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TECHNICAL MEMORANDUM

DATE: January 18, 2012 **Project 605.31**

TO: Greg Ghidotti
RESOLUTION COPPER MINING LLC

FROM: Charlie King, Janis Blainer-Fleming, and Todd Keay
MONTGOMERY & ASSOCIATES

SUBJECT: RESULTS OF DRILLING AND CONSTRUCTION OF HYDROLOGIC TEST WELL DHRES-14 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 and construction at hydrologic test well DHRES-14. DHRES-14 is located east of Devils Canyon, between the Devils Canyon Fault and JI Ranch Fault. The well was installed to characterize hydrogeologic conditions and provide a monitoring location in the Tertiary Whitetail Conglomerate and Precambrian Pinal Schist. Monitoring data obtained from DHRES-14 will be incorporated into the RCM hydrologic monitoring program.

SUMMARY

A summary of drilling and construction operations is provided below:

1. Hydrologic test well DHRES-14 is located on land owned by the U.S. Forest Service, in Township 1 South, Range 13 East, in the SW ¼ of the SW ¼ of the SW ¼ of Section 28 ((D-1-13)28ccc), east of Devils Canyon, between the Devils Canyon Fault and JI Ranch Fault.
2. Well DHRES-14 was drilled and constructed during the period April 7 through May 16, 2011.
3. Total drilled depth is 999.7 meters below land surface (bls).

4. Geologic units encountered during drilling from land surface to total depth include Tertiary Apache Leap Tuff (Tal), Early Sediments (Tes), Early Volcanics (Tev), and Whitetail Conglomerate (Tw), and Precambrian Pinal Schist (pCpi).
5. An intermediate casing string and four grouted vibrating-wire pressure transducers were installed in the upper part of the borehole in the Tal, Tes, Tev, and upper Tw.
6. The well was completed in the Tw and pCpi with one perforated interval from 797.6 to 990.2 meters bls; non-pumping water level was 349.49 meters bls on November 22, 2011.
7. Following installation of production casing, airlift development was conducted. Airlifting could not be sustained which indicates that transmissivity of the Tw and pCpi at DHRES-14 is very small.

INTRODUCTION

Hydrologic test well DHRES-14 was drilled and constructed during the period April 7 through May 16, 2011. The well was drilled to:

- evaluate groundwater conditions within the Tal, Tw, and pCpi east of the Devils Canyon Fault
- characterize lithology east of the proposed block-cave zone
- provide a groundwater level monitoring location in the Tw and pCpi at this site.

Hydrologic test well DHRES-14 is located on land owned by the U.S. Forest Service, in Township 1 South, Range 13 East, in the SW ¼ of the SW ¼ of the SW ¼ of Section 28 ((D-1-13)28ccc), east of Devils Canyon, between the Devils Canyon Fault and JI Ranch Fault. 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, fracture summary log, drilling methods, borehole geophysical logs, groundwater level, and total head at each grouted piezometer. A detailed lithologic log for the test well is provided in **Appendix A**.

DRILLING OPERATIONS

Hydrologic test well DHRES-14 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. 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-14 was drilled and constructed in two stages. During the first stage, the borehole was drilled to 652.6 meters bls, and casing and instrumentation were installed and cemented in place. During the second stage, the borehole was drilled to total depth of 999.7 meters bls, and blank and perforated casing were installed to a total depth of 996.7 meters bls. Final completion of the well was designed by 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-14 was drilled using the conventional air rotary drilling method for the surface casing borehole, the dual-wall air reverse circulation and flooded reverse circulation drilling methods for the intermediate borehole, and the conventional mud rotary drilling method 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-14

Depth Interval (meters bls)	Drilling Method	Bit Type	Borehole Diameter (inches)
0 – 9.1	conventional air rotary	tricone	19
9.1 – 300.5	dual-wall air reverse	hammer	12-¼
300.5 – 652.6	flooded reverse mud rotary	tricone	12-¼
652.6 – 999.7	conventional mud rotary	tricone	6-¾

The flooded reverse mud rotary drilling method was used for the intermediate borehole for the depth interval from 300.5 to 652.6 meters bls to regain drill cuttings returns and to establish a well-conditioned borehole for installation and cementing of casing and annular vibrating-wire piezometers. For the production portion of the borehole, the conventional mud rotary drilling method was used to ensure a stable, well-conditioned borehole within the Tw.

