in **Appendix A**.

Fracturing within the Tal was noted in drill cutting by the presence of fracture-filling calcite crystals, slickensides, and mineral staining (mostly iron oxide) on fracture surfaces. The zones where these features were noted in drill cuttings include 24.4 to 27.4 meters bls, 48.8 to 51.8 meters bls, and 57.9 to 84.0 meters bls. The FMI log indicates that fractures in the Tal fall into two general types including low angle flow surfaces or joints with dips less than 30 degrees, and moderate to high angle joints and faults with dips greater than 40 degrees. The FMI log

indicates that fracturing in the Tal is less intense below a depth of 51.0 meter bls, and the low angle features are generally absent (Schlumberger, 2010).

Whitetail Conglomerate (Tw)

The Tw at DHRES-06 is 287.9 meters thick and consists of Lacustrine unit (Tw2) from 84.0 to 134.1 meters bls, and Conglomerate unit (Tw3) from 134.1 to 371.9 meters bls. Tw2 consists of moderately to well lithified, thin bedded mudstones, siltstones, and sandstones with minor gravel. Tw3 consists of weakly to moderately lithified, poorly to well bedded, conglomerate with clasts of diabase, quartzite, schist, limestone, and basalt in clayey silt to silty sand matrix. Tw3 is in part matrix-supported, and in part clast-supported. The Tw1 and Tw4 conglomerate units were not encountered at DHRES-06.

The contact between the Tal and Tw at a depth of 84.0 meters bls was confirmed by an increase in gamma ray activity, resistivity, and spontaneous potential (Schlumberger, 2010). The gradational contact between the Tw2 and Tw3 units was picked at a depth of 134.1 meters bls. Inspection of drill cuttings indicates the contact between Tw2 and Tw3 occurs between 131.0 and 137.1 meters bls. The AIT log indicates a transition from lower to higher resistivity at about 131.0 meters bls and the FMI log indicates a less well bedded zone between 133.5 and 137.0 meters bls (Schlumberger, 2010). The contact between the Tw and the Pnaco at a depth of 371.9 meters bls was confirmed with the AIT and FMI logs (Schlumberger, 2010).

Fracturing within the Tw was noted in drill cuttings by the presence of fracture-filling calcite and iron oxide staining on fracture surfaces. The FMI log indicates that fractures in the Tw unit are typically moderate to high angle features with dips larger than 40 degrees, generally to the southwest. The log indicates fracture apertures ranging from 0.7 to more than 2 centimeters in width.

Paleozoic units

The Paleozoic sedimentary units encountered during drilling at DHRES-06 include the Pnaco, Me, Dm, and Cb. At DHRES-06, the Paleozoic sequence is 411.4 meters thick, and occurs in the depth interval from 371.9 to 783.3 meter bls. The sequence is dominated by carbonate rocks. Detailed descriptions for the Paleozoic units encountered at DHRES-06 are provided in **Appendix A**.

Fracturing of the Paleozoic units was noted in drill cuttings by the presence of iron oxide staining, calcite, quartz, and sulfide veins, slickensides, and fault gouge. The FMI log for the depth interval from 372 to 600 meters bls provides fracture details for the Naco Formation and most of the Escabrosa Limestone (Schlumberger, 2010).

Naco Formation (Pnaco)

The Pnaco at DHRES-06 is 198.6 meters thick and consists of well lithified, interbedded limestone, siltstone, and shale. The AIT and FMI logs were used to confirm the contacts between the Tw and Pnaco at depth of 371.9 meters bls, and between the Pnaco and Me at a depth of 570.5 meters bls (Schlumberger, 2010). The Maroon Shale Marker No. 2 was encountered in the depth interval from 528 to 544 meters bls, and the Maroon Shale Marker No. 1 was encountered in the depth interval from 559 to 570 meters bls.

Escabrosa Limestone (Me)

The Me at DHRES-06 is 42.6 meters thick and consists of well lithified limestone and dolomite. The AIT and FMI logs were used to confirm the contact between the Pnaco and Me at 570.5 meters bls, and the AIT log was used to confirm the contact between the Me and the Dm at a depth of 613.1 meters bls (Schlumberger, 2010).

Martin Formation (Dm)

The Dm at DHRES-06 is 76.9 meters thick and consists of well lithified, interbedded limestone, siltstone, dolomite, and shale. Based on inspection of drill cutting the Last Black Shale Marker bed was encountered in the depth interval from 612.6 to 624.8 meters bls. The AIT log was used to confirm the contacts between the Dm and overlying Me, and underlying Cb at depths of 613.1 and 690.0 meters bls, respectively (Schlumberger, 2010).

Bolsa Quartzite (Cb)

The Cb at DHRES-06 is 93.3 meters thick and consists of well lithified quartzite. The lowermost 10 to 20 meters is muddy with up to 40 percent fines. The AIT log was used to confirm the contacts between the Cb and overlying Dm, and underlying pCdiab at depths of 690.0 and 783.3 meters bls, respectively (Schlumberger, 2010).

Younger Precambrian Diabase (pCdiab)

The pCdiab at DHRES-06 consists of weathered to well lithified diabase. The diabase is predominantly medium to coarse-grained green to black pyroxene with white plagioclase laths. The AIT log was used to confirm the contact between the pCdiab and overlying Cb at a depth of 783.3 meters bls. The AIT log shows a decrease in resistivity at about 786.5 meter bls where the diabase is less weathered. There is a marked change in the character of the AIT log from about 806 meters bls to total drilled depth of 881.2 meters bls. Gamma ray decreases and resistivity increases (Schlumberger, 2010). Drill cuttings for this zone are characterized by sulfide mineralization, fault gouge and slickensides, and clay alteration (**Appendix A**). The borehole was relatively unstable through this interval during drilling and geophysical logging. A large washout was noted in the depth interval from 815.5 to 817.5 meters bls. Characteristics of the zone from 806 to 881 meters bls suggest the presence of a fault zone.

WELL CONSTRUCTION

Hydrologic test well DHRES-06 was constructed in two parts. An intermediate casing was installed from land surface to a depth of 382.2 meters bls, approximately 10 meters below the contact with the Pnaco. The intermediate casing consisted of 7-5/8-inch outside diameter blank, threaded and coupled steel casing. During casing installation, four vibrating-wire pressure transducers manufactured by Geokon of Lebanon, New Hampshire, were attached to the outside of the casing string to measure pore pressures in the Tal and Tw. **Photograph 1** shows the site layout during installation of the 7-5/8-inch casing and instrumentation. **Photograph 2** shows a transducer protector being installed on the 7-5/8-inch casing. **Photographs 3 and 4** show set up for pressure grouting operations by Halliburton. Details regarding the piezometers installed at DHRES-06 are given in **Table 5** and installed depths are shown on **Figure 2**.

Photograph 1. Site layout during installation of 7-5/8-inch intermediate casing

Photograph 2. Transducer protector shroud mounted on 7-5/8-inch casing

Photograph 3. Halliburton crew preparing for pressure grouting

Photograph 4. Halliburton pump truck positioned for pressure grouting

TABLE 5. DETAILS FOR GROUTED PRESSURE TRANSDUCER INSTALLATION FOR HYDROLOGIC TEST WELL DHRES-06

	Model Number	Serial Number	Installed Depth (meters below land surface)	Hydrogeologic Unit	Pressure Rating (Mega-Pascals)
1	Geokon 4500S	10-01053	80.0	Apache Leap Tuff	2
2	Geokon 4500S	10-00985	209.9	Whitetail Conglomerate	3
3	Geokon 4500S	09-37957	237.9	Whitetail Conglomerate	5
4	Geokon 4500S	09-37958	304.9	Whitetail Conglomerate	5

After the casing string and instrumentation were installed in the borehole, pressure grout was installed in the annular space by Halliburton of Farmington, New Mexico. The pressure grout mix consisted of the following ratio by weight: 2.5 parts water: 1 part cement: 0.3 parts bentonite. The lowermost 68 meters of annular seal material consisted of neat cement to prevent loss of the pressure grout from the bottom of the upper interval when drilling of the lower borehole commenced. Drilling of the lower borehole commenced following a 72-hour cure period. Details for the pressure grouting operation are provided a separate summary report to RCM (Halliburton, 2010).

The production string for DHRES-06 was constructed using 4-1/2-inch outside diameter blank and slotted, threaded and coupled steel casing. A single continuous perforated interval was installed in the depth interval from 498.7 to 807.4 meters bls. Two 20-foot joints of blank steel casing were installed below the slotted casing; the lowermost joint was torch cut, tapered, and welded closed. The production casing was installed using a mechanical casing hanger manufactured by TIW Corporation of Houston, Texas, installed between the 7-5/8-inch diameter intermediate casing and the 4-1/2-inch production casing. Top of the 4-1/2-inch casing is at 373.4 meters bls. Annular materials were not installed in the production interval of the well. A schematic diagram of well construction is shown on **Figure 2**.

Surface completion consists of an extension of the 14-inch steel surface casing to approximately 1 meter above land surface. The casing extension was cemented in place and secured with a locking cap. Horizontal and vertical well coordinates for the top of surface casing and top of the well cap were surveyed by Civiltec Engineering, Inc. of Phoenix, Arizona, on January 11, 2011. Survey data and computed land surface and measurement point elevations are provided in **Table 6**. Following survey, a modification was made to the surface monument. A 15.2 centimeter extension was welded on to the surface casing to accommodate the discharge assembly for the permanent pump.

TABLE 6. SUMMARY OF SURVEY RESULTS FOR HYDROLOGIC TEST WELL DHRES-06

	(meters)
Easting	495616.513
Northing	3680765.896
Elevation Top of 14-inch Surface Casing	1233.127
Elevation Top of 14-inch Surface Casing Extension	1233.279
Elevation Land Surface	1232.400
Elevation Top of 1-1/4-inch PVC Sounder Access	1232.971

Datum: UTM Zone 12 North (NAD27)-NGVD29

PUMP INSTALLATION AND INSTRUMENTATION

A dedicated pump assembly was installed in hydrologic test well DHRES-06 by Layne Christensen Company, Water Supply / Environmental Division (Layne), of Chandler, Arizona on January 6 and 7, 2011. Well DHRES-06 was equipped with a stainless steel Grundfos Model 40S200-50 pump with a 20-horsepower, 460-volt, three-phase Grundfos Model MS6EST30 electric motor. The pump was installed on 2-inch galvanized steel column pipe with galvanized steel couplings at a depth of 367 meters bls. The well was equipped with two 1-1/4-inch PVC

sounder access tubes which extend from the wellhead to the top of the pump. The sounder access tubes are capped on the bottom and factory slotted in the lowermost 3 meters. The pump, motor, and column pipe are suspended from a steel and rubber sanitary well seal installed at the wellhead. An In-Situ Level TROLL 700 (S/N 137556; 500 psi non-vented) pressure transducer is currently installed at DHRES-06.

HYDRAULIC TESTING

Initial characterization of the deep groundwater system at DHRES-06 was accomplished by conducting short-term airlift tests in the open borehole and in the cased well. Once dedicated pumping equipment was installed, a 24-hour constant rate pumping test was conducted. Operational details and results of the airlift tests and the pumping test are provided in **Table 7**. Discussion of each test is included below.

TABLE 7. SUMMARY OF HYDRAULIC TESTING CONDUCTED IN HYDROLOGIC TEST WELL DHRES-06

Well Identifier	DHRES-06 Total depth 579.7 meters bls	DHRES-06 Cased well	DHRES-06 Cased well
Description of Hydrologic Testing Zone (meters bls):	Open borehole (384.7 to 579.7)	Open Interval (384.7 to 881.2) Perforations (498.7 to 807.4)	Open Interval (384.7 to 881.2) Perforations (498.7 to 807.4)
Approximate Borehole Volume (liters)	8,000	13,000	13,000
Test Type	Airlift test	Airlift test	Constant-rate pumping test
Geologic Units in Testing Zone	Naco Formation and upper Escabrosa Limestone	Paleozoic sedimentary rocks and Precambrian diabase	Paleozoic sedimentary rocks and Precambrian diabase
Test Duration (hours):	2	12	24
Non-pumping Depth to Water (meters bls):	245.0	231.3	242.2
Average Discharge Rate (L/s):	3.5	1.1	1.6
Maximum Drawdown (meters):	> 51	> 28	42.9
Transmissivity (m^2/d):	1	6	10
Hydraulic Conductivity (cm/s):	8×10^{-6}	1×10^{-5}	2×10^{-5}

Airlift Testing

Two airlift tests were conducted at hydrologic test well DHRES-06. The first test was conducted in the open borehole at a drilled depth of 579.7 meters bls. The second test was conducted following construction of test well DHRES-06 at a total cased depth of 819.9 meters bls (**Figure 2).** Discharge volumes and airlift rates were calculated by periodic measurement of storage tank levels. Test details are summarized in **Table 7**.

Due to the discharge head configuration, drawdown could not be measured during airlift pumping; however, groundwater level measurements were obtained prior to the test and during the recovery period. Recovery data were analyzed using the Theis recovery method (1935) implemented in the computer-based analytical aquifer test software AQTESOLV® for Windows, version 4.50.002 (Glenn M. Duffield, HydroSOLVE, Inc., 2008).

DHRES-06 Open Borehole Airlift Test

An open borehole airlift test was conducted to investigate hydraulic parameters and water quality in the Pnaco and upper Me. Open borehole interval was from 384.7 to 579.7 meters bls. This depth was chosen for airlift testing due to increase in water production during drilling from approximately 1.3 L/s at 576.3 meters to 3.0 L/s at 579.7 meters, concurrent with reduced hammer penetration rate. Depth to pre-pumping water level was 245.0 meters bls. The bottom of the drill pipe used for airlift operations was approximately 569 meters bls. Initial submergence for airlift pumping was about 324 meters. Airlifting started at 21:53 and stopped at 24:00 March 8, 2010. The discharge rate was erratic due to surging, but declined from an initial rate of about 3.9 L/s to a final rate of about 2.8 L/s; average rate was 3.5 L/s. During recovery, water level was measured through the open dual-wall drill pipe using an electric water level sounder. A summary of test data and the results of the analysis are given in **Table 7**. A graph of the recovery data and analysis is shown on **Figure 3**. Straight-line analysis using the Theis recovery method yields an estimated transmissivity of 1 m^2/d. Estimated average hydraulic conductivity, based on open borehole interval of 195 meters, is 8 x 10^{-6} cm/s.

DHRES-06 Cased Well Airlift Test

Following casing installation, an airlift test was conducted to develop the well, and to investigate hydraulic parameters and water quality in the Paleozoic sedimentary rocks and pCdiab. Open interval is from 384.7 to 881.2 meters bls. Depth to pre-pumping water level was 231.3 meters bls. The bottom of the drill pipe used for airlift operations was approximately 371 meters bls. Initial submergence for airlift pumping was about 140 meters. Airlifting started at 01:06 and stopped at 13:14 March 21, 2010. The discharge rate was erratic due to surging for the initial 6 hours of airlifting, but increased from an initial rate of about 0.9 L/s to a final rate of about 1.5 L/s; average rate was 1.1 L/s. Specific electrical conductance of pumped water declined from initial value of about 2,000 microSiemens per centimeter (µS/cm) to about 700 µS/cm. During recovery, water levels were measured and recorded using an In-Situ LevelTROLL pressure transducer datalogger. The LevelTroll was installed in the drill pipe to a

depth of approximately 350.5 meters bls to collect piezometric head data for the duration of the recovery test. Groundwater level was also manually measured through the dual-wall drill pipe using an electric water level sounder. A summary of test data and the results of the analysis are given in **Table 7**. A graph of the recovery data and analysis is shown on **Figure 4**. Straight-line analysis using the Theis recovery method yields an estimated transmissivity of 6 m^2/d. Estimated average hydraulic conductivity, based on saturated interval of 496.5 meters (base of conductor casing to total depth of borehole) is 1 x 10^{-5} cm/s.

DHRES-06 Pumping Test

Operations

A 24-hour constant-rate pumping test was conducted in the cased well at DHRES-06 on January 8 and 9, 2011. Water discharged from DHRES-06 was contained in a tank until the fine sediment had settled and then discharged to Hackberry Creek stream channel. During testing, water levels in well DHRES-06 were measured and recorded using the dedicated Level TROLL. Water levels were also measured periodically using an electric sounder. Pumping rate and line pressure were measured along with water quality parameters. Sand content of the water was measured using a 1-liter calibrated Imhoff cone. After the constant-rate test pumping period was complete, water level recovery was measured for a period equal to the pumping period. Test details are summarized in **Table 7**.

Constant-Rate Test

A 24-hour constant rate test was conducted at well DHRES-06. Depth to pre-pumping water level was 242.2 meters bls. Pumping started at 12:30 on January 8, 2011 and stopped at 12:30, on January 9, 2011. Average pumping rate was 1.6 L/s. Maximum drawdown at the well which occurred near the end of the pumping period was 42.9 meters. A graph of the water level drawdown and recovery data and analysis is shown on **Figure 5**. Straight-line analysis of drawdown data using the Cooper-Jacob (1946) method yields an estimated transmissivity of 60 m^2/d; analysis of recovery data using the Theis recovery method yields an estimated transmissivity of 10 m^2/d. Based on transmissivity calculated from recovery data and a saturated interval of 496.5 meters (base of conductor casing to total depth of borehole) the hydraulic conductivity is 2 x 10^{-5} cm/s.

During the constant-rate test, grouted piezometers in the intermediate casing at DHRES-06 were monitored for response to pumping in the deep groundwater system. Pore pressures in all four piezometers located in the Tw and Tal increased when pumping commenced and decreased when the pump was shut-off (**Figure 6**). These responses are most likely due to compression in the bentonite cement grout and/or the casing string in response to depressurization of the geologic units immediately underlying the confining layer (similar to Noordbergum/Rhade effects discussed in Verruijt (1969) and Langguth and Treskatis (1989)).

These responses did not yield information regarding hydraulic parameters in the deep groundwater system, the Tw, or the Tal.

Water levels in an adjacent well, HRES-08, were also monitored during the constant-rate pumping test at DHRES-06. No discernable response to pumping was observed in either the Tw or Tal at this location.

GROUNDWATER SAMPLING

Water quality parameters (temperature, pH, and specific conductance) were measured and recorded during both tests using a Myron-L parameter meter that was calibrated prior to each test. Groundwater samples were collected periodically during drilling operations, near the end of each airlift test, and near the end of the 24-hour constant-rate pumping test. Sample identifiers and water quality parameters for samples collected during drilling and testing operations are provided in **Table 8**. Groundwater samples are collected during drilling and airlift testing to obtain an initial indication of water quality. Data considered to be most representative of the hydrochemical composition of formation water are those generated from samples collected at the end of pumping tests. These data and associated discussion are provided in M&A (2011).

TABLE 8. WATER SAMPLES COLLECTED DURING DRILLING AND TESTING AT HYDROLOGIC TEST WELL DHRES-06

				Field Parameters		
Sample Identifier	**Sample Description**	**Date**	**Time**	**Temp (°C)**	**pH**	**Specific Conductance (µS/cm)**
RESE-1000292	during drilling at 509 meters	8-Mar-10	00:30	16.4	8.47	655.6
RESE-1000294	end of 2-hour airlift test at 580 meters	8-Mar-10	23:40	31.2	8.24	570.0
RESE-1000295	during drilling at 593 meters	10-Mar-10	07:40	29.8	8.21	555.7
RESE-1000296	end of 12-hour airlift test in cased well	22-Mar-10	13:00	60.7	8.6	695.6
RESE-1003186	end of 24-hour constant-rate pumping test in cased well	9-Jan-11	11:30	37.7	7.36	599.1

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490,000 R. 12 E. 495,000 R. 13 E. 500,000 R. 14 E.

3,690,000 T. 1 S.

3,685,000

3,680,000 T. 2 S.

3,675,000

T. 3 S.

Top of the World
60
Corral
Middle
HRES-06
JI Ranch
HRES-14
DHRES-11
HRES-12
Queen Creek
Oak Flat
HRES-03
Shaft No. 3
DHRES-09
DHRES-10
Shaft No. 9
HRES-01
DHRES-04
DHRES-03
DHRES-05
DHRES-02
HRES-02
HRES-04
DHRES-01
A-06
DHRES-08
DHRES-13
Town of Superior
DHRES-07
HRES-09
HRES-05
HRES-13
Devils Canyon
Hackberry Canyon
HRES-07
Hackberry Windmill
MJ-11
HRES-10
DHRES-06
HRES-08
HRES-11
177
Arnett Creek
Mineral Creek
Gila County
Pinal County
1,400
1,600

490,000 R. 12 E. 495,000 R. 13 E. 500,000 R. 14 E.