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 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 Tes, Tev, and Tw were contained in portable tanks on site before being removed using vacuum trucks to be deposited at a designated storage facility at the RCM 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 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 conducted on a regular basis using a Totco mechanical drift recorder. Borehole deviation was 3 degrees or less for the depth interval from land surface to 304.8 meters bls using the dual-wall air reverse circulation drilling method. Borehole deviation decreased from 2.7 to 1.5 degrees for the depth interval from 304.8 to 518.2 meters bls using flooded reverse circulation drilling methods. Deviation increased from 1.7 to 4 degrees from the depth interval 518.2 to total depth of 999.7 meters bls.

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 by RCM. 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 flooded reverse and conventional mud rotary drilling at DHRES-14.

At DHRES-14 the depth interval from 9.1 to 300.5 meters bls (the upper portion of the Tal) was drilled using the dual-wall air reverse circulation method, and observations of natural groundwater production was attempted 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 to clear the injection fluid from the borehole. No sustainable groundwater production was observed before switching to the flooded reverse mud rotary drilling method at a depth of 300.5 meters bls.

BOREHOLE GEOPHYSICAL LOGGING

Borehole geophysical logging was conducted in three stages at hydrologic test well DHRES-14. The first stage of logging was conducted following drilling of the intermediate borehole to a depth of 350.3 meters bls, the second stage of logging was conducted following drilling of the intermediate borehole to a depth of 652.6 meters bls, and the final stage of logging was conducted after drilling of the production borehole to a depth of 999.7 meters bls. Borehole geophysical logging services were provided by Southwest Exploration Services, LLC (SWE) of Gilbert, Arizona, and Schlumberger Water Services (SWS) of Farmington, New Mexico.

The first suite of geophysical logs was obtained by SWE on April 26, 2011; logs included: natural gamma ray, 3-arm caliper, temperature, fluid resistivity, and optical televiewer (OBI). The second suite of geophysical logs was obtained by SWS on April 26 and 27, 2011; logs included: borehole deviation, gamma ray, 6-arm caliper, temperature, sonic, array induction (AIT), and formation micro-resistivity imaging (FMI). The third suite of geophysical logs was obtained by SWE on May 14 and 15, 2011; logs included: natural gamma ray, 3-arm caliper, temperature, sonic, normal resistivity (E-logs), single point resistance, spontaneous potential, and acoustic borehole televiewer (ABI). **Table 2** shows logs obtained and depth intervals for each type of log. SWE and SWS provided field and final logs in digital format to RCM staff. SWS analyzed and interpreted the logs for the middle portion of the DHRES-14 borehole and prepared a summary log montage for RCM (SWS, 2011). Logs obtained by SWE are shown on **Figure 2**.

TABLE 2. SUMMARY OF BOREHOLE GEOPHYSICAL LOGS OBTAINED AT DHRES-14

LOG	SWE DEPTH INTERVAL (meters bls)	SWS DEPTH INTERVAL (meters bls)
Caliper	0 – 350; 650 – 1,000	6 – 653
Temperature	0 – 350; 650 – 1,000	6 – 653
Borehole fluid resistivity	281 – 350; 650 – 1,000	6 – 653
Gamma ray / Natural gamma ray	0 – 350; 650 – 1,000	6 – 653
Induction (AIT) / Normal resistivity (E-logs)	650 – 1,000	6 – 653
Single point resistance	650 – 1,000	N/A
Spontaneous potential	650 – 1,000	N/A
Borehole imaging (OBI, ABI, or FMI)	OBI: 8 – 281 ABI: 650 – 1,000	FMI: 290 – 653
Sonic	650 – 1,000	290 - 650
Borehole deviation	N/A	280 – 653