EXPLANATION

- Watershed Boundary
- Perennial Reach

Groundwater Monitoring Sites

- Shallow Alluvial Aquifer Monitor Well
- Apache Leap Tuff Aquifer Monitor Well
- Deep Groundwater System Monitor Well
- Shaft

Elevation Range

(meters above mean sea level)

- 1,600 - 1,800
- 1,400 - 1,600
- 1,200 - 1,400
- 1,000 - 1,200
- 800 - 1,000
- 600 - 800

N

0 0.5 1 1.5 2

Miles

Resolution Copper Mining

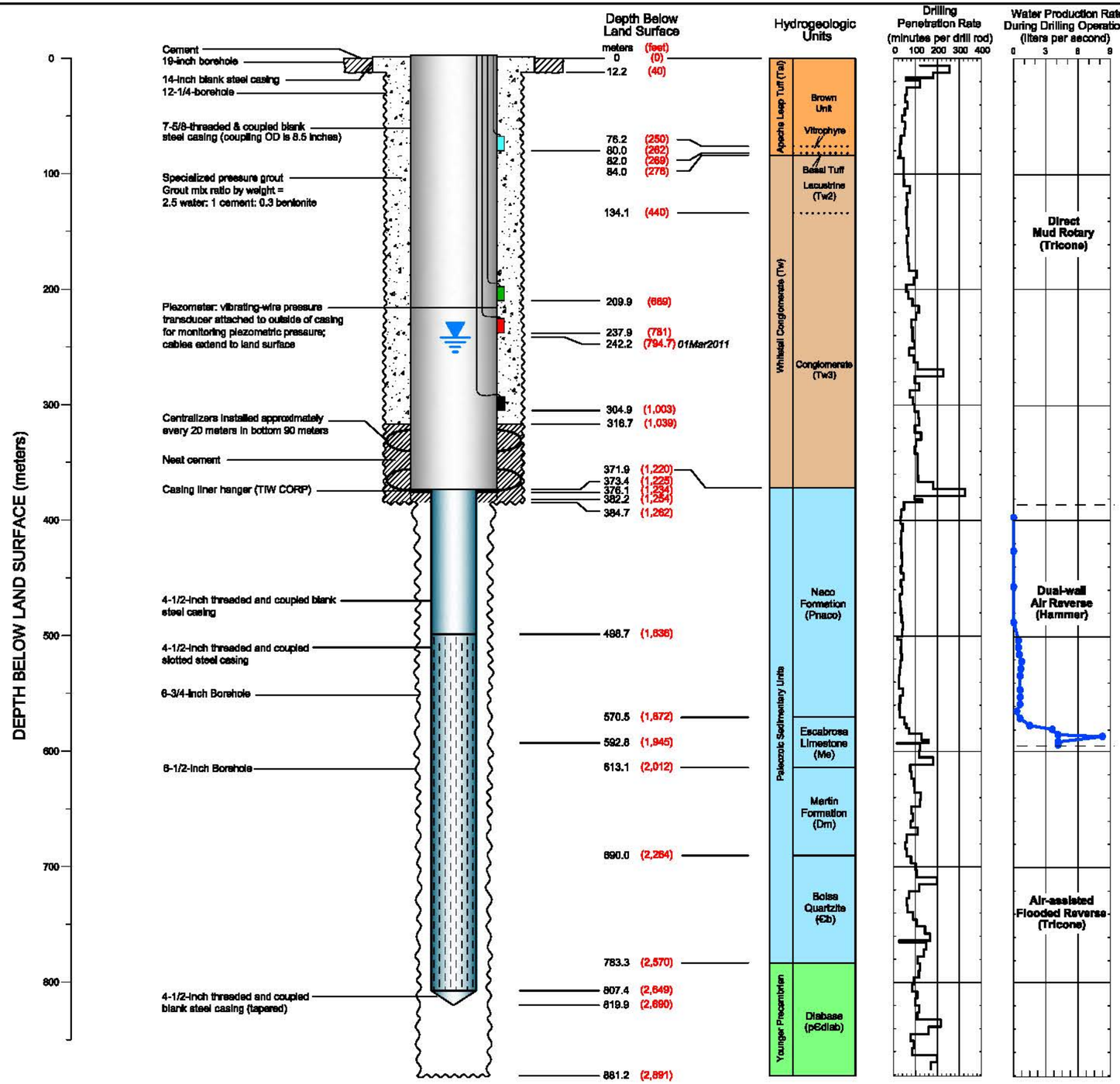
DHRES-06 WELL LOCATION

MONTGOMERY & ASSOCIATES
Water Resource Consultants

2011

FIGURE 1

\GIS-Tuc\Projects\605\605.3\Welloc_DHRES_06.mxd\10May2011



SUMMARY OF BOREHOLE GEOPHYSICAL LOGS OBTAINED AT DHRES -06	
LOG	DEPTH INTERVAL(S) (meters bls)
Caliper	0 – 385, 383–875
Temperature	0 – 385
Gamma ray	0 – 385, 383–875
Array induction (resistivity)	0 – 385, 383–875
Micro-resistivity imaging (FMI)	0 – 385, 392–600
Dipole sonic (DSI)	15 – 385
Borehole deviation	0 – 385, 385–600

REGISTERED GEOLOGIST
CERTIFICATE No.
25063
TODD
KEAY
Date Signed 13 MAY 2011
ARIZONA U.S.A.
Expires 6/30/2012

CADASTRAL: (D-2-13) 8cca	ADWR NO: 55-911688
NORTHING: 3680785.896	EASTING: 495616.513
LAND SURFACE ELEVATION: 1232.40	
DATUM: NAD 27 VERTICAL: NGVD 29 METERS	

Non-pumping Water Level

Resolution Copper Mining

MONTGOMERY & ASSOCIATES
Water Resource Consultants

DHRES-06
SCHEMATIC DIAGRAM OF WELL CONSTRUCTION

Version: May 13, 2011

FIGURE 2

805\WellSchematics_2010\DHRES-6-wLOGS\13May2011

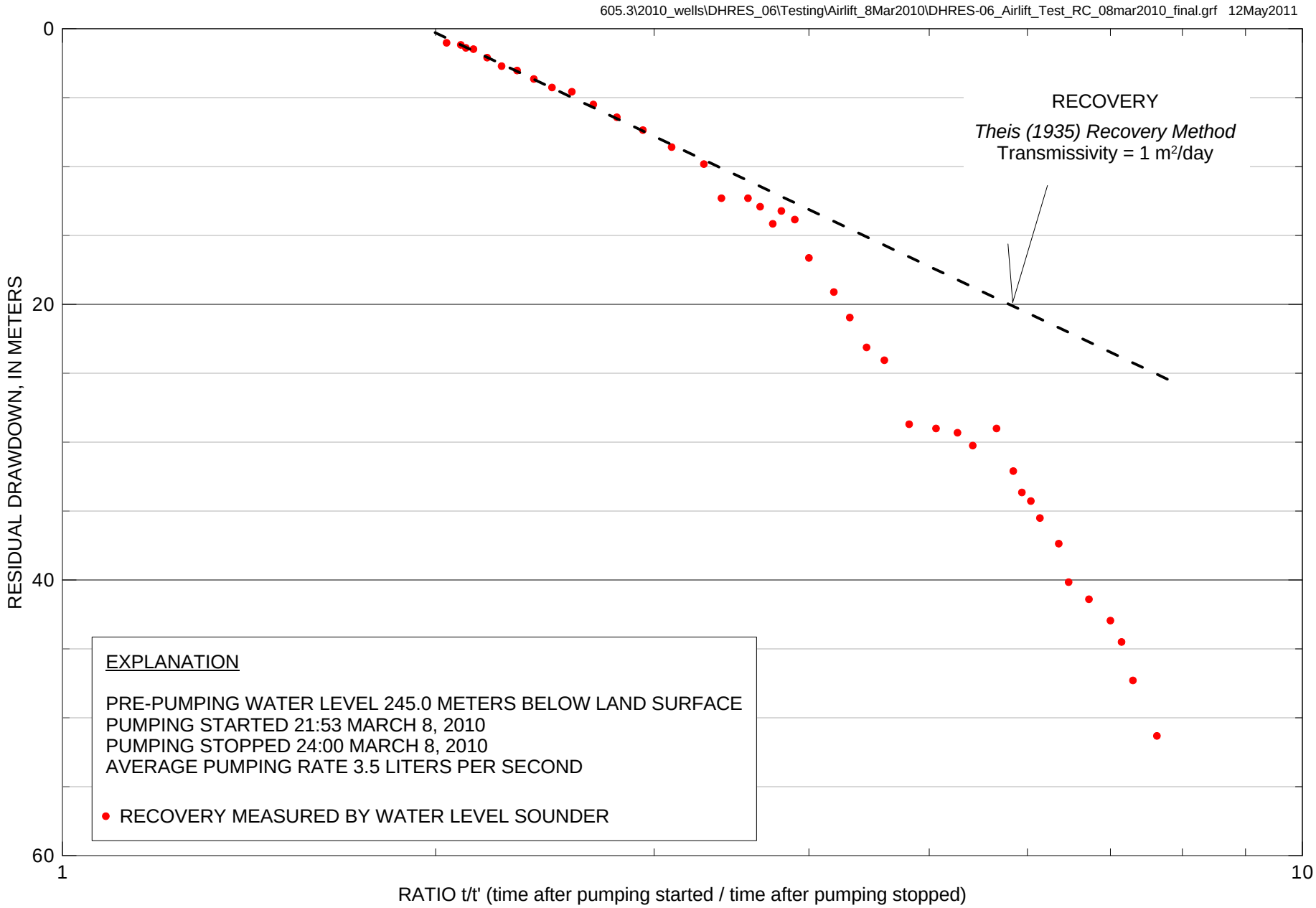


FIGURE 3. RECOVERY GRAPH FOR 2-HOUR OPEN BOREHOLE AIRLIFT TEST AT WELL DHRES-06 (OPEN INTERVAL 384.7 TO 579.7 METERS BELOW LAND SURFACE), RESOLUTION PROJECT

MONTGOMERY & ASSOCIATES

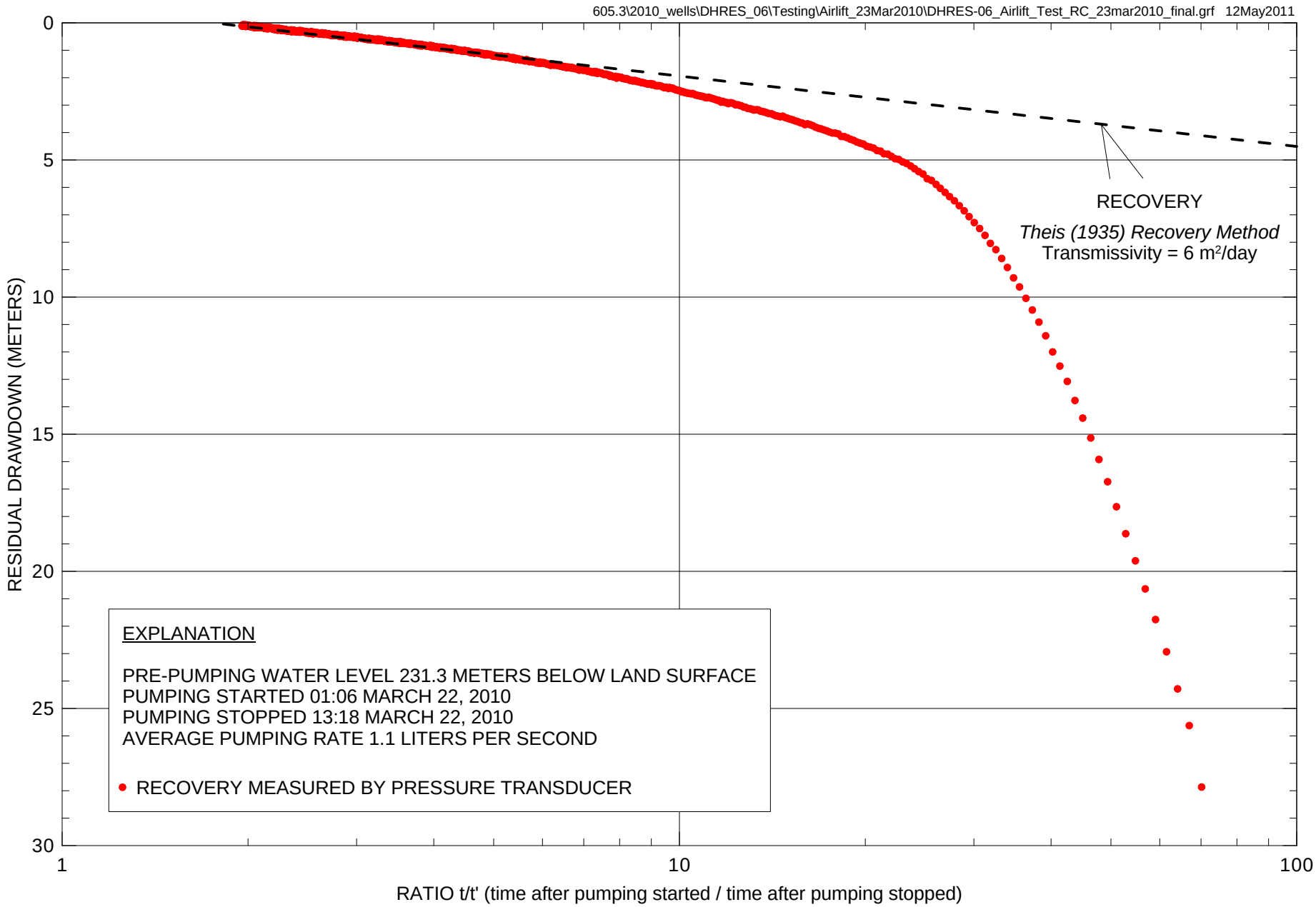


FIGURE 4. RECOVERY GRAPH FOR 12-HOUR AIRLIFT TEST AT CASED WELL DHRES-06, RESOLUTION PROJECT

MONTGOMERY & ASSOCIATES

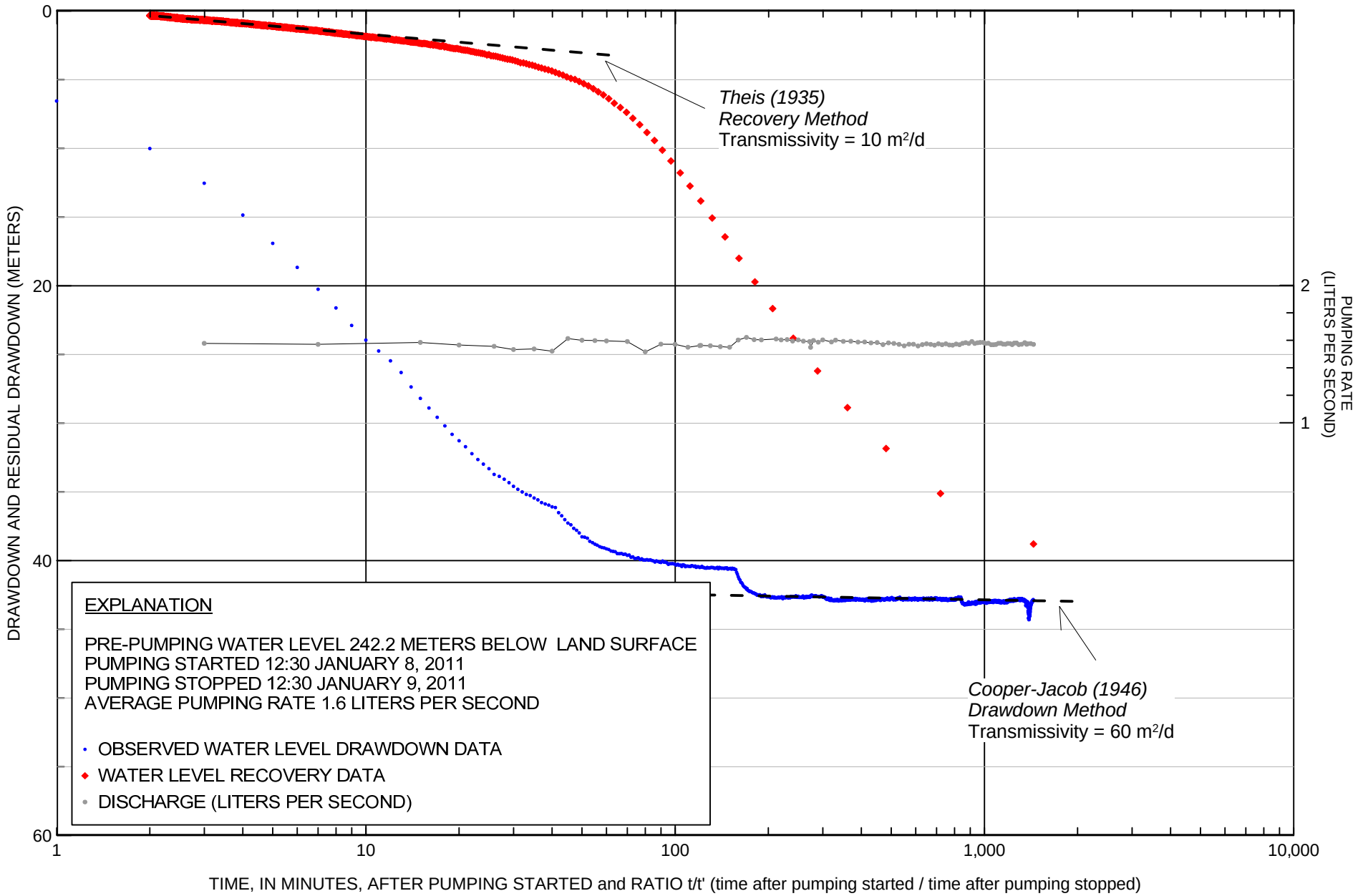


FIGURE 5. DRAWDOWN AND RECOVERY GRAPH FOR PUMPED WELL DHRES-06 DURING CONSTANT-RATE PUMPING TEST, RESOLUTION PROJECT

S:\projects\605 - Resolution_HydroCharacterization\605.4_Aquifer_Testing\DHRES-06_24hr_Pumping_Test\DHRES-06_DD_RC_metric_final.grf 12May2011

MONTGOMERY & ASSOCIATES

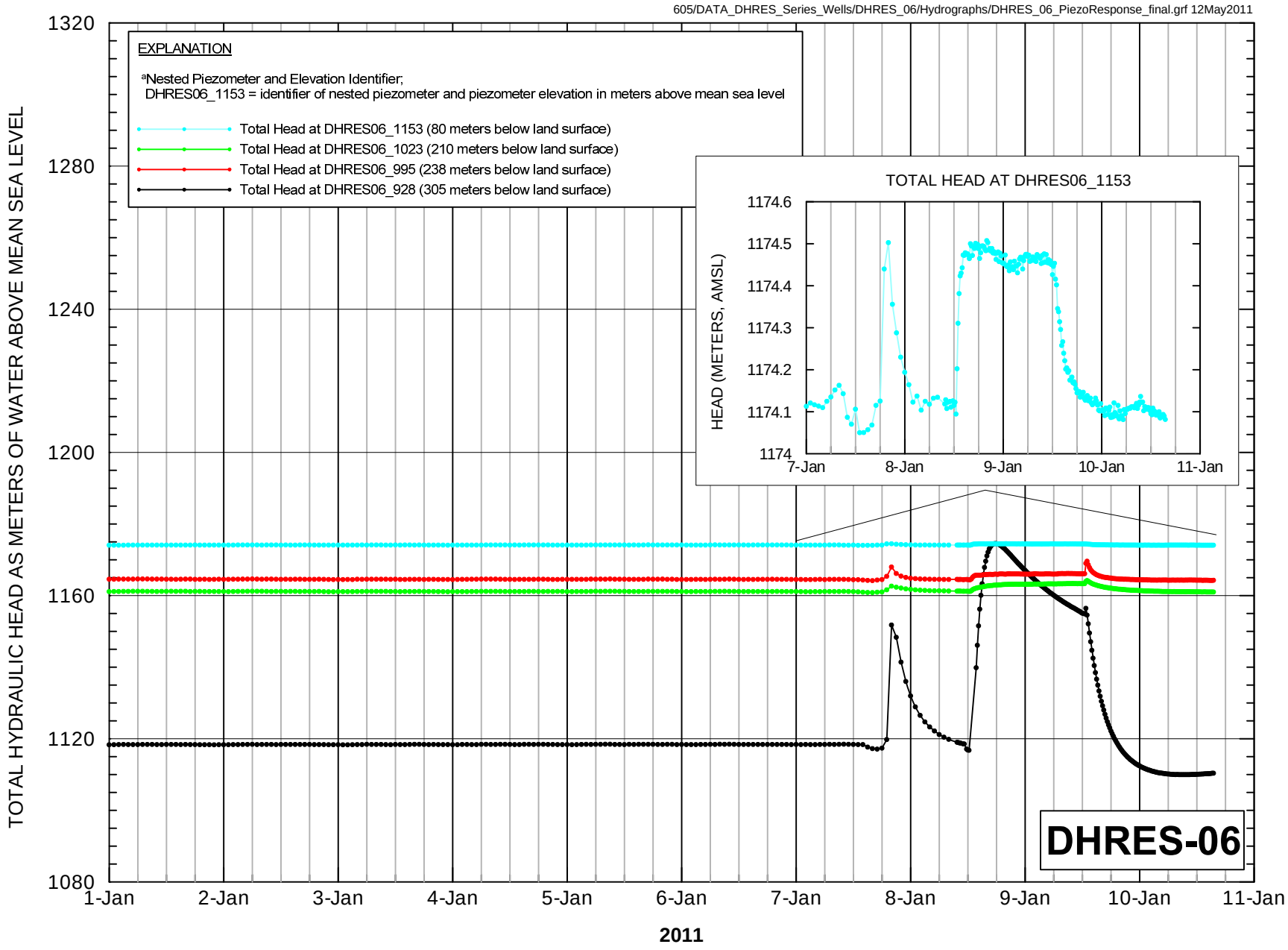


FIGURE 6. HYDROGRAPH OF PORE PRESSURES FROM DHRES-06 GROUTED PIEZOMETERS DURING 24-HOUR CONSTANT-RATE PUMPING TEST AT DHRES-06, RESOLUTION PROJECT

MONTGOMERY & ASSOCIATES

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF- Brown Unit (Tal)				
0 - 10	0.0 - 3.0	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, quartz, and bronzy biotite; abundant pumice fragments; minor lithic fragments including white, orange, clear, and pink quartz and friable brownish-black rocks; reaction to acid: none	some iron oxide staining	CONVENTIONAL AIR-ROTARY; generally fine cut chips are 65% sand size, 20% fines size, and 15% gravel size; subangular to subrounded chips up to 1.0 cm
10 - 20	3.0 - 6.1	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, quartz, and bronzy biotite; abundant pumice fragments; minor lithic fragments including orange, clear, pink, and yellow quartz, friable brownish-black rocks, and gray quartzite; reaction to acid: none	some iron oxide staining	generally fine cut chips are 70% sand size, 20% fines size, and 10% gravel size; subangular to subrounded chips up to 1.1 cm
20 - 30	6.1 - 9.1	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar and bronzy black biotite; abundant pumice fragments; trace lithics including gray quartz and gray limestone; reaction to acid: none	trace iron oxide staining	extremely fine cut chips are 80% sand size, 20% fines size, and trace gravel size; weak acid reaction on lithic fragments; subangular to subrounded chips up to 0.7 cm
30 - 40	9.1 - 12.2	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar and bronzy black biotite; abundant pumice fragments; trace lithics including yellowish-red vein quartz and gray shale; reaction to acid: none	trace iron oxide staining	cut chips are 55% sand size, 30% gravel size, and 15% fines size; subangular to subrounded chips up to 0.7 cm
40 - 50	12.2 - 15.2	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, bronzy black biotite, and trace magnetite; less pumice; reaction to acid: none	trace iron oxide staining	CONVENTIONAL MUD-ROTARY; cut chips are 65% sand size, 25% gravel size, and 10% fines size; trace cement chips; subangular to subrounded chips up to 2.0 cm
50 - 60	15.2 - 18.3	Brown Unit; pinkish gray [5YR6/2]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, bronzy black biotite, and trace magnetite; common pumice; reaction to acid: none	trace iron oxide staining	cut chips are 50% gravel size, 40% sand size, and 10% fines size; trace cement chips; subangular to subrounded chips up to 3.0 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF- Brown Unit (Tal)				
60 - 70	18.3 - 21.3	Brown Unit; pinkish gray [5YR6/2]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, bronzy black biotite, and trace magnetite; common pumice; trace brownish-gray shale lithic fragments; reaction to acid: none		cut chips are 50% sand size, 30% gravel size, and 20% fines size; trace cement chips; subangular to subrounded chips up to 2.0 cm
70 - 80	21.3 - 24.4	Brown Unit; pinkish gray [5YR6/2]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar and bronzy black biotite; increased feldspar; trace magnetite; common pumice; trace brownish-gray shale lithic fragments; reaction to acid: none	trace iron oxide staining	cut chips are 50% sand size, 30% gravel size, and 20% fines size; trace cement chips; subangular to subrounded chips up to 1.5 cm
80 - 90	24.4 - 27.4	Brown Unit; pinkish gray [5YR6/2]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar and bronzy black biotite; increased feldspar; trace magnetite; common pumice; reaction to acid: none to very weak	trace iron oxide staining, trace slickensides	cut chips are 50% sand size, 30% gravel size, and 20% fines size; trace cement chips; subangular to subrounded chips up to 1.7 cm
90 - 100	27.4 - 30.5	Brown Unit; pinkish gray [5YR6/2]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, bronzy black biotite, and trace magnetite; common pumice; reaction to acid: none	trace iron oxide staining	cut chips are 50% sand size, 30% gravel size, and 20% fines size; subangular to subrounded chips up to 1.2 cm
100 - 110	30.5 - 33.5	Brown Unit; pinkish gray [5YR6/2]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, bronzy black biotite, and trace magnetite; common pumice; reaction to acid: none		cut chips are 50% subangular, 30% gravel, 20% fine; subangular to subrounded chips up to 1.8 cm
110 - 120	33.5 - 36.6	Brown Unit; light brown [7.5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, bronzy black biotite, and trace magnetite; common pumice; trace finer volcanic tuff lithic fragments; reaction to acid: none	trace iron oxide staining	cut chips are 50% sand size, 30% gravel size, 20% fines size; subangular to subrounded chips up to 1.6 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF- Brown Unit (Tal)				
120 - 130	36.6 - 39.6	Brown Unit; light brown [7.5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, bronzy black biotite, and trace magnetite; common pumice; trace finer volcanic tuff lithic fragments; reaction to acid: none		cut chips are 50% sand size, 30% gravel size, 20% fines size; subangular to subrounded chips up to 1.5 cm
130 - 140	39.6 - 42.7	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, bronzy black biotite, and trace magnetite; common pumice; trace finer volcanic tuff lithic fragments; reaction to acid: none	trace iron oxide staining (hematite and limonite)	cut chips are 50% sand size, 30% gravel size, 20% fines size; subangular to subrounded chips up to 2.2 cm
140 - 150	42.7 - 45.7	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice; trace finer purplish-gray volcanic tuff lithic fragments; reaction to acid: none		cut chips are 50% sand size, 30% gravel size, 20% fines size; subangular to subrounded chips up to 1.0 cm
150 - 160	45.7 - 48.8	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice; trace finer volcanic tuff lithic fragments; reaction to acid: none		cut chips are 50% sand size, 30% gravel size, 20% fines size; subangular to subrounded chips up to 1.2 cm
160 - 170	48.8 - 51.8	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice; trace finer purplish-gray volcanic tuff lithic fragments; reaction to acid: none	trace slickensides	cut chips are 50% sand size, 30% gravel size, 20% fines size; subangular to subrounded chips up to 2.1 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF- Brown Unit (Tal)				
170 - 180	51.8 - 54.9	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice; trace finer purplish-gray volcanic tuff lithic fragments; reaction to acid: none to weak		cut chips are 70% sand size, 20% fines size, 10% gravel size; subangular to subrounded chips up to 0.8 cm
180 - 190	54.9 - 57.9	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice; trace brownish-black shale lithic fragments; reaction to acid: none	trace iron oxide staining	cut chips are 65% sand size, 20% fines size, 15% gravel size; subangular to subrounded chips up to 2.0 cm
190 - 200	57.9 - 61.0	Brown Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice; trace brownish-black shale lithic fragments; reaction to acid: weak to moderate	trace iron oxide staining, 1% subhedral to euhedral calcite crystals	cut chips are 65% sand size, 20% fines size, 15% gravel size; acid reaction on calcite crystals only; subangular to subrounded chips up to 1.5 cm
200 - 210	61.0 - 64.0	Brown Unit; pink [5YR7/4]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice; trace brownish-black shale lithic fragments; reaction to acid: weak	trace iron oxide staining (limonite), trace calcite	cut chips are 60% sand size, 25% gravel size, 15% fines size; subangular to subrounded chips up to 0.7 cm
210 - 220	64.0 - 67.1	Brown Unit; pink [5YR7/4]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice fragments; reaction to acid: weak to moderate	trace iron oxide staining, 2% clear subhedral calcite fracture fill	cut chips are 60% sand size, 25% gravel size, 15% fines size; subangular to subrounded chips up to 1.2 cm
220 - 230	67.1 - 70.1	Brown Unit; pink [5YR7/4]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice fragments; reaction to acid: weak to moderate	trace iron oxide staining (limonite), trace to 1% calcite crystals	cut chips are 75% sand size, 15% fines size, 10% gravel size; acid reaction on calcite fracture fill; subangular to subrounded chips up to 1.5 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF- Brown Unit (Tal)				
230 - 240	70.1 - 73.2	Brown Unit; pink [5YR7/4]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice fragments; reaction to acid: weak	trace iron oxide staining, trace to 1% calcite crystals	cut chips are 75% sand size, 15% fines size, 10% gravel size; acid reaction on calcite fracture fill; subangular to subrounded chips up to 1.1 cm
240 - 250	73.2 - 76.2	Brown Unit; pink [5YR7/4]; well lithified; crystal-rich dacite tuff with pinkish-brown aphanitic groundmass and phenocrysts of feldspar, clear quartz, bronzy black biotite, trace amphibole, and trace magnetite; common pumice fragments; reaction to acid: weak to moderate	trace iron oxide staining, trace to 1% calcite crystals	cut chips are 75% sand size, 20% fines size, 5% gravel size; acid reaction on calcite fracture fill; subangular to subrounded chips up to 1.7 cm
APACHE LEAP TUFF- Vitrophyre (Tal)				
250 - 260	76.2 - 79.2	Vitrophyre; light brown [7.5YR6/4]; well lithified; 55% crystal-rich dacite tuff with orange glassy groundmass and phenocrysts of clear quartz, feldspar, black biotite, and trace magnetite; trace lithics including gray and green mudstone; 30% black vitrophyre; and 15% pink tuff; reaction to acid: none	trace calcite	cut chips are 70% sand size, 20% fines size, 10% gravel size; acid reaction on calcite only; subangular to subrounded chips up to 1.0 cm
260 - 270	79.2 - 82.3	Vitrophyre; light brown [7.5YR6/3]; well lithified; 55% black vitrophyre; 40% crystal-rich dacite tuff with pinkish-brown aphanitic to glassy groundmass and phenocrysts of clear quartz, feldspar, black biotite, and trace magnetite; trace lithics including gray and green mudstone; 5% pink tuff; reaction to acid: none	trace iron oxide staining, trace slickensides	cut chips are 50% gravel size, 40% sand size, 10% fines size; subangular to subrounded chips up to 1.2 cm
270 - 280	82.3 - 85.3	Vitrophyre; light yellowish brown [10YR6/4] and reddish brown [5YR5/4]; well lithified; 60% black vitrophyre; 40% crystal-rich dacite tuff with pinkish-brown aphanitic to glassy groundmass and phenocrysts of clear quartz, feldspar, black biotite, and trace magnetite; trace lithics including white and gray quartzite, trace red mudstone (from underlying formation), and trace pink tuff; reaction to acid: none	some iron oxide staining, trace calcite	cut chips are 50% gravel size, 40% sand size, 10% fines size; subangular to subrounded chips up to 1.2 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw2)				
280 - 290	85.3 - 88.4	Lacustrine Unit Tw2; reddish brown [2.5YR5/4]; moderately to well lithified; mudstone; cut chips are 90% matrix chips of red mudstone and trace sandstone and 10% clasts of black vitrophyre, white limestone, orange quartz, orange tuff; reaction to acid: weak	abundant iron oxide staining (hematite), trace calcite veinlet	subangular to subrounded chips up to 0.9 cm; clay balls; did not measure fines/sand/gravel because sample is very washed out. shaker keeps getting clogged and has to be washed; slight acid reaction on calcite and limestone clasts
290 - 300	88.4 - 91.4	Lacustrine Unit Tw2; reddish brown [2.5YR5/4]; moderately to well lithified; mudstone and siltstone; cut chips are mostly matrix chips of 50% red calcareous mudstone, 50% red siltstone and trace red sandstone, trace clasts of gray limestone, black and white diabase and silvery schist; overall sample is 95% calcareous red clayey silt matrix, 5% sand, and trace gravel; reaction to acid: moderate to strong	abundant iron oxide staining (hematite)	subangular to subrounded chips up to 1.2 cm; some clay balls
300 - 310	91.4 - 94.5	Lacustrine Unit Tw2; reddish brown [2.5YR5/4]; moderately to well lithified; mudstone and siltstone; cut chips are mostly matrix chips of 50% red calcareous mudstone, 50% red siltstone and trace red sandstone, with trace clasts of gray limestone, black and white diabase, silvery schist, very weathereddish-gray tuff, trace orange tuff (from uphole?); overall sample is 94% calcareous red clayey silt matrix, 6% sand, and trace gravel; reaction to acid: strong	abundant iron oxide (hematite), trace slickensides, trace calcite veinlet	subangular to subrounded chips up to 1.3 cm
310 - 320	94.5 - 97.5	Lacustrine Unit Tw2; reddish brown [2.5YR5/4]; moderately to well lithified; mudstone and siltstone; cut chips are mostly matrix chips of 50% red calcareous mudstone, 50% red siltstone and trace red sandstone, with trace clasts of gray limestone, black and white diabase, silvery schist, very weathereddish-gray tuff, trace orange tuff (from uphole?); overall sample is 98% calcareous red clayey silt matrix, 2% sand, and trace gravel; reaction to acid: strong	abundant iron oxide (hematite)	subangular to subrounded chips up to 1.3 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw2)				
320 - 330	97.5 - 100.6	Lacustrine Unit Tw2; reddish brown [2.5YR5/4]; moderately to well lithified; sandstone and siltstone; cut chips are mostly matrix chips of 50% red sandstone, 50% red siltstone and trace red calcareous mudstone, with trace clasts of gray limestone, black and white diabase, silvery schist, very weathereddish-gray tuff, trace orange tuff (from uphole?); overall sample is 98% calcareous red clayey silt matrix, 2% sand, and trace gravel; reaction to acid: moderate to strong	abundant iron oxide (hematite)	subangular to subrounded chips up to 1.3 cm
330 - 340	100.6 - 103.6	Lacustrine Unit Tw2; yellowish red [5YR5/6]; moderately to well lithified; siltstone and silty sandstone; cut chips are 98% matrix chips of brown and red siltstone and silty sandstone, trace red mudstone, 2% clasts of orangish-red waxy aphanitic volcanic rock, trace schist, milky vein quartz, gray limestone, green and black diabase; overall sample is 99% calcareous reddish-brown clayey silt matrix, 1% sand, gravel; reaction to acid: moderate to strong	common iron oxide (hematite)	subangular to subrounded chips up to 1.6 cm
340 - 350	103.6 - 106.7	Lacustrine Unit Tw2; yellowish red [5YR5/6]; moderately to well lithified; siltstone and silty sandstone; cut chips are mostly matrix chips of brown and red siltstone and silty sandstone, trace red mudstone, with trace clasts of orangish-red waxy aphanitic volcanic rock, schist, milky vein quartz, gray limestone, green and black diabase; overall sample is 100% calcareous reddish-brown clayey silt matrix, trace sand, gravel; reaction to acid: moderate to strong	common iron oxide (hematite)	subangular to subrounded chips up to 1.6 cm
350 - 360	106.7 - 109.7	Lacustrine Unit Tw2; yellowish red [5YR5/6]; moderately to well lithified; siltstone and silty sandstone; cut chips are mostly matrix chips of brown and red siltstone and silty sandstone, trace red mudstone, with trace clasts of orangish-red waxy aphanitic volcanic rock, schist, milky vein quartz, gray limestone, green and black diabase; overall sample is 100% calcareous reddish-brown clayey silt matrix, trace sand, gravel; reaction to acid: moderate	common iron oxide (hematite)	subangular to subrounded chips up to 1.6 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw2)				
360 - 370	109.7 - 112.8	Lacustrine Unit Tw2; yellowish red [5YR5/6]; moderately to well lithified; siltstone and silty sandstone; cut chips are mostly matrix chips of brown and red siltstone and silty sandstone, trace red mudstone, with trace clasts of orangish-red waxy aphanitic volcanic rock, schist, milky vein quartz, green and black diabase; overall sample is 100% calcareous reddish-brown clayey silt matrix, trace sand, gravel; reaction to acid: weak to moderate	common iron oxide (hematite), trace calcite	subangular to subrounded chips up to 1.0 cm; calcite chips in sand fraction
370 - 380	112.8 - 115.8	Lacustrine Unit Tw2; yellowish red [5YR5/6]; moderately to well lithified; siltstone and silty sandstone; cut chips are 98% matrix chips of brown and red siltstone and silty sandstone, trace red mudstone, 2% clasts of orangish-red waxy aphanitic volcanic rock, schist, milky vein quartz, green and black diabase; overall sample is 99.5% calcareous reddish-brown clayey silt matrix, 0.5% sand, gravel`; reaction to acid: weak to moderate	common iron oxide (hematite)	subangular to subrounded chips up to 1.4 cm
380 - 390	115.8 - 118.9	Lacustrine Unit Tw2; yellowish red [5YR5/6]; moderately to well lithified; siltstone and silty sandstone; cut chips are mostly matrix chips of brown and red siltstone and silty sandstone, trace red mudstone, with trace clasts of orangish-red waxy aphanitic volcanic rock, schist, milky vein quartz, green and black diabase; overall sample is 100% calcareous reddish-brown clayey silt matrix, trace sand, gravel; reaction to acid: weak to moderate	some iron oxide (hematite)	subangular to subrounded chips up to 0.7 cm
390 - 400	118.9 - 121.9	Lacustrine Unit Tw2; yellowish red [5YR5/6]; moderately to well lithified; siltstone and silty sandstone; cut chips are mostly matrix chips of brown and red siltstone and silty sandstone, trace red mudstone, with trace clasts of orangish-red waxy aphanitic volcanic rock, schist, milky vein quartz, green and black diabase; overall sample is 100% calcareous reddish-brown clayey silt matrix, trace sand, gravel; reaction to acid: weak to moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.1 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw2)				
400 - 410	121.9 - 125.0	Lacustrine Unit Tw2; yellowish red [5YR5/6]; moderately to well lithified; siltstone and silty sandstone; cut chips are mostly matrix chips of brown and red siltstone and silty sandstone, trace red mudstone, with trace clasts of orangish-red waxy aphanitic volcanic rock, schist, milky vein quartz, green and black diabase; overall sample is 100% calcareous reddish-brown clayey silt matrix, trace sand, gravel; reaction to acid: weak to moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.0 cm, trace clay balls
410 - 420	125.0 - 128.0	Lacustrine Unit Tw2; yellowish red [5YR5/6]; moderately to well lithified; siltstone and sandstone; cut chips are 80% matrix chips of brown and red siltstone and sandstone, trace red mudstone, 20% clasts of black and white diabase, silvery schist, clear and white quartz; overall sample is 93% calcareous reddish-brown clayey silt matrix, 6% sand, 1% gravel; reaction to acid: moderate	trace iron oxide (hematite), trace calcite	subrounded chips up to 0.9 cm; calcite in sand fraction
420 - 430	128.0 - 131.1	Lacustrine Unit Tw2; light brown [7.5YR6/4]; moderately to well lithified; siltstone and sandstone; cut chips are 80% matrix chips of brown and red siltstone and sandstone, 20% clasts of black diabase, pink limestone, white quartz and schist in sand fraction; overall sample is 92% calcareous reddish-brown clayey silt matrix, 7% sand, 1% gravel; reaction to acid: moderate	trace iron oxide (hematite), trace calcite	subrounded chips up to 1.3 cm; calcite in sand fraction
430 - 440	131.1 - 134.1	Lacustrine Unit Tw2; reddish brown [5YR5/4]; moderately to well lithified; siltstone and sandstone; cut chips are 60% matrix chips of brown and red siltstone and sandstone, 40% clasts of black diabase, pink limestone, white quartz and schist; overall sample is 84% calcareous reddish-brown clayey silt matrix, 14% sand, 2% gravel; reaction to acid: moderate	trace iron oxide (hematite), trace calcite	subrounded chips up to 1.3 cm; calcite in sand fraction
440 - 450	134.1 - 137.2	Lacustrine Unit Tw2; reddish brown [5YR5/4]; moderately to well lithified; siltstone and sandstone; cut chips are 60% matrix chips of brown and red siltstone and sandstone, 40% clasts of black diabase, pink limestone, white quartz and schist; overall sample is 82% calcareous reddish-brown clayey silt matrix, 16% sand, 2% gravel; reaction to acid: moderate	trace iron oxide (hematite), trace calcite	subrounded chips up to 2.0 cm