OBI = Optical borehole image
ABI = Acoustic borehole image
FMI = Formation micro-resistivity image
N/A = Not obtained

ANALYSIS OF GEOLOGIC CONDITIONS

Geologic Contacts

Geologic contacts were picked based on analysis of drill cuttings samples, geophysical logs, and information obtained during drilling. **Table 3** is a summary of geologic contacts at DHRES-14. Detailed lithologic descriptions based on drill cuttings samples are provided in **Appendix A**. At well DHRES-14 geophysical logs provided by SWS and SWE were used to confirm the formation depth intervals (**Table 3; Figure 2**).

TABLE 3. SUMMARY OF GEOLOGIC UNITS DRILLED FOR HYDROLOGIC TEST WELL DHRES-14

Depth Interval (meters bls)	Geologic Formation
0 – 57.9	Apache Leap Tuff – White Unit (Talw)
57.9 – 347.5	Apache Leap Tuff – Gray Unit (Talg)
347.5 – 456.0	Apache Leap Tuff – Brown Unit (Talb)
456.0 – 466.1	Apache Leap Tuff – Vitrophyre (Talv)
466.1 – 481.2	Apache Leap Tuff – Basal tuff (Talbt)
481.2 – 484.6	Tertiary Early Sediments (Tes)
484.6 – 523.8	Tertiary Early Volcanics and Sediments (Tev)
523.8 – 958.0	Whitetail Conglomerate (Tw3)
958.0 - 999.7	Pinal Schist (pCpi)

Apache Leap Tuff (Tal)

The Tal at DHRES-14 is 481.2 meters thick, and consists of White Unit (Talw) from land surface to 57.9 meters bls, Gray Unit (Talg) from 57.9 to 347.5 meters bls, Brown Unit (Talb) from 347.5 to 456.0 meters bls, vitrophyre (Talv) from 456.0 to 466.1 meters bls, and basal tuff (Talbt) from 466.1 to 481.2 meters bls. The Talw, Talg, Talb, and Talbt units consist of dacite porphyry tuff with phenocrysts of potassium and plagioclase feldspars, quartz, biotite, and pumice fragments in an aphanitic to cryptocrystalline groundmass. The Talv has black glassy groundmass with the same phenocryst assemblage as the tuff. Detailed lithologic descriptions are provided in **Appendix A**.

For the depth interval from 455.0 to 456.0 meters bls, the AIT log indicates low resistivity and the gamma ray log indicates decreased activity. Sonic logs show higher acoustic velocity, increased compressional wave slowness, and decreased shear wave slowness for this interval. This interval is interpreted to be a megaspherulite zone. The FMI log shows a highly conductive zone for the depth interval from 455.0 to 456.0 meter bls, a slightly to moderately conductive zone from 456.0 to 465.1 meters bls, and a highly conductive zone from 465.1 to 481.2 meters bls. These are interpreted to be the megaspherulite, Talv, and Talbt units, respectively. The contact between the Tal and Tes at a

depth of 481.2 meters bls was confirmed by a slight increase in gamma ray activity and spontaneous potential (SWS, 2011).

Tertiary Early Sediments (Tes)

The Tes at DHRES-14 is 3.4 meters thick and occurs in the depth interval from 481.2 to 484.6 meters bls. The Tes is predominantly arkosic quartzite and tuffaceous sandstone, with some weathered basalt. The contact between the Tes and the underlying Tev at 484.6 meters bls was picked where resistivity decreased substantially (SWS, 2011).