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Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
450 - 460	137.2 - 140.2	Matrix-supported conglomerate Unit Tw3; brown [7.5YR5/4]; weakly to moderately lithified; clayey sandy silt; cut chips are clasts of black and white diabase, black basalt, silvery schist, gray, orange, red and purple quartzite; overall sample is 50% brown clayey silt matrix, 45% sand, 5% gravel; reaction to acid: moderate	some iron oxide (hematite), calcite crystals up to 0.4 cm	subangular to subrounded chips up to 1.2 cm
460 - 470	140.2 - 143.3	Matrix-supported conglomerate Unit Tw3; brown [7.5YR5/4]; weakly to moderately lithified; clayey silty sand; cut chips are clasts of black, green and white diabase with trace epidote, black basalt, silvery schist, gray limestone, gray, orange, red, green and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 35% brown clayey silt matrix, 60% sand, 5% gravel; reaction to acid: moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.3 cm
470 - 480	143.3 - 146.3	Matrix-supported conglomerate Unit Tw3; brown [7.5YR5/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of black, green and white diabase with trace epidote, black basalt, silvery schist, gray limestone, gray, orange, red, green and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 70% brown clayey silt matrix, 25% sand, 5% gravel; reaction to acid: moderate	some iron oxide (hematite)	subangular to subrounded chips up to 0.9 cm
480 - 490	146.3 - 149.4	Matrix-supported conglomerate Unit Tw3; brown [7.5YR5/4]; weakly to moderately lithified; clayey sandy silt; cut chips are clasts of black, green and white diabase with trace epidote, black basalt, silvery schist, gray limestone, gray, orange, red, green and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 60% brown clayey silt matrix, 35% sand, 5% gravel; reaction to acid: moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.2 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
490 - 500	149.4 - 152.4	Matrix-supported conglomerate Unit Tw3; brown [7.5YR5/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of black, green and white diabase with trace epidote, black basalt, silvery schist, gray limestone, gray, orange, red, green and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 70% brown clayey silt matrix, 25% sand, 5% gravel; reaction to acid: weak to moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.0 cm
500 - 510	152.4 - 155.4	Matrix-supported conglomerate Unit Tw3; brown [7.5YR5/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of black, green and white diabase with trace epidote, black basalt, silvery schist, gray limestone, gray, orange, red, green and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 70% brown clayey silt matrix, 30% sand, trace gravel; reaction to acid: weak to moderate	trace iron oxide	subangular to subrounded chips up to 0.5 cm with clayballs
510 - 520	155.4 - 158.5	Matrix-supported conglomerate Unit Tw3; brown [7.5YR5/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of black, green and white diabase with trace epidote, black basalt, silvery schist, gray limestone, gray, orange, red, green and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 80% brown clayey silt matrix, 20% sand, trace gravel; reaction to acid: weak to moderate	trace iron oxide, trace calcite vein fill	subangular to subrounded chips up to 0.6 cm with clayballs
520 - 530	158.5 - 161.5	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of black, green and white diabase with trace epidote, black basalt, silvery schist, gray limestone, gray, orange, red, green and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 75% brown clayey silt matrix, 25% sand, trace gravel; reaction to acid: weak to moderate	trace iron oxide	subangular to subrounded chips up to 0.6 cm with clayballs

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
530 - 540	161.5 - 164.6	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of black, green and white diabase with trace epidote, black basalt, silvery schist, gray limestone, gray, orange, red, green and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 75% brown clayey silt matrix, 25% sand, trace gravel; reaction to acid: weak to moderate	trace iron oxide	subangular to subrounded chips up to 0.6 cm with clayballs
540 - 550	164.6 - 167.6	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; clayey silty sand; cut chips are clasts of 50% black, green and white diabase with trace epidote, 50% mixed lithologies including black basalt, silvery schist, gray limestone, gray, orange, red, green, beige and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 40% brown clayey silt matrix, 50% sand, 10% gravel; reaction to acid: weak to moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.0 cm
550 - 560	167.6 - 170.7	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; clayey silty sand; cut chips are clasts of 50% black, green and white diabase with trace epidote, 50% mixed lithologies including black basalt, silvery schist, gray limestone, gray, orange, red, green, beige and purple quartzite, trace clear quartz, with trace matrix chips of red mudstone; overall sample is 40% brown clayey silt matrix, 50% sand, 10% gravel; reaction to acid: moderate	some iron oxide (hematite)	subangular to subrounded chips up to 0.3 cm
560 - 570	170.7 - 173.7	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; silty sand; cut chips are clasts of 50% black, green and white diabase with trace magnetite, 35% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt and gray limestone, 15% matrix chips of reddish-brown siltstone and mudstone; overall sample is 40% brown silt matrix, 47% sand, 13% gravel; reaction to acid: moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.5 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
570 - 580	173.7 - 176.8	Clast-supported conglomerate Unit Tw3; brown [7.5YR5/4]; weakly to moderately lithified; silty gravelly sand; cut chips are clasts of 50% black, green and white diabase with trace epidote and trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt and gray limestone, with trace matrix chips of reddish-brown siltstone and mudstone; overall sample is 15% brown silt matrix, 55% sand, 30% gravel; reaction to acid: weak to moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.1 cm
580 - 590	176.8 - 179.8	Clast-supported conglomerate Unit Tw3; brown [7.5YR5/4]; weakly to moderately lithified; silty gravelly sand; cut chips are clasts of 50% black, green and white diabase with trace epidote and trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt and gray limestone, with trace matrix chips of reddish-brown siltstone and mudstone; overall sample is 15% brown silt matrix, 55% sand, 30% gravel; reaction to acid: weak to moderate	some iron oxide (hematite)	subangular to subrounded chips up to 0.6 cm
590 - 600	179.8 - 182.9	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of 50% black, green and white diabase with trace epidote and trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt and gray limestone, with trace matrix chips of reddish-brown siltstone and mudstone; overall sample is 30% brown silt matrix, 50% sand, 20% gravel; reaction to acid: weak to moderate	some iron oxide (hematite), trace manganese oxide on limestone clast	subangular to subrounded chips up to 1.0 cm
600 - 610	182.9 - 185.9	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of 50% black, green and white diabase with trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt, gray, red, pink and brown limestone and trace vein quartz, with trace matrix chips of brown silty sandstone; overall sample is 35% brown silt matrix, 50% sand, 15% gravel; reaction to acid: moderate to strong	some iron oxide (hematite)	subangular to subrounded chips up to 1.3 cm

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Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
610 - 620	185.9 - 189.0	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of 50% black, green and white diabase with trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt, gray, red, pink and brown limestone and trace vein quartz, with trace matrix chips of brown silty sandstone; overall sample is 35% brown silt matrix, 50% sand, 15% gravel; reaction to acid: moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.3 cm
620 - 630	189.0 - 192.0	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; silty gravelly sand; cut chips are clasts of 50% black, green and white diabase with trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt, gray, red, pink and brown limestone and trace vein quartz, with trace matrix chips of brown silty sandstone; overall sample is 20% brown silt matrix, 50% sand, 30% gravel; reaction to acid: moderate to strong	some iron oxide (hematite)	subangular to subrounded chips up to 1.0 cm
630 - 640	192.0 - 195.1	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of 50% black, green and white diabase with trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt, gray, red, pink and brown limestone and trace vein quartz, with trace matrix chips of brown silty sandstone; overall sample is 35% brown silt matrix, 45% sand, 20% gravel; reaction to acid: moderate to strong	some iron oxide (hematite)	subangular to subrounded chips up to 12 cm
640 - 650	195.1 - 198.1	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly sandy silt; cut chips are clasts of 50% black, green and white diabase with trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt, gray, red, pink and brown limestone and trace vein quartz, with trace matrix chips of brown silty sandstone; overall sample is 45% brown silt matrix, 40% sand, 15% gravel; reaction to acid: moderate to strong	some iron oxide (hematite)	subangular to subrounded chips up to 0.9 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
650 - 660	198.1 - 201.2	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly sandy silt; cut chips are clasts of 50% black, green and white diabase with trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt, gray, red, pink and brown limestone and trace vein quartz, with trace matrix chips of brown silty sandstone and red mudstone; overall sample is 45% brown silt matrix, 40% sand, 15% gravel; reaction to acid: moderate to strong	some iron oxide (hematite), trace manganese oxide	subangular to subrounded chips up to 0.9 cm
660 - 670	201.2 - 204.2	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of 50% black, green and white diabase with trace magnetite, 50% mixed lithologies including tuff, orange, purple and gray quartzite, black basalt, gray, red, pink and brown limestone and trace vein quartz, with trace matrix chips of brown silty sandstone and red mudstone, trace orange-pink gypsum; overall sample is 35% brown silt matrix, 50% sand, 15% gravel; reaction to acid: moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.0 cm
670 - 680	204.2 - 207.3	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace magnetite, gray and pink limestone, brown, red and gray quartzite and silvery schist, with trace matrix chips of brown silty sandstone; overall sample is 45% brown silt matrix, 40% sand, 15% gravel; reaction to acid: moderate	some iron oxide (hematite), calcite crystals, trace manganese oxide on limestone clasts	subangular to subrounded chips up to 1.2 cm
680 - 690	207.3 - 210.3	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, gray and pink limestone (trace oolitic), brown, red, green and gray quartzite and silvery schist, with trace matrix chips of brown silty sandstone; overall sample is 50% brown silt matrix, 40% sand, 10% gravel; reaction to acid: moderate	some iron oxide (hematite), trace pyrite on green quartzite	subangular to subrounded chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
690 - 700	210.3 - 213.4	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, gray and pink limestone (trace oolitic), brown, red, green and gray quartzite, silvery schist and trace gray milky vein quartz, with trace matrix chips of brown silty sandstone; overall sample is 70% brown silt matrix, 25% sand, 5% gravel; reaction to acid: moderate	some iron oxide (hematite), trace vein quartz	subangular to subrounded chips up to 1.0 cm
700 - 710	213.4 - 216.4	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace magnetite, gray, green, brown and red quartzite, gray and pink limestone and silvery schist, with trace matrix chips of brown sandy siltstone; overall sample is 70% brown silt matrix, 25% sand, 5% gravel; reaction to acid: weak to moderate	some iron oxide, trace calcite	subangular to subrounded chips up to 1.0 cm; calcite chips in subangular fraction
710 - 720	216.4 - 219.5	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, gray, green, brown and red quartzite, gray and pink limestone and silvery schist, with trace matrix chips of brown sandy siltstone; overall sample is 30% brown silt matrix, 50% sand, 20% gravel; reaction to acid: moderate	some iron oxide	subangular to subrounded chips up to 1.1 cm
720 - 730	219.5 - 222.5	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace magnetite, gray, green, brown and red quartzite, gray and pink limestone, silvery schist and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone; overall sample is 35% brown silt matrix, 45% sand, 20% gravel; reaction to acid: moderate	some iron oxide	subangular to subrounded chips up to 1.5 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
730 - 740	222.5 - 225.6	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase, gray, green, brown and red quartzite, gray and pink limestone, silvery schist and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone; overall sample is 40% brown silt matrix, 45% sand, 15% gravel; reaction to acid: moderate	some iron oxide	subangular to subrounded chips up to 1.0 cm
740 - 750	225.6 - 228.6	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace magnetite, gray, green, brown and red quartzite, gray and pink limestone (trace oolitic), silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone; overall sample is 55% brown silt matrix, 30% sand, 15% gravel; reaction to acid: moderate to strong	some iron oxide	subangular to subrounded chips up to 1.4 cm
750 - 760	228.6 - 231.6	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, gray, green, brown and red quartzite, gray and pink limestone, silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone; overall sample is 35% brown silt matrix, 45% sand, 20% gravel; reaction to acid: moderate to strong	some iron oxide	subangular to subrounded chips up to 0.9 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
760 - 770	231.6 - 234.7	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, gray, green, brown and red quartzite, gray and pink limestone, silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone and red siltstone; overall sample is 35% brown silt matrix, 45% sand, 20% gravel; reaction to acid: moderate to strong	some iron oxide	subangular to subrounded chips up to 0.8 cm
770 - 780	234.7 - 237.7	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, gray, green, brown and red quartzite, gray and pink limestone, silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone and red siltstone; overall sample is 30% brown silt matrix, 50% sand, 20% gravel; reaction to acid: moderate to strong	some iron oxide	subangular to subrounded chips up to 1.0 cm
780 - 790	237.7 - 240.8	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; silty gravelly sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, gray, green, brown and red quartzite, gray and pink limestone, silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone and red siltstone; overall sample is 20% brown silt matrix, 50% sand, 30% gravel; reaction to acid: moderate to strong	some iron oxide	subangular to subrounded chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
790 - 800	240.8 - 243.8	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, gray, green, brown and red quartzite, gray and pink limestone, silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone and red siltstone; overall sample is 50% brown silt matrix, 40% sand, 10% gravel; reaction to acid: moderate	some iron oxide	subangular to subrounded chips up to 1.0 cm
800 - 810	243.8 - 246.9	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, gray, green, brown, purple and red quartzite, purple siltstone, gray and pink limestone, silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone and red siltstone; overall sample is 45% brown silt matrix, 40% sand, 15% gravel; reaction to acid: moderate to strong	some iron oxide	subangular to subrounded chips up to 1.0 cm
810 - 820	246.9 - 249.9	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote, gray, green, brown, purple and red quartzite, purple siltstone, gray and pink limestone, silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone and red siltstone; overall sample is 60% brown silt matrix, 35% sand, 5% gravel; reaction to acid: moderate	some iron oxide	subangular to subrounded chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
820 - 830	249.9 - 253.0	Matrix-supported conglomerate Unit Tw3; light yellowish brown [10YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote, gray, green, brown, purple and red quartzite, purple siltstone, gray limestone, silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone and red siltstone; overall sample is 55% brown silt matrix, 40% sand, 5% gravel; reaction to acid: moderate	some iron oxide	subangular to subrounded chips up to 0.9 cm
830 - 840	253.0 - 256.0	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote, gray, green, brown, purple and red quartzite, purple siltstone, gray limestone, silvery schist, trace gray vein quartz and trace green soapstone with tiny pyrite, with trace matrix chips of brown sandy siltstone and red siltstone; overall sample is 65% brown silt matrix, 30% sand, 5% gravel; reaction to acid: moderate	some iron oxide	subangular to subrounded chips up to 1.1 cm
840 - 850	256.0 - 259.1	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase, silvery schist, beige, purple, green and orange quartzite, gray limestone and milky vein quartz; overall sample is 60% brown silt matrix, 35% sand, 5% gravel; reaction to acid: moderate	some iron oxide	subangular to subrounded chips up to 0.9 cm
850 - 860	259.1 - 262.1	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace magnetite, silvery schist with trace chlorite, beige, purple, green and orange quartzite, gray, red and orange limestone and gray vein quartz, with trace matrix chips of brown sandy siltstone; overall sample is 60% brown silt matrix, 35% sand, 5% gravel; reaction to acid: moderate to strong	some iron oxide	subangular to subrounded chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
860 - 870	262.1 - 265.2	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, silvery schist with trace chlorite, beige, purple, green and orange quartzite, gray, red and orange limestone and gray vein quartz, with trace matrix chips of brown sandy siltstone; overall sample is 50% brown silt matrix, 45% sand, 5% gravel; reaction to acid: moderate to strong	some iron oxide	subangular to subrounded chips up to 1.0 cm
870 - 880	265.2 - 268.2	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, silvery schist with trace chlorite, beige, purple, green and orange quartzite, gray, red, brown and orange limestone and gray vein quartz, with trace matrix chips of brown sandy siltstone; overall sample is 55% brown silt matrix, 40% sand, 5% gravel; reaction to acid: moderate to strong	some iron oxide, trace calcite crystals	subangular to subrounded chips up to 1.3 cm
880 - 890	268.2 - 271.3	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/3]; weakly to moderately lithified; silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, silvery schist with trace chlorite, beige, purple, green and orange quartzite, gray, red, brown and orange limestone and gray vein quartz, with trace matrix chips of brown sandy siltstone and red mudstone; overall sample is 45% brown silt matrix, 50% sand, 5% gravel; reaction to acid: moderate	some iron oxide, trace calcite crystals	subangular to subrounded chips up to 2.2 cm; calcite in sand fraction

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
890 - 900	271.3 - 274.3	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/3]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, silvery schist with trace chlorite, beige, purple, green and orange quartzite, gray, red, brown and orange limestone and gray vein quartz, with trace matrix chips of brown sandy siltstone and red and brown mudstone; overall sample is 50% brown silt matrix, 45% sand, 5% gravel; reaction to acid: moderate	trace iron oxide, trace calcite crystals	subangular to subrounded chips up to 1.9 cm; calcite in subangular and gravel fractions
900 - 910	274.3 - 277.4	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, silvery schist with trace chlorite, beige, purple, green and orange quartzite, gray, red, brown and orange limestone and gray vein quartz, with trace matrix chips of brown sandy siltstone and red mudstone; overall sample is 45% brown silt matrix, 45% sand, 10% gravel; reaction to acid: moderate	trace iron oxide	subangular to subrounded chips up to 1.1 cm
910 - 920	277.4 - 280.4	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote, silvery schist with trace chlorite, beige, purple, green and orange quartzite, gray, red, brown and orange limestone, gray vein quartz and trace pink weathered tuff, with trace matrix chips of brown sandy siltstone and red mudstone; overall sample is 75% brown silt matrix, 25% sand, trace gravel; reaction to acid: moderate	trace iron oxide	subangular to subrounded chips up to 0.8 cm
920 - 930	280.4 - 283.5	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of mixed lithologies including pink tuff, black, white and red diabase, green, brown and red quartzite and trace epidote in sand fraction; overall sample is 85% brown clayey silt matrix, 15% sand, trace gravel; reaction to acid: moderate	trace iron oxide, trace calcite	subangular to subrounded chips up to 0.6 cm; epidote and calcite in sand fraction

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
930 - 940	283.5 - 286.5	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; clayey silt; cut chips are clasts of mixed lithologies including black and white diabase, orange, green and brown quartzite, brown, gray and red limestone, gray vein quartz, silvery schist and trace epidote in sand fraction; overall sample is 90% brown clayey silt matrix, 10% sand, trace gravel; reaction to acid: moderate	trace iron oxide, trace calcite	subangular to subrounded chips up to 0.5 cm; epidote and calcite in sand fraction
940 - 950	286.5 - 289.6	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of mixed lithologies including black and white diabase, orange, green and brown quartzite, brown, gray and red limestone, gray vein quartz, silvery schist and trace epidote in sand fraction; overall sample is 75% brown clayey silt matrix, 25% sand, trace gravel; reaction to acid: moderate	trace iron oxide, trace calcite	subangular to subrounded chips up to 1.0 cm; epidote and calcite in sand fraction
950 - 960	289.6 - 292.6	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of mixed lithologies including pinkish-brown crystal-rich tuff (Tal from uphole), other tuff chips, red and gray limestone, gray vein quartz, silvery schist, black, white and green diabase with trace epidote and brown quartzite, with trace matrix chips of brown sandy siltstone; overall sample is 85% brown clayey silt matrix, 15% sand, trace gravel; reaction to acid: moderate	trace iron oxide clasts	subangular to subrounded chips up to 3.5 cm; some Apache Leap Tuff contamination
960 - 970	292.6 - 295.7	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of mixed lithologies including black, white and green diabase, green, orange and brown quartzite, gray and white vein quartz, silvery schist and pink limestone; overall sample is 75% brown clayey silt matrix, 25% sand, trace gravel; reaction to acid: moderate	trace iron oxide	subangular to subrounded chips up to 0.8 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
970 - 980	295.7 - 298.7	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of mixed lithologies including black, white and green diabase, green, orange and brown quartzite, gray and white vein quartz, silvery schist and pink and gray limestone, with trace matrix chips of red mudstone; overall sample is 60% brown clayey silt matrix, 35% sand, 5% gravel; reaction to acid: moderate	some iron oxide (hematite and limonite), trace slickensides	subangular to subrounded chips up to 0.8 cm
980 - 990	298.7 - 301.8	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy clayey silt; cut chips are clasts of mixed lithologies including black, white and green diabase, silvery schist, orange and brown quartzite, gray limestone and white vein quartz, with trace matrix chips of brown siltstone; overall sample is 65% brown clayey silt matrix, 35% sand, trace gravel; reaction to acid: moderate	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 0.7 cm
990 - 1,000	301.8 - 304.8	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; clayey silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote, silvery schist, orange and brown quartzite, gray and brown limestone, white vein quartz and trace orange chert, with trace matrix chips of brown siltstone and red mudstone; overall sample is 50% brown clayey silt matrix, 50% sand, trace gravel; reaction to acid: moderate	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.1 cm
1,000 - 1,010	304.8 - 307.8	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; clayey silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote, silvery schist, orange and brown quartzite, gray and brown limestone, white vein quartz and trace orange chert, with trace matrix chips of brown siltstone and red mudstone; overall sample is 50% brown clayey silt matrix, 45% sand, 5% gravel; reaction to acid: strong	some iron oxide (hematite and limonite), trace calcite crystals	subangular to subrounded chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
1,010 - 1,020	307.8 - 310.9	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; silty sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote, silvery schist, orange and brown quartzite, gray, white and brown limestone, white vein quartz, trace orange chert and trace pink altered tuff, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 40% brown silt matrix, 55% sand, 5% gravel; reaction to acid: moderate to strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.0 cm
1,020 - 1,030	310.9 - 313.9	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace epidote and trace magnetite, silvery schist, orange, white and brown quartzite, gray, white and brown limestone (trace oolitic), white vein quartz, pinkish-brown crystal-rich tuff (Tal from uphole), trace orange chert and trace black basalt, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 5% brown silt matrix, 75% sand, 20% gravel; reaction to acid: strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.4 cm; trace cement chips
1,030 - 1,040	313.9 - 317.0	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace magnetite, silvery schist, orange, white and brown quartzite, gray, white vein quartz, pinkish-brown crystal-rich tuff (Tal from uphole), trace orange chert, trace black basalt and limestone in sand fraction, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 5% brown silt matrix, 75% sand, 20% gravel; reaction to acid: strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.2 cm; trace cement chips

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
1,040 - 1,050	317.0 - 320.0	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly sand; cut chips are clasts of mixed lithologies including black, white and green diabase with trace magnetite, silvery schist, orange, white and brown quartzite, gray, white vein quartz, gray, brown and pink limestone, trace pinkish-brown crystal-rich tuff (Tal from uphole), trace orange chert, trace black basalt, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 10% brown silt matrix, 70% sand, 15% gravel; reaction to acid: strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.4 cm; trace Apache Leap Tuff contamination
1,050 - 1,060	320.0 - 323.1	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/3]; weakly to moderately lithified; silty sand; cut chips are clasts of 50% black, white and green diabase with trace magnetite, 50% mixed lithologies including silvery schist, orange, white and brown quartzite, gray, white vein quartz, gray, brown and pink limestone, trace pinkish-brown crystal-rich tuff (Tal from uphole), trace orange and green chert, trace black basalt, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 35% brown silt matrix, 55% sand, 10% gravel; reaction to acid: strong	some iron oxide (hematite and limonite), trace white fault gouge	subangular to subrounded chips up to 1.0 cm
1,060 - 1,070	323.1 - 326.1	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/3]; weakly to moderately lithified; gravelly sand; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including silvery schist, orange, white and brown quartzite, gray, white vein quartz, trace gray, brown and pink limestone, trace pinkish-brown crystal-rich tuff (Tal from uphole), trace orange and green chert, trace black basalt, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 5% brown silt matrix, 75% sand, 15% gravel; reaction to acid: strong	some iron oxide (hematite and limonite), trace calcite crystals	subangular to subrounded chips up to 1.2 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
1,070 - 1,080	326.1 - 329.2	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/3]; weakly to moderately lithified; gravelly sand; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including silvery schist, orange, white and brown quartzite, gray, white vein quartz, trace gray, brown and pink limestone, trace pinkish-brown crystal-rich tuff (Tal from uphole), trace orange and green chert, trace black basalt, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 10% brown silt matrix, 70% sand, 15% gravel; reaction to acid: strong	trace iron oxide (hematite and limonite)	subangular to subrounded chips up to 0.8 cm
1,080 - 1,090	329.2 - 332.2	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/3]; weakly to moderately lithified; gravelly sand; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including silvery schist, orange, white and brown quartzite, gray, white vein quartz, trace gray, brown and pink limestone, trace pinkish-brown crystal-rich tuff (Tal from uphole), trace orange and green chert, trace black basalt, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 10% brown silt matrix, 70% sand, 15% gravel; reaction to acid: moderate to strong	trace iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.1 cm
1,090 - 1,100	332.2 - 335.3	Clast-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; gravelly sand; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including silvery schist, orange, white and brown quartzite, gray, white vein quartz, trace gray, brown and pink limestone, trace pinkish-brown crystal-rich tuff (Tal from uphole), trace orange and green chert, trace black basalt, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 10% brown silt matrix, 70% sand, 15% gravel; reaction to acid: moderate to strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.4 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
1,100 - 1,110	335.3 - 338.3	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of 50% black, white and green diabase with trace epidote, 50% mixed lithologies including silvery schist, orange, white and brown quartzite, gray, white vein quartz, trace gray, brown and pink limestone, trace pinkish-brown crystal-rich tuff (Tal from uphole), trace orange and green chert, trace black basalt, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 55% brown silt matrix, 40% sand, 5% gravel; reaction to acid: strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.4 cm
1,110 - 1,120	338.3 - 341.4	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of 50% black, white and green diabase with trace epidote, 50% mixed lithologies including silvery schist, orange, white and brown quartzite, gray, white vein quartz, trace gray, brown and pink limestone, trace pinkish-brown crystal-rich tuff (Tal from uphole), trace orange, red and green chert, trace black basalt, with trace matrix chips of brown siltstone and red mudstone and siltstone; overall sample is 50% brown silt matrix, 45% sand, 5% gravel; reaction to acid: moderate to strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 0.9 cm
1,120 - 1,130	341.4 - 344.4	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of 50% black, white and green diabase with trace epidote, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist and white vein quartz, with trace matrix chips of brown siltstone; overall sample is 50% brown silt matrix, 45% sand, 5% gravel; reaction to acid: strong	some iron oxide (hematite and limonite), trace slickensides, trace calcite crystals and hematite stain on fracture surfaces	subangular to subrounded chips up to 1.5 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
1,130 - 1,140	344.4 - 347.5	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist with trace chlorite and white vein quartz, with trace matrix chips of brown siltstone; overall sample is 65% brown silt matrix, 30% sand, 5% gravel; reaction to acid: strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.6 cm
1,140 - 1,150	347.5 - 350.5	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist, white vein quartz and trace purple chert, with trace matrix chips of brown siltstone; overall sample is 60% brown silt matrix, 35% sand, 5% gravel; reaction to acid: strong	some iron oxide (hematite and limonite), trace calcite crystals	subangular to subrounded chips up to 1.3 cm
1,150 - 1,160	350.5 - 353.6	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist and white vein quartz, with trace matrix chips of brown siltstone; overall sample is 50% brown silt matrix, 35% sand, 10% gravel; reaction to acid: strong	some iron oxide (hematite and limonite), trace slickensides	subangular to subrounded chips up to 1.0 cm
1,160 - 1,170	353.6 - 356.6	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist, white vein quartz and trace gray chert, with trace matrix chips of brown siltstone; overall sample is 70% brown silt matrix, 25% sand, 5% gravel; reaction to acid: moderate to strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.2 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
Resolution Copper Mining
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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
1,170 - 1,180	356.6 - 359.7	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/4]; weakly to moderately lithified; sandy silt; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist, white vein quartz, trace dark brown siliceous mudstone, trace pale green volcanic rock and trace gray chert; overall sample is 80% brown silt matrix, 15% sand, 5% gravel; reaction to acid: moderate to strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.0 cm
1,180 - 1,190	359.7 - 362.7	Matrix-supported conglomerate Unit Tw3; brown [7.5YR5/3]; weakly to moderately lithified; sand; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist, white vein quartz and trace gray chert, with trace matrix chips of brown siltstone; overall sample is trace brown silt matrix, 95% sand, 5% gravel; reaction to acid: moderate to strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.1 cm
1,190 - 1,200	362.7 - 365.8	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/3]; weakly to moderately lithified; sand; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist with trace chlorite, white vein quartz and trace gray chert, with trace matrix chips of brown siltstone; overall sample is 10% brown silt matrix, 85% sand, 5% gravel; reaction to acid: moderate to strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.1 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE (Tw3)				
1,200 - 1,210	365.8 - 368.8	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/3]; weakly to moderately lithified; sandy silt; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist with trace chlorite, white vein quartz, pink crystal-rich tuff (Tal from uphole) and trace gray chert, with trace matrix chips of brown siltstone; overall sample is 70% brown silt matrix, 25% sand, 5% gravel; reaction to acid: strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.0 cm; trace Apache Leap Tuff contamination
1,210 - 1,220	368.8 - 371.9	Matrix-supported conglomerate Unit Tw3; light brown [7.5YR6/3]; weakly to moderately lithified; silty sand; cut chips are clasts of 50% black, white and green diabase with trace epidote and trace magnetite, 50% mixed lithologies including green, red and white quartzite, gray, red and brown limestone, silvery schist, white vein quartz, pink crystal-rich tuff (Tal from uphole) and trace gray chert, with trace matrix chips of brown siltstone; overall sample is 30% brown silt matrix, 65% sand, 5% gravel; reaction to acid: strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.0 cm
NACO GROUP (Undifferentiated) (Pnaco)				
1,220 - 1,230	371.9 - 374.9	Limestone; pink [7.5YR7/4]; well lithified; 80% gray, brown, pink and yellow limestone, trace oolitic limestone, with 20% mixed lithologies including black, white and green diabase, silvery schist, white, brown and purple quartzite and gray chert, trace magnetite; reaction to acid: very strong	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.1 cm; mostly gravel size chips
1,230 - 1,240	374.9 - 378.0	Limestone; pink [7.5YR8/4]; well lithified; mostly gray, pink, brown and yellow limestone, trace oolitic limestone, trace black, white and green diabase and red quartzite; reaction to acid: very strong	some iron oxide (hematite and limonite)	subangular chips up to 1.5 cm
1,240 - 1,250	378.0 - 381.0	Limestone; pink [7.5YR7/4]; well lithified; mostly gray, pink, brown and yellow limestone, trace oolitic limestone, trace black, white and green diabase and red quartzite; reaction to acid: very strong	some iron oxide (hematite and limonite)	subangular chips up to 1.5 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
NACO GROUP (Undifferentiated) (Pnaco)				
1,250 - 1,260	381.0 - 384.0	Limestone; pink [7.5YR8/4]; well lithified; mostly gray, pink, brown and yellow limestone, trace oolitic limestone, more pink limestone, trace black, white and green diabase and red quartzite; reaction to acid: very strong	common iron oxide (hematite and limonite)	subangular chips up to 1.5 cm
1,260 - 1,270	384.0 - 387.1	Silty limestone; pinkish gray [5YR6/2]; well lithified; medium gray, red and pink silty limestone, trace diabase, trace black basalt; reaction to acid: very strong	some iron oxide (hematite and limonite), trace calcite on fracture surfaces, trace quartz veins	DUAL-WALL AIR REVERSE CIRCULATION; subangular chips up to 0.8 cm; trace cement chips
1,270 - 1,280	387.1 - 390.1	Limestone and silty limestone; pinkish gray [5YR6/2]; well lithified; medium gray and brown limestone, purple silty limestone and trace orange chert, trace basalt; reaction to acid: very strong	some iron oxide (limonite and trace hematite), trace orange calcite veinlets	subangular chips up to 1.0 cm
1,280 - 1,290	390.1 - 393.2	Limestone and silty limestone; pinkish gray [5YR6/2]; well lithified; medium gray and brown limestone and reddish-brown and purple silty limestone; reaction to acid: very strong	some iron oxide (limonite and trace hematite)	subangular chips up to 1.0 cm
1,290 - 1,300	393.2 - 396.2	Limestone and silty limestone; light brownish gray [10YR6/2]; well lithified; medium and light gray and brown limestone and reddish-brown and purple silty limestone, trace reddish-brown clay balls; reaction to acid: very strong	some iron oxide (limonite and trace hematite)	subangular chips up to 1.0 cm
1,300 - 1,310	396.2 - 399.3	Limestone and siltstone; gray [10YR6/1]; well lithified; light and medium gray limestone and purplish-brown siltstone; reaction to acid: very strong	some iron oxide (limonite and trace hematite)	subangular chips up to 1.2 cm
1,310 - 1,320	399.3 - 402.3	Limestone, silty limestone, and siltstone; light gray [2.5Y7/1] and weak red [10R5/3]; well lithified; light and medium gray limestone, red silty limestone and purplish-brown siltstone; reaction to acid: very strong	hematite common iron oxide (hematite and limonite), trace manganese oxide	subangular chips up to 1.0 cm; trace cement chips
1,320 - 1,330	402.3 - 405.4	Limestone and silty limestone; strong brown [7.5YR5/6] and light gray [2.5Y7/1]; well lithified; 70% orangish-brown and purple calcareous siltstone and silty limestone, 30% light gray and light brown limestone and trace brown chert; reaction to acid: very strong	common iron oxide (hematite and limonite)	subangular chips up to 1.5 cm; trace cement chips