Tertiary Early Volcanics and Sediments (Tev)

The Tev at DHRES-14 is 39.2 meters thick and occurs in the depth interval from 484.6 to 523.8 meters bls. The Tev consists of black basalt with trace vesicles. The depth interval from 518.2 to 521.4 meters bls comprises 50 percent basalt and 50 percent reddish-brown paleosol. The paleosol unit is discernable on the AIT log, where resistivity increased substantially. The contact between the Tev and Tw at 523.8 meters bls was apparent on the SWS sonic log where compressional and shear wave slowness increased slightly (SWS, 2011).

Whitetail Conglomerate (Tw)

The Tw at DHRES-14 is 434.2 meters thick and occurs in the depth interval from 523.8 to 958.0 meters bls. The Tw at this location includes Conglomerate Unit (Tw3) only. At DHRES-14, the Tw3 consists of weakly to moderately lithified, clast-supported conglomerate with clasts of schist, quartzite, diabase, limestone, and basalt in clayey silt to silt matrix. The gravel fraction changes from a mixed lithology to a schist-dominated lithology at 592.5 meters bls. The clast composition changes gradually from schist-dominated at 592.5 meters bls to quartzite-dominated by 826.0 meters bls. The Tw1, Tw2, and Tw4 units were not encountered at DHRES-14.

The contact between the Tev and Tw at a depth of 523.8 meters bls was confirmed by a very slight increase in gamma ray activity and by a change in the drill cuttings. The contact between the mixed lithology conglomerate and the schist-dominated conglomerate was picked where gamma ray activity increased slightly and resistivity decreased slightly (SWS, 2011). There is a currently unexplained increase in resistivity in the Tw3 at a depth of about 845 meters bls.

The contact between the Tw and pCpi was not immediately discernable from drill cuttings samples at DHRES-14. Drill cuttings were ground very fine and the textural difference between schist-dominated conglomerate and schist was not apparent. The ABI log for the lower part of the borehole did not provide enough detail to help identify the contact either. RCM geology staff identified the contact between the Tw3 and pCpi at 958.0 meters

bls based on QEMScan and assay data (G. Ghidotti, personal communication). Further discussion is provided below.

Pinal Schist (pCpi)

At DHRES-14, the contact between the Tw3 and pCpi at a depth of 958.0 meters bls was confirmed by (1) a decrease in normal resistivity and single point resistance, (2) an increase in drilling penetration rate, (3) RCM QEMScan and assay data, and (4) presence of sulfide minerals in drill cuttings samples. Inspection of geophysical logs indicates a decrease in normal resistivity and single point resistance at a depth of 958.0 meters bls which corresponds to the contact (**Figure 2**). A slight increase in drilling penetration rate occurred from about 957.4 meters bls to total depth (**Figure 2**). RCM assay data indicate 0.34 percent copper as copper sulfides for the lowermost 43 meters of the borehole (H. Martin, RCM). Sulfides were noted in drill cuttings samples for the depth interval from 960.1 meters bls to total depth (**Appendix A**). Unoxidized, sulfide-bearing clasts are not known to occur in the Tw above the Resolution or Superior East ore bodies (H. Martin, RCM).

WELL CONSTRUCTION

Construction of DHRES-14 began with installation of 14-inch diameter blank steel surface casing. The surface casing was installed to 9.1 meters bls and cemented in place. Intermediate casing was installed from land surface to a depth of 651.0 meters bls, approximately 127 meters below the contact between the Tev and the Tw. The intermediate casing consists 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. The shallowest piezometer is installed in the vadose zone of the Tal. Details regarding the piezometers installed at DHRES-14 are given in **Table 4** and installed depths are shown on **Figure 2**.