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
NACO GROUP (Undifferentiated) (Pnaco)				
1,330 - 1,340	405.4 - 408.4	Limestone and siltstone; light gray [2.5Y7/1] and light gray [2.5Y7/2]; well lithified; 95% light gray limestone, 5% brown and red siltstone, trace brown chert; reaction to acid: very strong	common iron oxide (hematite and limonite)	subangular chips up to 1.0 cm
1,340 - 1,350	408.4 - 411.5	Limestone and silty limestone; weak red [10R5/4]; well lithified; mostly red silty limestone, medium gray and brown limestone; reaction to acid: very strong	abundant iron oxide (hematite and limonite)	subangular chips up to 1.5 cm
1,350 - 1,360	411.5 - 414.5	Cherty limestone; light brownish gray [2.5Y6/2]; well lithified; 60% medium gray limestone, 40% orangish-brown chert and trace pink limestone; reaction to acid: strong	some iron oxide (hematite and limonite), trace calcite veins, trace manganese oxide on chert	subangular chips up to 1.9 cm
1,360 - 1,370	414.5 - 417.6	Limestone and limy siltstone; pinkish gray [7.5YR6/2] and reddish brown [2.5YR5/4]; well lithified; 50% gray and pink limestone, 50% reddish-purple and orange calcareous siltstone, trace orange chert; reaction to acid: very strong	common iron oxide (hematite and limonite), trace calcite veins and crystals on fracture surfaces	subangular chips up to 1.4 cm
1,370 - 1,380	417.6 - 420.6	Siltstone and limy siltstone; weak red [10R4/2] and weak red [10R4/4]; well lithified; dark red and brown siltstone and calcareous siltstone with trace gray limestone and gray chert; reaction to acid: very strong	abundant iron oxide (hematite and limonite), trace calcite veining	subangular chips up to 1.0 cm
1,380 - 1,390	420.6 - 423.7	Limestone; weak red [10R5/2]; well lithified; medium gray, pink and brown limestone; reaction to acid: very strong	some iron oxide (hematite and limonite), trace calcite veining	subangular chips up to 2.0 cm
1,390 - 1,400	423.7 - 426.7	Limestone; weak red [10R5/2]; well lithified; medium to dark gray, brown, pink limestone, trace brown chert; reaction to acid: very strong	some iron oxide (hematite and limonite), trace calcite veining	subangular chips up to 1.4 cm
1,400 - 1,410	426.7 - 429.8	Silty limestone; weak red [2.5YR5/2]; well lithified; gray, brown and pink silty limestone, trace gray limestone, trace gray and orange chert; reaction to acid: very strong	some iron oxide (hematite and limonite), trace white calcite veining	subangular chips up to 1.0 cm
1,410 - 1,420	429.8 - 432.8	Silty limestone; pinkish gray [7.5YR6/2]; well lithified; gray, brown and pink silty limestone, trace gray limestone, trace brown chert; reaction to acid: very strong	some iron oxide (hematite and limonite), hematite stain on fracture surfaces, trace white calcite veining and clear crystals	subangular chips up to 1.1 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
NACO GROUP (Undifferentiated) (Pnaco)				
1,420 - 1,430	432.8 - 435.9	Silty limestone; reddish gray [5YR5/2]; well lithified; mostly brown silty limestone, some gray and pink silty limestone, trace gray limestone, trace brown chert; reaction to acid: very strong	trace iron oxide (hematite and limonite), hematite stain on fracture surfaces, trace slickensides, trace orange calcite veining	subangular chips up to 1.5 cm
1,430 - 1,440	435.9 - 438.9	Limestone and limy siltstone; gray [5YR5/1] and brownish yellow [10YR6/6]; well lithified; 60% medium gray and dark gray to black limestone, 20% orange calcareous siltstone, 20% light gray fossiliferous limestone; reaction to acid: very strong	some iron oxide (hematite and limonite), trace orange and white calcite veining	subangular chips up to 1.2 cm
1,440 - 1,450	438.9 - 442.0	Limestone; grayish brown [10YR5/2]; well lithified; brown siliceous limestone and limestone, trace yellowish-brown limestone; reaction to acid: strong	trace iron oxide staining (hematite and limonite)	subangular chips up to 0.8 cm
1,450 - 1,460	442.0 - 445.0	Cherty limestone and limy siltstone; grayish brown [10YR5/2], yellow [10YR7/8], and brown [7.5YR4/3]; well lithified; 40% gray silty limestone, 30% yellow calcareous siltstone and shale, 30% red chert; reaction to acid: strong		angular to subangular chips up to 0.5 cm
1,460 - 1,470	445.0 - 448.1	Limy siltstone and shale; reddish brown [5YR4/3], yellow [5Y8/6], and dark red [2.5YR3/6]; well lithified; 20% yellow calcareous shale and siltstone, 50% gray shale, 30% red calcareous siltstone; reaction to acid: moderate	trace white calcite veinlet	angular to subangular chips up to 1.0 cm
1,470 - 1,480	448.1 - 451.1	Silty limestone; yellowish brown [10YR5/8] and reddish brown [5YR5/4]; well lithified; 50% red silty limestone and 50% yellow silty limestone; reaction to acid: strong	trace white calcite veinlet	angular to subangular chips up to 1.0 cm
1,480 - 1,490	451.1 - 454.2	Silty limestone; brown [10YR5/3] and yellowish brown [10YR5/4]; well lithified; 100% yellowish-gray silty limestone/calcareous siltstone; reaction to acid: strong	trace white calcite veinlet	angular to subangular chips up to 1.5 cm
1,490 - 1,500	454.2 - 457.2	Silty limestone; brown [10YR5/3] and yellowish brown [10YR5/4]; well lithified; 100% yellowish-gray silty limestone/calcareous siltstone; reaction to acid: strong	trace white calcite veinlet	angular to subangular chips up to 1.5 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
NACO GROUP (Undifferentiated) (Pnaco)				
1,500 - 1,510	457.2 - 460.2	Limestone; grayish brown [10YR5/2] and yellowish brown [10YR5/4]; well lithified; 90% gray limestone, 10% yellowish-brown limestone, trace red silty limestone; reaction to acid: strong	trace calcite veinlets	angular to subangular chips up to 0.5 cm
1,510 - 1,520	460.2 - 463.3	Limestone; grayish brown [10YR5/2] and yellowish brown [10YR5/4]; well lithified; 90% gray limestone, 10% yellowish-brown limestone, trace red silty limestone; reaction to acid: strong	trace calcite veinlets	angular to subangular chips up to 0.5 cm
1,520 - 1,530	463.3 - 466.3	Limestone; gray [10YR5/1] and reddish brown [5YR4/3]; well lithified; 80% gray limestone, 20% yellow, brown and red limestone, trace chert; reaction to acid: strong		angular to subangular chips up to 1.5 cm
1,530 - 1,540	466.3 - 469.4	Limestone and silty limestone; yellowish brown [10YR5/6]; well lithified; 60% yellowish-brown silty limestone, 40% gray limestone, trace red chert; reaction to acid: strong	abundant calcite veinlets	angular to subangular chips up to 1.5 cm
1,540 - 1,550	469.4 - 472.4	Silty limestone; yellowish brown [10YR5/6] and gray [10YR5/1]; well lithified; 70% gray silty limestone (fossiliferous), 30% yellowish-brown silty limestone, trace red chert; reaction to acid: strong	calcite veinlets	angular to subangular chips up to 1.5 cm
1,550 - 1,560	472.4 - 475.5	Limestone; grayish brown [10YR5/2] and yellowish brown [10YR5/6]; well lithified; 80% gray limestone, 20% yellowish-brown recrystallized limestone, trace white to gray chert; reaction to acid: strong	trace calcite veinlets	angular to subangular chips up to 0.5 cm
1,560 - 1,570	475.5 - 478.5	Silty limestone; dusky red [10R3/4]; well lithified; 90% red silty limestone, 10% yellow and gray limestone; reaction to acid: strong	trace calcite veinlets	angular to subangular chips up to 1.0 cm
1,570 - 1,580	478.5 - 481.6	Limestone; grayish brown [10YR5/2] and yellowish brown [10YR5/6]; well lithified; 70% gray limestone, 20% yellowish-brown limestone, 10% red silty limestone; reaction to acid: strong	trace calcite veinlets	angular to subangular chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
NACO GROUP (Undifferentiated) (Pnaco)				
1,580 - 1,590	481.6 - 484.6	Limestone; light brownish gray [10YR6/2] and brownish yellow [10YR6/6]; well lithified; 90% gray limestone, 10% yellow and red limestone; reaction to acid: strong		angular to subangular chips up to 1.0 cm
1,590 - 1,600	484.6 - 487.7	Limestone and limy siltstone; gray [10YR5/1] and yellowish brown [10YR5/8]; moderately to well lithified; 50% gray limestone, 50% yellow calcareous siltstone (friable); reaction to acid: strong		angular to subrounded chips up to 1.5 cm
1,600 - 1,610	487.7 - 490.7	Limestone and limy siltstone; gray [10YR5/1] and yellowish brown [10YR5/8]; moderately to well lithified; 50% gray limestone, 50% yellow calcareous siltstone (friable) with trace clay; reaction to acid: strong	trace calcite veinlets	angular to subrounded chips up to 1.5 cm
1,610 - 1,620	490.7 - 493.8	Limestone; gray [10YR5/1] and yellowish brown [10YR5/6]; well lithified; 80% mottled gray limestone (fossiliferous), 20% yellow limestone and siltstone, trace red chert; reaction to acid: strong	trace calcite veinlets	angular to subangular chips up to 1.0 cm
1,620 - 1,630	493.8 - 496.8	Limestone; gray [10YR5/1] and yellowish brown [10YR5/6]; well lithified; 90% gray limestone, 10% yellow limestone and siltstone, trace red limestone and siltstone; reaction to acid: strong	weak iron oxide stain on veinlet (yellow to red), trace calcite veinlets	angular to subangular chips up to 1.0 cm
1,630 - 1,640	496.8 - 499.9	Limestone and limy siltstone; brown [10YR5/3] and yellowish brown [10YR5/4]; well lithified; varicolored limestones and calcareous siltstones--bluish-gray, red, yellowish-brown and gray, some shaly cut chips; reaction to acid: strong		angular to subangular chips up to 1.5 cm
1,640 - 1,650	499.9 - 502.9	Limestone; gray [10YR5/1] and yellowish brown [10YR5/8]; well lithified; 70% bluish-gray limestone and dolomite(?), 30% yellow limestone/siltstone; reaction to acid: strong	trace calcite veinlets	angular to subrounded chips up to 1.0 cm
1,650 - 1,660	502.9 - 506.0	Limestone and limy siltstone; gray [10YR5/1], yellowish brown [10YR5/4], and bluish gray [5PB6/1]; moderately to well lithified; 90% gray to yellowish-brown limestone and calcareous siltstone, 10% bluish-gray siltstone and shale; reaction to acid: strong		subangular to subrounded chips up to 0.5 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
NACO GROUP (Undifferentiated) (Pnaco)				
1,660 - 1,670	506.0 - 509.0	Limestone and shale; bluish gray [5PB6/1], gray [10YR5/1], and yellowish brown [10YR5/6]; moderately to well lithified; 50% bluish-gray shale, 50% gray to yellowish-brown limestone; reaction to acid: none to strong		subangular to subrounded chips up to 0.75 cm
1,670 - 1,680	509.0 - 512.1	Silty limestone; grayish brown [10YR5/2] and yellowish brown [10YR5/4]; well lithified; silty limestone, trace bluish-gray shale; reaction to acid: strong	trace calcite veinlets	subangular to subrounded chips up to 1.0 cm
1,680 - 1,690	512.1 - 515.1	Limestone; gray [10YR5/1] and brown [10YR5/3]; well lithified; gray to brown limestone, trace red chert, trace yellowish-brown siltstone; reaction to acid: strong		angular to subangular chips up to 1.0 cm
1,690 - 1,700	515.1 - 518.2	Limestone; dark gray [10YR4/1] and brown [10YR4/3]; well lithified; dark gray to brown limestone, trace red chert, trace yellowish-brown calcareous siltstone; reaction to acid: strong		angular to subangular chips up to 1.0 cm
1,700 - 1,710	518.2 - 521.2	Limestone; grayish brown [10YR5/2] and yellowish brown [10YR5/4]; well lithified; gray limestone to shaly limestone, trace pink and yellow limestone; reaction to acid: strong	trace calcite veinlets, trace iron oxide stain on veinlets	angular to subrounded chips up to 1.0 cm
1,710 - 1,720	521.2 - 524.3	Siltstone; bluish gray [5PB5/1] and light yellowish brown [10YR6/4]; well lithified; 90% gray siltstone, 10% gray limestone, trace yellow siltstone; reaction to acid: none to strong	trace iron oxide stain on fracture faces and veinlets	angular to subrounded chips up to 1.0 cm
1,720 - 1,730	524.3 - 527.3	Limestone and siltstone; dark gray [10YR4/1], gray [10YR5/1], and yellowish brown [10YR5/6]; well lithified; 50% gray limestone, 50% gray siltstone, trace red chert, trace yellow siltstone; reaction to acid: strong	trace iron oxide stain on veinlets	angular to subrounded chips up to 0.75 cm
1,730 - 1,740	527.3 - 530.4	Limestone and siltstone; dark gray [10YR4/1]; well lithified; gray limestone and purplish-siltstone; reaction to acid: none to strong	trace calcite veinlets, trace iron oxide stain on veinlets	angular to subrounded chips up to 0.75 cm
NACO GROUP-Maroon Shale Marker No.2 (Pnaco)				
1,740 - 1,750	530.4 - 533.4	Maroon Shale Marker no. 2; dark reddish gray [2.5YR4/1]; well lithified; purplish-siltstone and less limestone; reaction to acid: none to strong	trace iron oxide stain on veinlets	angular to subrounded chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
NACO GROUP-Maroon Shale Marker No.2 (Pnaco)				
1,750 - 1,760	533.4 - 536.4	Maroon Shale Marker no. 2; light brownish gray [10YR6/2] and dark reddish gray [10R3/1]; well lithified; 55% grayish-brown and yellowish-orange limestone, 45% purple to black calcareous siltstone, trace gray siltstone with speckled or veiny iron oxide; reaction to acid: very strong	common iron oxide (hematite and limonite)	angular to subangular chips up to 0.9 cm; trace cement chips
1,760 - 1,770	536.4 - 539.5	Maroon Shale Marker no. 2; light brownish gray [10YR6/2] and dark reddish gray [10R3/1]; well lithified; 45% grayish-brown and yellowish-orange limestone, 40% reddish-purple calcareous siltstone, 15% bluish-green silty limestone, trace pyrite; reaction to acid: very strong	common to abundant iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.0 cm; trace fines
1,770 - 1,780	539.5 - 542.5	Maroon Shale Marker no. 2; dark reddish gray [10R3/1] and reddish brown [5YR5/4]; well lithified; 80% reddish-purple to purplish-black siltstone and shale, 10% bluish-green silty limestone with pyrite, 5% grayish-brown siltstone, 5% yellowish-orange siltstone, trace gray siltstone with speckled iron oxide; reaction to acid: very strong	common iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.0 cm; trace fines
1,780 - 1,790	542.5 - 545.6	Maroon Shale Marker no. 2; dusky red [2.5YR3/2] and light brown [7.5YR6/4]; well lithified; 75% purplish-black siltstone and shale, 10% yellowish-orange siltstone, 10% grayish-brown limestone with trace brown chert and limonite veinlets, 5% blue calcareous siltstone; reaction to acid: strong	common iron oxide (hematite and limonite)	subangular chips up to 1.2 cm; trace fines
NACO GROUP (Undifferentiated) (Pnaco)				
1,790 - 1,800	545.6 - 548.6	Limestone; very pale brown [10YR7/3]; well lithified; light grayish-brown limestone with yellow limonite veinlets, trace brown chert, trace purplish-black shale, trace blue siltstone; reaction to acid: very strong	some iron oxide (hematite and limonite)	angular to subangular chips up to 0.7 cm
1,800 - 1,810	548.6 - 551.7	Limestone; very pale brown [10YR7/3]; well lithified; light grayish-brown limestone with yellow limonite veinlets, trace brown chert, trace purplish-black shale, trace blue siltstone; reaction to acid: very strong	some iron oxide (hematite and limonite)	angular to subangular chips up to 0.8 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
NACO GROUP (Undifferentiated) (Pnaco)				
1,810 - 1,820	551.7 - 554.7	Limestone; very pale brown [10YR7/3]; well lithified; 95% light grayish-brown limestone with yellow limonite veinlets and trace brown chert, 5% purplish-black siltstone, trace blue siltstone; reaction to acid: very strong	some iron oxide (hematite and limonite), trace milky and clear vein quartz	subangular chips up to 1.3 cm
1,820 - 1,830	554.7 - 557.8	Cherty limestone; very pale brown [10YR8/2] and yellow [10YR7/6]; well lithified; 80% light gray limestone, 20% clear, light gray and orange chert, trace purplish-black shale, trace blue siltstone with trace pyrite; reaction to acid: very strong	common to abundant iron oxide (limonite), trace manganese oxide	subangular chips up to 0.6 cm
1,830 - 1,840	557.8 - 560.8	Cherty limestone; very pale brown [10YR8/2] and yellow [10YR7/6]; well lithified; 80% light gray limestone, 20% clear, light gray and orange chert, trace purplish-black shale, trace blue siltstone with trace pyrite; reaction to acid: very strong	common to abundant iron oxide (limonite)	subangular chips up to 1.0 cm
NACO GROUP-Maroon Shale Marker No.1 (Pnaco)				
1,840 - 1,850	560.8 - 563.9	Maroon Shale Marker no. 1; weak red [10R5/4]; well lithified; 90% red sandy siltstone, 5% buff to pinkish-gray siltstone, 5% light grayish-brown limestone, trace grayish-brown chert, trace gray and pink quartz; reaction to acid: strong	abundant iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.0 cm; trace fines
1,850 - 1,860	563.9 - 566.9	Maroon Shale Marker no. 1; weak red [10R4/4]; well lithified; 90% red shale, 5% red, brown and orange chert, 5% purplish-black shale, trace black, white and gray siltstone, trace gray limestone, trace bluish-green siltstone with trace pyrite; reaction to acid: weak	abundant iron oxide (hematite and limonite)	angular to subangular chips up to 1.5 cm; trace fines
1,860 - 1,870	566.9 - 570.0	Maroon Shale Marker no. 1; brownish yellow [10YR6/6] and weak red [10R4/4]; well lithified; 80% red, buff, dark gray, orange and brown chert, 10% red shale and siltstone, 10% pale green talcy siltstone, trace light gray limestone; reaction to acid: weak	abundant iron oxide (hematite and limonite)	angular to subangular chips up to 1.3 cm; trace fines
1,870 - 1,880	570.0 - 573.0	Maroon Shale Marker no. 1; red [10R5/6], red [2.5YR5/6], and dark bluish gray [5PB4/1]; well lithified; 80% red and orange siltstone, 15% gray and purple siltstone, 5% grayish-brown limestone, trace blue siltstone with pyrite, trace pale green talcy siltstone with pyrite, trace gray, red and brown chert; reaction to acid: moderate	abundant iron oxide (hematite and limonite), trace chalcopyrite, trace calcite veinlets	subangular to subrounded chips up to 1.0 cm; trace fines

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
ESCABROSA LIMESTONE (Me)				
1,880 - 1,890	573.0 - 576.1	Limestone; pinkish gray [7.5YR7/2] and red [2.5YR5/6]; well lithified; 85% light gray recrystallized limestone, 15% reddish-orange, purplish-black and gray siltstone, trace orange, yellow and gray chert, trace pale green talcy siltstone; reaction to acid: very strong	common iron (hematite and limonite), trace fault gouge / clayey material	subangular to subrounded chips up to 0.7 cm
1,890 - 1,900	576.1 - 579.1	Limestone; pinkish gray [7.5YR7/2] and bluish gray [5PB5/1]; well lithified; 70% light gray, recrystallized limestone, 20% purplish-black and gray siltstone, 10% gray, pink and yellow chert, trace pale green talcy siltstone; reaction to acid: very strong	common iron (hematite and limonite), trace manganese oxide, very small trace chalcopyrite	subangular chips up to 1.0 cm
1,900 - 1,910	579.1 - 582.2	Limestone; pinkish gray [7.5YR7/2] and bluish gray [5PB5/1]; well lithified; 85% light gray, recrystallized limestone, 10% gray, pink and yellow chert, 5% purplish-black and gray siltstone, trace pale green talcy siltstone; reaction to acid: very strong	some iron oxide (hematite and limonite)	subangular chips up to 1.2 cm
1,910 - 1,920	582.2 - 585.2	Dolomite; light reddish brown [5YR6/3]; well lithified; 90% gray, pink and brown dolomite, 10% orange, brown and gray chert, trace white calcite, trace purple and green siltstone; reaction to acid: strong	common iron oxide (hematite and limonite), trace white calcite	subangular chips up to 1.0 cm
1,920 - 1,930	585.2 - 588.3	Dolomite; dark gray [10YR3/1], yellow [10YR7/8], and grayish brown [10YR5/2]; well lithified; 70% dark brown and purplish-black dolomite, 15% orange, red, gray and brown chert, 15% pale green serpentine; reaction to acid: moderate	common iron oxide (hematite and limonite), limonite on fracture surfaces	subangular chips up to 1.2 cm
1,930 - 1,940	588.3 - 591.3	Dolomite; very dark gray [10YR3/1] and yellow [10YR7/6]; well lithified; 90% dark brown and purplish-black dolomite, 5% orange, red, gray and brown chert, 5% pale green serpentine; reaction to acid: strong	some iron oxide (hematite and limonite)	subangular chips up to 0.9 cm
1,940 - 1,950	591.3 - 594.4	Dolomite; very dark gray [10YR3/1]; well lithified; dark brown and purplish-black dolomite, trace orange, red, gray and brown chert, trace pale green serpentine; reaction to acid: strong	trace iron oxide (hematite and limonite)	AIR-ASSISTED FLOOD-REVERSE CIRCULATION; subangular chips up to 0.6 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
ESCABROSA LIMESTONE (Me)				
1,950 - 1,960	594.4 - 597.4	Dolomite; grayish brown [10YR5/2] and light yellowish brown [10YR6/4]; well lithified; 55% dark brown and gray dolomite, 15% purplish-black shale, 15% orange, red and gray chert, 10% yellowish-orange siltstone, 5% pale green talcy siltstone, trace blue siltstone with pyrite; reaction to acid: moderate to strong	trace vein quartz	subangular to subrounded chips up to 1.6 cm
1,960 - 1,970	597.4 - 600.5	Limestone; light brownish gray [10YR6/2]; well lithified; 85% dark brown to gray limestone, 10% yellow and pale green talcy siltstone, 5% red, orange, yellow and gray chert; reaction to acid: very strong	some iron oxide (hematite and limonite), trace calcite veining	subangular to subrounded chips up to 1.0 cm
1,970 - 1,980	600.5 - 603.5	Limestone; light brownish gray [10YR6/2]; well lithified; 95% dark grayish-brown limestone (trace oolitic), 5% purplish-red siltstone, pale green talcy siltstone, orange chert; reaction to acid: very strong	some iron oxide (hematite and limonite), trace calcite veining, trace limonite veinlets	subangular to subrounded chips up to 1.3 cm
1,980 - 1,990	603.5 - 606.6	Limestone; pale brown [10YR6/3], bluish black [5B2.5/1], and yellow [10YR7/6]; well lithified; conglomeratic unit(?), 50% brown limestone, 30% black, white, green diabase, 10% brown chert, orange siltstone and red siltstone; reaction to acid: moderate to strong	common iron oxide (hematite and limonite), trace epidote, fracture surfaces	subangular to subrounded chips up to 0.7 cm; diabase contamination?
1,990 - 2,000	606.6 - 609.6	Dolomitic limestone; brown [10YR5/3] and gray [10YR5/1]; well lithified; 90% brown dolomitic limestone, 10% orange, yellow, gray and pink chert, trace pale green talcy siltstone; reaction to acid: moderate to strong	trace iron oxide (hematite and limonite), trace limonite veining	subangular chips up to 0.8 cm
2,000 - 2,010	609.6 - 612.6	Limestone; grayish brown [10YR5/2]; well lithified; 95% brown limestone, 5% yellow, brown, orange and red chert, trace gray limestone, trace purple, gray and red siltstone; reaction to acid: very strong	common iron oxide (hematite and limonite), trace calcite veining, trace manganese oxide	angular to subangular chips up to 1.4 cm
MARTIN FORMATION-Last Black Shale Marker (Dm)				
2,010 - 2,020	612.6 - 615.7	Last Black Shale Marker; dark grayish brown [10Y4/2]; well lithified; dark brown silty limestone and shale, trace orange, gray and milky chert, trace gray and pink limestone (some oolitic); reaction to acid: very strong	trace iron oxide (hematite and limonite), trace hematite on fracture surfaces, possible slickensides	subangular chips up to 0.9 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
MARTIN FORMATION-Last Black Shale Marker (Dm)				
2,020 - 2,030	615.7 - 618.7	Last Black Shale Marker; very dark grayish brown [10YR3/2]; well lithified; dark brownish-black calcareous/dolomitic shale and silty limestone, trace gray and pink limestone, trace orange, red and gray chert, trace pale green talcy siltstone, trace blue calcareous siltstone; reaction to acid: strong to very strong	trace iron oxide (hematite and limonite), trace calcite on fracture surfaces	subangular chips up to 1.0 cm
2,030 - 2,040	618.7 - 621.8	Last Black Shale Marker; dark gray [10YR4/1]; well lithified; dark brownish-black dolomitic shale, trace gray and pink limestone, trace orange, red and gray chert, trace pale green talcy siltstone, trace blue calcareous siltstone, trace purple siltstone; reaction to acid: strong to very strong	trace iron oxide (hematite and limonite), trace calcite on fracture surfaces	subangular chips up to 1.2 cm
2,040 - 2,050	621.8 - 624.8	Last Black Shale Marker; dark grayish brown [10YR4/2] and light yellowish brown [10YR6/4]; well lithified; 55% dark brown silty limestone and dolomitic limestone, 45% orange calcareous siltstone, trace gray siltstone, trace yellow chert, trace pale green talcy siltstone; reaction to acid: strong to very strong	common iron oxide (hematite and limonite), trace fault gouge?, trace calcite	subangular to subrounded chips up to 1.2 cm; trace fines
MARTIN FORMATION (Dm)				
2,050 - 2,060	624.8 - 627.9	Dolomitic shale; brownish yellow [10YR6/6]; well lithified; 95% orange dolomitic shale, 5% dark gray dolomitic shale, trace yellow chert, trace orangish-brown limestone; reaction to acid: moderate to strong	abundant iron oxide (hematite and limonite) veinlets, trace slickensides, trace calcite veinlets	subangular to subrounded chips up to 1.5 cm
2,060 - 2,070	627.9 - 630.9	Shale; yellowish brown [10YR5/4] and dark gray [10YR4/1]; well lithified; 90% orange dolomitic shale, 10% dark gray dolomitic shale, trace yellow chert, trace orangish-brown limestone; reaction to acid: moderate	abundant iron oxide (hematite and limonite) veinlets, trace calcite veinlets and subhedral crystals	subangular to subrounded chips up to 2.4 cm
2,070 - 2,080	630.9 - 634.0	Shale; yellowish brown [10YR5/4] and dark gray [10YR4/1]; well lithified; 90% orange dolomitic shale, 10% dark gray dolomitic shale, trace yellow chert, trace orangish-brown limestone; reaction to acid: moderate	abundant iron oxide (hematite and limonite) veinlets, trace calcite veinlets and crystals	subangular to subrounded chips up to 2.0 cm
2,080 - 2,090	634.0 - 637.0	Shale; yellowish brown [10YR5/4] and dark gray [10YR4/1]; well lithified; 90% orange dolomitic shale, 10% dark gray dolomitic shale, trace yellow chert, trace orangish-brown limestone; reaction to acid: moderate to strong	abundant iron oxide (hematite and limonite) veinlets, trace calcite veinlets and subhedral crystals, trace slickensides	subangular to subrounded chips up to 1.9 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
MARTIN FORMATION (Dm)				
2,090 - 2,100	637.0 - 640.1	Limestone; light yellowish brown [10YR6/4] and light brown [7.5YR6/3]; well lithified; 75% gray, brown and orange limestone, 25% yellow dolomitic shale, trace purple siltstone, trace pink and yellow chert; reaction to acid: strong to very strong	abundant iron oxide (hematite and limonite) on fracture surfaces and in veinlets, trace calcite veinlets and subhedral crystals, trace slickensides	subangular to subrounded chips up to 2.0 cm
2,100 - 2,110	640.1 - 643.1	Limestone; gray [10YR6/1], very pale brown [10YR7/3], and pale red [10R6/2]; well lithified; gray, brown, red and orange limestone, trace grayish-purple siltstone, trace yellow chert; reaction to acid: very strong	abundant iron oxide (hematite and limonite) on fracture surfaces, trace calcite veinlets	subangular to subrounded chips up to 1.4 cm
2,110 - 2,120	643.1 - 646.2	Limy siltstone and limestone; gray [10YR6/1] and very pale brown [10YR7/3]; well lithified; 50% yellowish-orange calcareous siltstone, 50% gray, brown, red and orange limestone, trace orangish-red and yellow chert; reaction to acid: strong to very strong	abundant iron oxide (hematite and limonite) on fracture surfaces, trace calcite veinlets and euhedral crystals	subangular to subrounded chips up to 1.0 cm
2,120 - 2,130	646.2 - 649.2	Limestone; gray [10YR6/1] and very pale brown [10YR7/3]; well lithified; 80% red, gray and brown and orange limestone, 20% yellowish-orange calcareous siltstone, trace orangish-red and yellow chert; reaction to acid: very strong	abundant iron oxide (hematite and limonite) on fracture surfaces, trace calcite veinlets and subhedral crystals	subangular to subrounded chips up to 1.3 cm
2,130 - 2,140	649.2 - 652.3	Limestone; gray [10YR6/1] and very pale brown [10YR7/3]; well lithified; 95% orange, gray, brown and red limestone, 5% white calcite; reaction to acid: very strong	abundant iron oxide (hematite and limonite) on fracture surfaces, trace calcite veinlets and euhedral crystals	subangular to subrounded chips up to 1.7 cm
2,140 - 2,150	652.3 - 655.3	Dolomitic shale; yellowish red [5YR5/6] and dark gray [10YR4/1]; well lithified; 55% orangish-red dolomitic shale, 45% dark gray-black dolomitic shale, trace gray and orange limestone; reaction to acid: strong to very strong	abundant iron oxide (hematite and limonite) on fracture surfaces, trace calcite veinlets	subangular to subrounded chips up to 12 cm
2,150 - 2,160	655.3 - 658.4	Dolomitic shale; yellowish red [5YR5/6] and dark gray [10YR4/1]; well lithified; 55% orangish-red dolomitic shale, 45% dark gray-black dolomitic shale, trace gray and orange limestone; reaction to acid: strong	abundant iron oxide (hematite and limonite) on fracture surfaces, trace calcite veinlets, trace fault gouge	subangular to subrounded chips up to 1.6 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
MARTIN FORMATION (Dm)				
2,160 - 2,170	658.4 - 661.4	Limestone; dark gray [10YR4/1] and pale brown [10YR6/3]; well lithified; 95% dark gray, black and grayish-brown limestone and calcareous shale, 5% orange dolomitic shale, trace calcareous shale; reaction to acid: strong to very strong	common iron oxide stain (hematite and limonite) on fracture surfaces, common calcite veinlets, some fault gouge	subangular chips up to 1.0 cm
2,170 - 2,180	661.4 - 664.5	Shale and limestone; yellowish red [5YR5/6] and dark gray [10YR4/1]; well lithified; 70% orange dolomitic shale, 30% dark gray to black and brown limestone and calcareous shale; reaction to acid: very strong	abundant iron oxide (hematite and limonite) on fracture surfaces, common calcite veinlets, trace manganese oxide	subangular to subrounded chips up to 1.5 cm
2,180 - 2,190	664.5 - 667.5	Silty dolomite; brownish yellow [10YR6/6] and light red [10R6/6]; well lithified; orange, red and yellow silty dolomite, trace black calcareous shale, trace pale green talcy siltstone; reaction to acid: strong	abundant iron oxide (hematite and limonite) on fracture surfaces, common calcite veinlets	subangular to subrounded chips up to 1.4 cm
2,190 - 2,200	667.5 - 670.6	Silty dolomite; yellowish brown [10YR5/4] and dark grayish brown [10YR4/2]; well lithified; orange, red and yellow silty dolomite, trace black calcareous shale, trace pale green talcy siltstone, brecciated(?), some dark gray to black limestone, trace gray chert; reaction to acid: strong	abundant iron oxide (hematite and limonite), common manganese oxide	subangular to subrounded chips up to 1.4 cm
2,200 - 2,210	670.6 - 673.6	Limestone; brown [10YR5/3], red [2.5YR5/6], and dark gray [10YR4/1]; well lithified; 90% brown and pink limestone, 5% dark gray calcareous shale, 5% vein calcite, trace yellowish-gray talc-silicate; reaction to acid: strong to very strong	common iron oxide (hematite and limonite) in veinlets, calcite veins	subangular to subrounded chips up to 1.5 cm
2,210 - 2,220	673.6 - 676.7	Shale and limestone; dark gray [10YR4/1] and brown [7.5YR5/4]; well lithified; 55% dark gray calcareous shale, 40% grayish-brown and orange limestone, 5% orange sandy limestone, trace yellowish-gray talc-silicate; reaction to acid: strong	common iron oxide (hematite and limonite) in veinlets, trace calcite veins, trace hematite stained fault gouge	subangular to subrounded chips up to 1.7 cm
2,220 - 2,230	676.7 - 679.7	Silty limestone; light brown [7.5YR6/4] and dark gray [10YR4/1]; well lithified; 85% orange sandy limestone, 10% black limestone, 5% brown limestone, trace yellowish-gray talc-silicate; reaction to acid: moderate to strong	abundant iron oxide (hematite and limonite) in veinlets, trace hematite stains in fault gouge, trace calcite veining	subangular to subrounded chips up to 1.7 cm; trace fines

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
MARTIN FORMATION (Dm)				
2,230 - 2,240	679.7 - 682.8	Shale; very dark gray [10YR3/1]; well lithified; dark gray-black and dark brown calcareous shale, trace pale green talc; reaction to acid: moderate to strong	trace iron oxide (hematite and limonite) in veinlets, trace manganese oxide, trace calcite veining	subangular chips up to 1.0 cm
2,240 - 2,250	682.8 - 685.8	Shale; very dark gray [10YR3/1] and dark gray [10YR4/1]; well lithified; 90% dark gray and dark brown calcareous shale, 10% orange sandy shale and gray and pink shale, trace pale green talcy siltstone, trace blue siltstone; reaction to acid: strong	some iron oxide (hematite and limonite), trace hematite and limonite on fracture surfaces, trace calcite veining	angular to subangular chips up to 1.5 cm
2,250 - 2,260	685.8 - 688.8	Shale; dark gray [10YR4/1], brown [10YR5/3], and weak red [10R4/2]; well lithified; black, orange and red calcareous shale, trace brown limestone; reaction to acid: weak to moderate	abundant iron oxide (hematite and limonite), trace hematite and limonite on fracture surfaces, trace dendritic manganese oxide, trace calcite veins	angular to subangular chips up to 1.2 cm
2,260 - 2,270	688.8 - 691.9	Shale and silty sandstone; brown [10YR5/3], weak red [10R4/4], and very dark gray [5Y3/1]; well lithified; 60% orange, gray, brown and red calcareous shale, 40% orange, red, gray and purple calcareous silty sandstone, trace pale green sandy siltstone, trace gray siltstone with trace bornite; reaction to acid: moderate	abundant iron oxide (hematite and limonite), trace hematite and limonite on fracture surfaces, trace dendritic manganese oxide	subangular to subrounded chips up to 2.1 cm
BOLSA QUARTZITE (Cb)				
2,270 - 2,280	691.9 - 694.9	Quartzite; very pale brown [10YR7/4] and reddish brown [5YR5/4]; well lithified; 90% white, yellow and gray silica-cemented quartzite, 10% red and orange silty sandstone, trace white chalky fracture material; reaction to acid: moderate to strong	common iron oxide (hematite and limonite), trace orange fault gouge, trace clear calcite, trace manganese oxide	subangular to subrounded chips up to 2.3 cm
2,280 - 2,290	694.9 - 698.0	Quartzite; very pale brown [10YR7/3]; well lithified; buff, light gray, light green and yellow orthoquartzite, well sorted, silica-cemented, trace dark gray shale, trace white and pink chalky, fracture material; reaction to acid: weak to moderate	some iron oxide (limonite and hematite), some pinkish gray fault gouge, trace hematite and limonite on fracture surfaces, trace slickensides, trace manganese oxide	subangular to subrounded chips up to 20 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
BOLSA QUARTZITE (Cb)				
2,290 - 2,300	698.0 - 701.0	Quartzite; very pale brown [10YR7/3]; well lithified; buff, light gray, light green and yellow orthoquartzite, well sorted, silica-cemented, trace dark gray shale, trace white and pink chalky, fracture material; reaction to acid: weak	some iron oxide (limonite and hematite), some pinkish gray fault gouge, trace hematite and limonite on fracture surfaces, trace slickensides, trace manganese oxide, trace bornite	subangular to subrounded chips up to 1.5 cm
2,300 - 2,310	701.0 - 704.1	Quartzite; very pale brown [10YR7/3]; well lithified; buff, light gray, light green and yellow orthoquartzite, well sorted, silica-cemented, trace gray and purple siltstone; reaction to acid: weak	some iron oxide (limonite and hematite), trace slickensides, trace manganese oxide	very sugary, crushed; subangular to subrounded chips up to 2.1 cm
2,310 - 2,320	704.1 - 707.1	Quartzite; light brown [7.5YR6/3]; well lithified; gray, brown, yellow and white quartzite, silica-cemented; reaction to acid: weak to moderate	some iron oxide (limonite and hematite), trace slickensides, common manganese oxide	very sugary, crushed; subangular to subrounded chips up to 2.1 cm
2,320 - 2,330	707.1 - 710.2	Quartzite; pale brown [10YR6/3]; well lithified; gray, brown, yellow and white quartzite, silica-cemented, trace blue siltstone; reaction to acid: moderate	some iron oxide (limonite and hematite), trace slickensides, common manganese oxide	very sugary, crushed; subangular to subrounded chips up to 1.2 cm
2,330 - 2,340	710.2 - 713.2	Quartzite; pale brown [10YR6/3]; well lithified; 95% gray, brown, yellow and white quartzite, silica-cemented, 5% white chalky fault material (sericite?), trace blue siltstone; reaction to acid: moderate	some iron oxide (limonite and hematite), trace slickensides, common manganese oxide, white, chalky fault material, trace vein quartz	very sugary, crushed; subangular to subrounded chips up to 1.0 cm
2,340 - 2,350	713.2 - 716.3	Quartzite; pale brown [10YR6/3]; well lithified; gray, brown, yellow and white quartzite, silica-cemented, trace white chalky fault material (sericite?), trace blue siltstone, trace gray shale, trace pale green talcy siltstone; reaction to acid: moderate	some iron oxide (limonite and hematite), trace slickensides, trace manganese oxide, trace fault material, speckled iron and manganese oxide staining, trace pyrite	very sugary, crushed; subangular to subrounded chips up to 2.0 cm
2,350 - 2,360	716.3 - 719.3	Quartzite; pale brown [10YR6/3]; well lithified; gray, brown, yellow and white quartzite, silica-cemented, trace white chalky fault material (sericite?), trace blue siltstone, trace gray shale, trace pale green talcy siltstone; reaction to acid: weak to moderate	some iron oxide (limonite and hematite), trace slickensides, trace manganese oxide, trace fault material, trace speckled iron and manganese oxide staining	subangular to subrounded chips up to 2.8 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
BOLSA QUARTZITE (Cb)				
2,360 - 2,370	719.3 - 722.4	Quartzite; very pale brown [10YR7/4]; well lithified; gray, brown, yellow and white quartzite, silica-cemented, trace white chalky fault material (sericite?), trace blue siltstone, trace gray shale, trace pale green talcy siltstone, trace orange talc-silicate; reaction to acid: very weak	trace iron oxide (limonite and hematite), trace slickensides, trace manganese oxide, trace speckled iron and manganese oxide staining	subangular to subrounded chips up to 1.4 cm
2,370 - 2,380	722.4 - 725.4	Quartzite; very pale brown [10YR7/4]; well lithified; gray, brown, yellow and white quartzite, silica-cemented, trace white chalky fault material (sericite?), trace blue siltstone, trace gray shale, trace pale green talcy siltstone, trace orange talc-silicate; reaction to acid: weak to moderate	trace iron oxide (limonite and hematite), trace slickensides, trace manganese oxide, trace speckled iron and manganese oxide staining	very sugary, crushed; subangular to subrounded chips up to 1.7 cm
2,380 - 2,390	725.4 - 728.5	Quartzite; very pale brown [10YR7/4]; well lithified; Orange and yellow quartzite, silica-cemented; reaction to acid: weak	trace iron oxide (hematite and limonite), trace slickensides, trace manganese oxide, trace white fracture material, some speckled iron and manganese oxide	very sugary, crushed; subangular to subrounded chips up to 1.2 cm
2,390 - 2,400	728.5 - 731.5	Quartzite; very pale brown [10YR7/4]; well lithified; orange and yellow quartzite, silica-cemented, trace pale green talcy siltstone; reaction to acid: weak	trace iron oxide (hematite and limonite), trace slickensides, trace manganese oxide, trace white fracture material, some speckled iron and manganese oxide	subangular to subrounded chips up to 2.0 cm
2,400 - 2,410	731.5 - 734.6	Quartzite; light yellowish brown [10YR6/4] and grayish brown [10YR5/2]; well lithified; orange and yellow quartzite, silica-cemented, trace pale green talcy siltstone; reaction to acid: moderate	some iron oxide (hematite and limonite), trace slickensides, trace manganese oxide, trace white fracture material, some speckled iron and manganese oxide, trace calcite	subangular to subrounded chips up to 0.8 cm
2,410 - 2,420	734.6 - 737.6	Quartzite; very pale brown [10YR7/3]; well lithified; orange, yellow, white and pink quartzite, silica-cemented, trace pale green talcy siltstone; reaction to acid: very weak	trace iron oxide (hematite and limonite), some speckled, trace slickensides, trace manganese oxide	subangular to subrounded chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
BOLSA QUARTZITE (Cb)				
2,420 - 2,430	737.6 - 740.7	Quartzite; very pale brown [10YR7/3]; well lithified; 90% Orange, yellow, white and pink quartzite, 10% purple and gray shale, silica-cemented, trace pale green talcy siltstone, trace orange talc-silicate; reaction to acid: weak	trace iron oxide (hematite and limonite), some speckled, trace slickensides, trace manganese oxide	subangular to subrounded chips up to 1.0 cm
2,430 - 2,440	740.7 - 743.7	Quartzite; very pale brown [10YR7/3]; well lithified; orange, yellow, white and pink quartzite, trace purple and gray shale, silica-cemented, trace pale green talcy siltstone, trace orange talc-silicate; reaction to acid: weak	trace iron oxide (hematite and limonite), some speckled, trace slickensides, trace manganese oxide	subangular to subrounded chips up to 1.0 cm
2,440 - 2,450	743.7 - 746.8	Quartzite; light reddish brown [5YR6/4]; well lithified; white, pink and light brown quartzite, silty, silica-cemented, trace bluish-purple siltstone, trace pale green talcy siltstone; reaction to acid: weak	some iron oxide (hematite and limonite), trace slickensides, trace manganese oxide, some red fault gouge, trace white iron oxide and manganese oxide fault material, trace bornite and pyrite	subangular to subrounded chips up to 1.5 cm
2,450 - 2,460	746.8 - 749.8	Quartzite; pale brown [10YR6/3]; well lithified; white, pink and light brown quartzite, silty, silica-cemented, trace bluish-purple siltstone, trace pale green talcy siltstone, trace pale green quartzite; reaction to acid: weak to moderate	abundant iron oxide (hematite and limonite), some speckled	subangular to subrounded chips up to 1.3 cm
2,460 - 2,470	749.8 - 752.9	Quartzite; light brown [7.5YR6/3]; well lithified; white, pink and light brown quartzite with trace chlorite, silty, silica-cemented, trace bluish-purple siltstone, trace pale green talcy siltstone; reaction to acid: weak	abundant iron oxide (hematite and limonite), some speckled, trace slickensides, trace manganese oxide	subangular to subrounded chips up to 1.0 cm
2,470 - 2,480	752.9 - 755.9	Quartzite; light brown [7.5YR6/3]; well lithified; red, light brown and pale green quartzite with trace chlorite, silty, silica-cemented, trace bluish-purple siltstone, trace pale green talcy siltstone; reaction to acid: weak	abundant iron oxide (hematite and limonite), some speckled, trace slickensides, trace manganese oxide, trace fault gouge, trace pyrite	subangular to subrounded chips up to 1.4 cm
2,480 - 2,490	755.9 - 759.0	Quartzite; pale brown [10YR6/3]; well lithified; red, light brown and pale green quartzite with trace chlorite, silty, silica-cemented, trace bluish-purple siltstone, trace pale green talcy siltstone; reaction to acid: weak	common iron oxide (hematite and limonite), some speckled, some veinlets, trace slickensides, trace manganese oxide	subangular to subrounded chips up to 1.0 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
BOLSA QUARTZITE (Cb)				
2,490 - 2,500	759.0 - 762.0	Quartzite; light brownish gray [10YR6/2]; well lithified; pale green, red and light brown quartzite with trace chlorite, silty, silica-cemented, trace bluish-purple siltstone, trace pale green talcy siltstone; reaction to acid: weak	common iron oxide (hematite and limonite), some speckled, trace slickensides, trace manganese oxide, trace calcite veinlets	subangular to subrounded chips up to 1.1 cm
2,500 - 2,510	762.0 - 765.0	Quartzite; reddish brown [2.5YR5/4]; well lithified; 50% white to light gray and green quartzite with small pyrite, silica-cemented, 50% dark reddish-brown muddy quartzite, very silty (20% fines), trace orange talc-silicate; reaction to acid: weak	abundant iron oxide (hematite, some limonite), trace slickensides, trace manganese oxide, trace fault material and gouge, trace pyrite,	subangular to subrounded chips up to 1.6 cm
2,510 - 2,520	765.0 - 768.1	Quartzite; reddish brown [2.5YR5/4]; well lithified; dark reddish-brown, some gray muddy quartzite, silica-cemented, less silty (5% fines); reaction to acid: weak	abundant iron oxide (hematite, some limonite), very trace fault gouge	subangular to subrounded chips up to 1.7 cm
2,520 - 2,530	768.1 - 771.1	Quartzite; reddish brown [2.5YR5/4]; well lithified; 80% gray and green quartzite with disseminated pyrite, silica-cemented, 20% dark reddish-brown muddy quartzite, very silty (40% fines), trace orangish-red talc-silicate; reaction to acid: weak	abundant iron oxide (hematite), trace pyrite, common fault gouge, trace calcite	subangular to subrounded chips up to 1.5 cm
2,530 - 2,540	771.1 - 774.2	Muddy quartzite and mudstone; weak red [10R4/3]; well lithified; reddish-brown muddy quartzite and mudstone, trace grayish-green quartzite, silica-cemented, (25% fines); reaction to acid: weak to moderate	abundant iron oxide (hematite), trace fault gouge	subrounded chips up to 1.3 cm
2,540 - 2,550	774.2 - 777.2	Quartzite and muddy quartzite; reddish brown [2.5YR4/3]; well lithified; 60% grayish-green quartzite with trace calcite and feldspar, silica-cemented, 40% reddish-brown muddy quartzite and mudstone (20% fines); reaction to acid: weak to moderate	abundant iron oxide (hematite), trace fault material, trace calcite	subangular to subrounded chips up to 1.4 cm
2,550 - 2,560	777.2 - 780.3	Muddy quartzite; reddish brown [2.5YR4/3]; well lithified; reddish-brown muddy quartzite, silica-cemented, (30% fines), trace black, white and green diabase; reaction to acid: weak	abundant iron oxide (hematite)	subangular to subrounded chips up to 2.1 cm
2,560 - 2,570	780.3 - 783.3	Muddy quartzite; weak red [2.5YR4/2]; well lithified; reddish-brown muddy quartzite, silica-cemented, (15% fines), trace black, white and green diabase; reaction to acid: very weak	abundant iron oxide (hematite)	subangular to subrounded chips up to 0.9 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
PRECAMBRIAN DIABASE (PCd)				
2,570 - 2,580	783.3 - 786.4	Diabase; weak red [2.5YR4/2]; well lithified; 50% dark greenish-gray and reddish-brown muddy quartzite, silica-cemented, (15% fines), 50% black, white and green weathered, re-worked diabase; reaction to acid: weak	abundant iron oxide (hematite), trace pyrite, diabase is weathered and re-worked	subangular to subrounded chips up to 0.9 cm; 15% fines
2,580 - 2,590	786.4 - 789.4	Diabase; weak red [2.5YR4/2]; well lithified; 90% black, green and white diabase with trace pyrite and bornite, 10% reddish-brown muddy quartzite; reaction to acid: weak	abundant iron oxide (hematite), trace pyrite and bornite, very weathered feldspar and biotite	subangular to subrounded chips up to 1.2 cm; 25% fines
2,590 - 2,600	789.4 - 792.5	Diabase; weak red [2.5YR4/2]; well lithified; 90% black, green and white diabase with trace pyrite and bornite, 10% reddish-brown muddy quartzite; reaction to acid: weak	common iron oxide (hematite), trace pyrite and bornite, abundant fault gouge	subangular to subrounded chips up to 1.0 cm; 98% fines
2,600 - 2,610	792.5 - 795.5	Diabase; weak red [2.5YR4/2]; well lithified; 95% black, green, white weathered, altered diabase with brownish-green serpentine, 5% reddish-brown muddy quartzite, trace orange talc-silicate; reaction to acid: very weak	common iron oxide (hematite), weathered, altered diabase	subangular to subrounded chips up to 0.5 cm; 60% fines
2,610 - 2,620	795.5 - 798.6	Diabase; weak red [2.5YR4/2]; well lithified; black, green, white weathered, altered diabase with brownish-green serpentine, trace reddish-brown muddy quartzite, trace orange talc-silicate; reaction to acid: none to weak	common iron oxide (hematite), trace calcite veins	subangular to subrounded chips up to 0.5 cm; 25% fines
2,620 - 2,630	798.6 - 801.6	Diabase; greenish gray [10Y5/1] and weak red [2.5YR4/2]; well lithified; black, green, white weathered, altered diabase with more brownish-green serpentine, trace reddish-brown muddy quartzite, trace orange talc-silicate; reaction to acid: weak	some iron oxide (hematite), trace vein quartz, increased calcite	subangular to subrounded chips up to 1.0 cm; 10% fines
2,630 - 2,640	801.6 - 804.7	Diabase; greenish gray [10Y5/1]; well lithified; black, green, white weathered, altered diabase with more brownish-green serpentine, trace reddish-brown muddy quartzite, trace orange talc-silicate; reaction to acid: strong	trace iron oxide (hematite), trace quartz, some calcite	subangular to subrounded chips up to 1.2 cm; 5% fines
2,640 - 2,650	804.7 - 807.7	Diabase; greenish gray [10Y5/1]; well lithified; black, green, white weathered, altered diabase with more brownish-green serpentine, trace reddish-brown muddy quartzite, trace orange talc-silicate; reaction to acid: strong	trace iron oxide (hematite), trace slickensides, trace quartz, some calcite	subangular to subrounded chips up to 1.2 cm; 5% fines

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
PRECAMBRIAN DIABASE (PCd)				
2,650 - 2,660	807.7 - 810.8	NO SAMPLE		
2,660 - 2,670	810.8 - 813.8	Diabase; greenish gray [10Y5/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration; reaction to acid: moderate	trace iron oxide, trace fault gouge, weathered, altered, calcite and serpentine on fracture surfaces	subangular to subrounded chips up to 1.1 cm; 2% fines
2,670 - 2,680	813.8 - 816.9	Diabase; greenish gray [10Y6/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, trace yellow quartzite; reaction to acid: moderate	trace iron oxide, trace chalcopyrite, abundant fault gouge	subangular to subrounded chips up to 1.0 cm; 90% fines
2,680 - 2,690	816.9 - 819.9	Diabase; greenish gray [10Y6/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, trace yellow quartzite; reaction to acid: moderate	trace iron oxide, trace slickensides, trace gouge	subangular to subrounded chips up to 1.6 cm; 10% fines
2,690 - 2,700	819.9 - 823.0	Diabase; greenish gray [10Y6/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, trace yellow quartzite; reaction to acid: moderate	trace iron oxide, some fault gouge, trace pyrite	subangular to subrounded chips up to 1.9 cm; 10% fines
2,700 - 2,710	823.0 - 826.0	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite, trace yellow quartzite; reaction to acid: weak	trace iron oxide, trace slickensides, trace pyrite, trace clay alteration, trace white fracture material	subangular to subrounded chips up to 3.0 cm; trace fines
2,710 - 2,720	826.0 - 829.1	Diabase; greenish gray [10Y6/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite, trace yellow quartzite; reaction to acid: strong	trace iron oxide, trace slickensides, trace fault gouge, trace pyrite, increased clay alteration, some calcite veins	subangular to subrounded chips up to 1.5 cm; 15% fines
2,720 - 2,730	829.1 - 832.1	Diabase; greenish gray [10Y6/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite, trace yellow quartzite; reaction to acid: strong	trace iron oxide, trace slickensides, trace fault gouge, trace pyrite, increased clay alteration, some calcite veins	subangular to subrounded chips up to 1.8 cm; 15% fines
2,730 - 2,740	832.1 - 835.2	Diabase; greenish gray [5GY5/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite, trace light orange quartzite; reaction to acid: weak to moderate	trace iron and manganese oxide, trace slickensides, trace pyrite, trace clay alteration, trace calcite	subangular to subrounded chips up to 1.6 cm; trace fines

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-06
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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
PRECAMBRIAN DIABASE (PCd)				
2,740 - 2,750	835.2 - 838.2	Diabase; greenish gray [10Y5/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite, trace light orange quartzite; reaction to acid: weak	trace iron and manganese oxide, trace slickensides, trace pyrite, trace gouge, trace white fracture material	subangular to subrounded chips up to 2.0 cm; 10% fines
2,750 - 2,760	838.2 - 841.2	Diabase; dark greenish gray [10GY4/1] and greenish gray [10Y6/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite; reaction to acid: weak	trace iron and manganese oxide, trace slickensides, trace pyrite, increased fault gouge, trace white fracture material	subangular to subrounded chips up to 1.7 cm; 20% fines
2,760 - 2,770	841.2 - 844.3	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite; reaction to acid: weak	trace iron and manganese oxide, trace slickensides, trace pyrite, trace white fracture material	subangular to subrounded chips up to 1.7 cm; 2% fines
2,770 - 2,780	844.3 - 847.3	Diabase; greenish gray [10Y5/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite; reaction to acid: very weak	trace iron oxide, trace slickensides, trace pyrite, trace white fracture material, trace fault gouge	subangular to subrounded chips up to 1.6 cm; 10% fines
2,780 - 2,790	847.3 - 850.4	Diabase; greenish gray [10Y5/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite, trace orange siltstone; reaction to acid: weak	trace iron oxide, trace slickensides, trace pyrite, trace white fracture material, trace fault gouge	subangular to subrounded chips up to 2.5 cm; 10% fines
2,790 - 2,800	850.4 - 853.4	Diabase; greenish gray [10Y5/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration and pyrite, trace orange siltstone; reaction to acid: weak	trace iron oxide, trace slickensides, trace pyrite, trace white fracture material	subangular to subrounded chips up to 2.5 cm; 2% fines
2,800 - 2,810	853.4 - 856.5	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, common magnetite, trace orange and red quartzite; reaction to acid: weak	trace iron and manganese oxide, trace slickensides, trace calcite veins, trace white fracture material	subangular to subrounded chips up to 2.0 cm; 10% fines
2,810 - 2,820	856.5 - 859.5	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, common magnetite, trace orange and red quartzite; reaction to acid: weak	trace iron and manganese oxide, trace slickensides, trace calcite veins, trace white fracture material	subangular to subrounded chips up to 1.3 cm; 5% fines

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
PRECAMBRIAN DIABASE (PCd)				
2,820 - 2,830	859.5 - 862.6	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, common magnetite, trace orange and red quartzite; reaction to acid: weak	trace iron oxide, trace slickensides, trace calcite veins, trace white fracture material, trace pyrite	subangular to subrounded chips up to 1.0 cm; 10% fines
2,830 - 2,840	862.6 - 865.6	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, common magnetite, trace orange and red quartzite; reaction to acid: weak	trace iron oxide, trace slickensides, trace calcite veins, trace white fracture material	subangular to subrounded chips up to 1.0 cm; 5% fines
2,840 - 2,850	865.6 - 868.7	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, common magnetite, trace orange and red quartzite; reaction to acid: weak	trace iron oxide, trace calcite veins, trace white fracture material, trace pyrite	subangular to subrounded chips up to 3.5 cm; 5% fines
2,850 - 2,860	868.7 - 871.7	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, common magnetite, trace orange talc-silicate; reaction to acid: weak	trace iron oxide, trace slickensides, trace calcite vein, trace white fracture material, trace pyrite	subangular to subrounded chips up to 1.4 cm; 5% fines
2,860 - 2,870	871.7 - 874.8	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, common magnetite, trace orange talc-silicate; reaction to acid: weak	trace iron and manganese oxide, trace slickensides, trace calcite vein, trace white fracture material, trace pyrite	subangular to subrounded chips up to 2.4 cm; 2% fines
2,870 - 2,880	874.8 - 877.8	Diabase; dark greenish gray [10Y4/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, common magnetite, trace orange talc-silicate; reaction to acid: weak	trace iron oxide, trace slickensides, trace calcite vein, trace white fracture material, trace pyrite	subangular to subrounded chips up to 2.0 cm; 2% fines
2,880 - 2,891	877.8 - 881.2	Diabase; greenish gray [10Y5/1]; well lithified; black and green diabase with abundant brownish-green serpentine alteration, common magnetite, trace orange talc-silicate; reaction to acid: weak	trace iron oxide, trace slickensides, trace calcite vein, trace white fracture material, trace pyrite	subangular to subrounded chips up to 1.8 cm; 2% fines

TABLE B-1. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL DHRES-06

Date	Hole #	Reporter	Shift Change Depth (m)	Shift Change Depth (ft)	Progress in last 24 Hrs (m)	Progress in last 24 Hrs (ft)	Comments	Hole Type/Size	Hydro Data	Geology
20-Feb	DHRES-6	C. Trout	0.00	0.00	0.00	0.00	Mobilizing equipment to DHRES-6 and re-positioning the drill rig to maximize distance from HRES-8.	Mobilization	n/a	n/a
21-Feb	DHRES-6	C. Trout	0.00	0.00	0.00	0.00	Continued mobilizing equipment and setting up at DHRES-6. Jonovich transferred drill mud to the new site. Currently finishing clean up at RES-19.	Mobilization	n/a	n/a
22-Feb	DHRES-6	C. Trout	0.00	0.00	0.00	0.00	Finished cleaning up the RES-19 site and final setup of DHRES-6. Successful completion of final site inspection this morning. Anticipate drilling surface casing this afternoon.	Mobilization	n/a	n/a
23-Feb	DHRES-6	J.Kent	12.19	40.00	12.19	40.00	Completed site set up of DHRES-6, and started drilling for installation of the surface casing. Completed drilling down to ~12m, and installed 14" surface casing. Cemented in surface casing up to .60 meters below land surface. Welded on diverter ring to surface casing and set up to drill 12-1/4" tricone conventional mud.	19" Tri-cone-Conventional Mud	n/a	Apache Leap Tuff
24-Feb	DHRES-6	J.Kent	85.34	280.00	73.15	240.00	Tripped in drill sting and started drilling. Drilling going well, took deviation survey @ 80m 0°.	12-1/4" Tri-cone Conventional Mud	n/a	Apache Leap Tuff contact with White Tail Conglomerate (Tw) @ 85m.
25-Feb	DHRES-6	C. Trout	171.60	563.00	86.26	283.00	Continued drilling in Tw (lacustrine). Climbing mud viscosity causing mud to sheet off shaker. Down for one hour to work on generator for the fuel truck and one hour this morning to change mud. Currently drilling in improving conditions.	12-1/4" Tri-cone Conventional Mud	n/a	Whitetail Conglomerate (lacustrine)
26-Feb	DHRES-6	C. Trout	259.08	850.00	87.48	287.00	Continued drilling in Tw (conglomerate) to 259m. Down for 15 minutes to change rope packing on mud pump. Currently drilling in good conditions.	12-1/4" Tri-cone Conventional Mud	n/a	Whitetail Conglomerate; contact between lacustrine & conglomerate units @ 175m.
27-Feb	DHRES-6	C. Trout	324.00	1063.00	64.92	213.00	Continued drilling in Tw to 324m. Baroid mud engineer onsite this morning. Anticipate TD Sunday morning.	12-1/4" Tri-cone Conventional Mud	n/a	Whitetail Conglomerate
28-Feb	DHRES-6	C. Trout	379.48	1245.00	55.47	182.00	Drilling, penetration rate has decreased possibly due to geology (limestone). Survey at 324m Inc 1.25°. Anticipate TD this evening.	12-1/4" Tri-cone Conventional Mud	n/a	Whitetail Conglomerate contact with Naco Limestone (Pz Naco)

TABLE B-1. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL DHRES-06

1-Mar	DHRES-6	J.Kent	384.66	1262.00	5.18	17.00	Drilled to TD yesterday afternoon, survey at 384m Inc 1.75°. Went on standby for ~1hr due to weather conditions. Tripped out drill string and setup for geophysical logging. Currently logging.	12-1/4" Tri-cone Conventional Mud	n/a	Pz Naco
2-Mar	DHRES-6	J.Kent	384.66	1262.00	0.00	0.00	Completed geophysical logging yesterday evening 1700hrs. Set up to trip in 7-5/8" casing and piezometers. Currently tripping in casing and installing piezometers; anticipate completing trip in late this evening ~2200hrs. Halliburton onsite ready to grout in casing.	7-5/8" Casing	n/a	Pz Naco
3-Mar	DHRES-6	J.Kent	384.66	1262.00	0.00	0.00	Completed tripping in 7-5/8" casing and piezometers. Halliburton successfully grouted in casing and piezometers early this morning. Currently on stand by waiting on cement to set up (72hrs). Crews will be switching out equipment preparing to drill reverse air.	7-5/8" Casing	n/a	Pz Naco
4-Mar	DHRES-6	J.Kent	384.66	1262.00	0.00	0.00	Crew on stand by waiting for grout to set up. Currently switching out equipment to drill reverse air.	7-5/8" Casing	n/a	Pz Naco
5-Mar	DHRES-6	J.Kent	384.66	1262.00	0.00	0.00	Stand by, waiting on grout to set up. Working on switching out equipment to drill reverse air, anticipate drilling tomorrow.	7-5/8" Casing	n/a	Pz Naco
6-Mar	DHRES-6	A. Jergenson	387.10	1270.00	2.44	8.00	Set up to drill utilizing reverse air technique with a 6-3/4" hammer. Peek's inspection completed on booster prior to drilling. Commenced drilling at 1000hrs. Currently drilling making good progress.	6-3/4" RC Hammer	n/a	Pz Naco
7-Mar	DHRES-6	A. Jergenson	500.48	1642.00	113.39	372.00	Drilled down to 500.48m. Survey completed and inclination was found to be 7 degrees. Decision was made to trip out and set up a stiffer assembly to decrease inclination and prevent dogleg.	6-3/4" RC Hammer	n/a	Pz Naco
8-Mar	DHRES-6	J.Kent	564.18	1851.00	63.70	209.00	Completed tripping out of the hole, and re-configured bottom hole assembley. Tripped back into the hole and continued drilling. Took survey at 533m Inc 7°, and survey at 564m Inc 7.25°. Currently discussing options to correct dogleg.	6-3/4" RC Hammer	Groundwater production at 503m 6 GPM. Groundwater production is holding steady 503m-564m 7-10 GPM. Currently setting up to run a airlift test due to the increase in GPM's (20 GPM).	Pz Naco

TABLE B-1. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL DHRES-06

9-Mar	DHRES-6	J.Kent	579.73	1902.00	15.54	51.00	Drilled down to 579.73m and the hammer stopped firing. Circulated on hole, decision was made to complete an air lift test before tripping out of the hole. Tripped out of the hole, decision was made to go back in with the hammer and continue drilling. Currently setting up bottom hole assembly, and tripping in.	6-3/4" RC Hammer	Groundwater production at 564-570m 8 GPM. 570-576m 20 GPM. 576-579m 48 GPM. Completed air lift test successfully. Starting water level before test 245m. Air lifted 50 GPM for 2 hours, water level after 2hr recovery was 247m.	Pz Naco
10-Mar	DHRES-6	J.Kent	592.836	1945.00	13.11	43.00	Tripped in drill string and circulated last 27m to bottom (hole was getting tight towards the bottom). Attempted to start drilling but the hammer was not firing, crew set up additional booster and commenced drilling. Decision was made to trip out of the hole and switch over to flooded reverse utilizing the tri-cone because the penetration rate was slow, and water production increased. Currently tripping out hammer assembly.	6-3/4" RC Hammer	Groundwater production at 579-584m 50 GPM. 584-586m 100 GPM. 586-593m 55 GPM.	Pz Naco
11-Mar	DHRES-6	E. Jung	617.5248	2026.00	24.69	81.00	Tripped hammer assembly out of hole. Set up to trip in (flooded RC). Tripped in to 567m. Hole tight - cleaned to 592.8m (3m of fill on bottom). Drilled to 617.5m	6-1/2" Tri-Cone Reverse flooded	N/A	Pz Limestone, currently logging chips to determine unit. Preliminary determination is Pz Escabrosa
12-Mar	DHRES-6	E. Jung	690.68	2266.00	73.15	240.00	Drilling with improved penetration rate, cleaned hole and took survey at 690m - Incl. 6.5°. Currently drilling.	6-1/2" Tri-Cone Reverse flooded	N/A	Pz Naco
13-Mar	DHRES-6	E. Jung	754.38	2475.00	63.70	209.00	Drilling is going well. Changed shaker screens. Currently drilling.	6-1/2" Tri-Cone Reverse flooded	N/A	Pz Naco to approximate contact with Cb at 683m
14-Mar	DHRES-6	E. Jung	763.83	2506.00	9.45	31.00	Took survey at 655.5m (7°+). Tripped out to change bit. Currently tripping in new bit.	6-1/2" Tricone Reverse flooded	N/A	Є̲b
15-Mar	DHRES-6	E. Jung	820.22	2691.00	56.39	185.00	Tripped in to bottom. Hole seems to be stable and drilling is going well. Cleaned hole at cross shift and currently drilling.	6-1/2" Tricone Reverse flooded	N/A	Є̲b to approximate contact with pЄ̲d at 788m.
16-Mar	DHRES-6	J.Kent	872.03	2861.00	51.82	170.00	Drilling, took survey @ 726m Inc 6°.	6-1/2" Tri-cone Reverse flooded	N/A	pЄ̲d (Diabase)
17-Mar	DHRES-6	J.Kent	881.18	2891.00	9.14	30.00	Drilled until 1915hrs, started tripping to switch out the tri-cone drill bit. Tripping back in anticipate drilling this afternoon.	6-1/2" Tri-cone Flooded Reverse	N/A	pЄ̲d (Diabase)

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18-Mar	DHRES-6	J.Kent	881.18	2891.00	0.00	0.00	While tripping back into the hole hit bridges and tight spots starting at ~816m to 881m. It was noted by the Geologist that there is a fault consisting of 90% gouge material at 813m-817m. Driller had to circulate to bottom, and was trying to clean up the hole before commencing drilling. Hole had sloughed in and collected at the bottom of the hole; when the air was dumped to lift cuttings out of the hole it plugged up the bit as well as the rods. Crew tripped out of the hole and cleaned out several buckets full of cuttings ranging in size from .5-4cm. Decision was made to trip back in with a drag bit which will get through the bridges and grind up the slough collected at the bottom of the hole. Crew will then circulate on hole and clean it up in preparation for geophysical logging which will take place Friday.	6" Drag Bit Flooded Reverse	N/A	pЄd (Diabase) Faults were logged at 789.43-792.48m and 813.81-816.86m
19-Mar	DHRES-6	E. Jung	881.18	2891.00	0.00	0.00	Hit bridge at 817m while tripping in with drag bit. Drilled out what had sloughed in on the bottom and circulated. Hole seems fairly stable. Currently tripping out for geophysical logging. Anticipate logging to begin around 3pm.	6" Drag Bit Flooded Reverse	N/A	pЄd (Diabase)
20-Mar	DHRES-6	E. Jung	881.18	2891.00	0.00	0.00	Tripped out and rigged up for geophysical surveys. Survey team encountered slough on bottom, and bridge was encountered at ~582m. Tripped in to clean hole, with no bridge found at the 582m level. Rod arm seal failing (leaking), so switched to tripping with sling. Currrently tripping out for re-survey.	6" Drag Bit Flooded Reverse	N/A	pЄd (Diabase)

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21-Mar	DHRES-6	E. Jung	881.18	2891.00	0.00	0.00	**3-19** Completed running first tool (Fluid resistivity, gamma, and caliper) from TD up to 384m, and FMI tool from 585m up to 384m. FMI tool got hung up at 585m, most likely a rock fell in on the hole, and they could not get the tool down. Decision was mad to trip in and complete a wiper trip to clean up the hole. **3-20 & 3-21** Tripped out for geophysical logging, second attempt. Survey truck broke down on the way to the drill site, and access to timely diagnostics/parts/repairs could not be found at the late weekend hour. Decision was made to demobilize geophysical logging crew due to the amount of time it would take to repair the truck while the hole was left open. Used geophysical logs from first attempt to create the casing schedule. Transported 444m of blank and perforated casing to drill site and tripped in according to the casing schedule. Currently tripping in casing hanger to secure the 4.5" blank and perforated pipe in suspension.	6" Drag Bit Flooded Reverse	Water level was measured at 243m.	pЄd (Diabase)
22-Mar	DHRES-6	E. Jung	881.18	2891.00	0.00	0.00	Set up and tripped in casing hangar with the 4.5" blank and perforated pipe. Top of casing hanger is set at 373.55m. Set up and conducted an air lift test starting at 0100hrs; stopped the air lift test at 1300hr. Currently monitoring the recovery of the water level.	4.5" blank and perforated casing	Air-lift test started at 0100hrs and ended at 1300hrs. Currently monitoring water level recovery.	pЄd (Diabase)
23-Mar	DHRES-6	E. Jung	881.18	2891.00	0.00	0.00	Completed water level recovery test @ 0130hrs. Currently rigging down and demobilizing. Move to new site may take additional time due to weather/road conditions, and repairs to rod handling arm. Anticipate moving drill rig to new site Wednesday afternoon or Thursday.	Rigging down - demobilizing	N/A	pЄd (Diabase)
24-Mar	DHRES-6	J.Kent	881.18	2891.00	0.00	0.00	BLY mechanic onsite working on rod arm while crew is breaking down other equipment and moving it to HRES-9. Anticipate moving the rig tomorrow.	Mobilization	N/A	pЄd (Diabase)