TABLE 4. DETAILS FOR GROUTED PRESSURE TRANSDUCER INSTALLATION FOR HYDROLOGIC TEST WELL DHRES-14

	Identifier*	Serial Number	Installed Depth (meters bls)	Hydrogeologic Unit	Pressure Rating (Mega-Pascals)
1	DHRES-14_1213	11-04538	213.1	Talg	5
2	DHRES-14_1071	11-04539	356.1	Talb	5
3	DHRES-14_888	11-07950	539.0	Tw3	10
4	DHRES-14_822	10-15632	605.1	Tw3	20

*Identifier consists of well name and piezometer elevation in meters above mean sea level

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 38 meters of annular seal material consisted of neat cement to prevent loss of the pressure grout from the bottom of the upper interval during drilling of the lower borehole. The grout and cement were allowed to cure for 72 hours before drilling of the lower borehole commenced. The pressure grouting job documents were provided by Halliburton and are included in **Appendix C**.

The production string for DHRES-14 consists of 4-1/2-inch outside diameter blank and slotted, threaded and coupled steel casing. A single interval of perforated casing was installed in the depth interval from 797.6 to 990.2 meters bls. Perforations are 0.125-inch wide by 2.5-inches long machine-cut slots, two slots per round, four rounds per foot, staggered (8 slots per foot). The bottom 20-foot joint of blank steel casing was torch cut, tapered, and welded closed. The production casing was suspended inside the 7-5/8-inch casing at a depth of 632.0 meters bls using a mechanical casing hanger manufactured by TIW Corporation of Houston, Texas. Annular materials were not installed in the production interval of the well. A schematic diagram of well construction is shown on **Figure 2**.

Following casing installation at DHRES-14, airlift pumping was conducted to remove drilling fluids from the hole and develop the well. Thick drilling mud in the well made it difficult to collect reliable groundwater level measurements, but prior to airlifting water level was about 136 meters bls. Three successive airlift purges were conducted with the airline installed at 274.3, 457.2, and 609.6 meters bls. The borehole unloaded with each purge, but discharge rapidly diminished to less than 0.06 L/s and could not be sustained. Due to the presence of heavy drilling fluid in the well it was not possible to collect groundwater level data during recovery. Airlift development and further testing were terminated. Results of airlift development indicate that transmissivity of the Tw at DHRES-14 is very small.

Surface completion at DHRES-14 consists of a locking box vault on a concrete pad. Horizontal and vertical well coordinates for the top of 7-5/8-inch casing and center of the well were surveyed by Civiltec Engineering, Inc. of Phoenix, Arizona, on June 2, 2011. Survey data and computed land surface and measurement point elevations are provided in **Table 5**.

TABLE 5. SUMMARY OF SURVEY RESULTS FOR HYDROLOGIC TEST WELL DHRES-14

	(meters)
Easting	498361.259
Northing	3685248.404
Elevation Top of 7-5/8-inch Casing	1427.176
Elevation Land Surface	1426.65

Datum: UTM Zone 12 North (NAD27)-NGVD29

HYDRAULIC HEAD DATA

Pore pressures measured at the DHRES-14 grouted-piezometer array have been converted to total hydraulic head in meters above mean sea level and are presented on the hydrograph in **Figure 3**. Pore pressures at the three deepest grouted piezometers appear to have equilibrated with pore pressures in the adjacent formation within approximately 3 weeks following installation. The uppermost grouted piezometer was installed above water level in order to investigate the possibility that measured pressure is elevated simply due to the presence of the grout (i.e., that there may be a background pressure reading even in the absence of positive pressure head imposed by an overlying water column). Preliminary results indicate that there is not a background pressure exerted by the grout; total head at piezometer DHRES-14_1213 shown on **Figure 3** is essentially the elevation of the piezometer with very small fluctuations due to variations in barometric pressure. The grouted piezometer is not expected to measure negative pore pressures associated with unsaturated conditions. Hydraulic head data for November 22, 2011, are shown on **Figure 2**. Further discussion of pore pressure data obtained at DHRES-14 will be provided in a future report.

Groundwater level at DHRES-14 was 349.47 meters bls on November 22, 2011 (**Figure 2**).

INSTRUMENTATION

Well DHRES-14 will not be equipped with a dedicated pump assembly due to low yield. An In-Situ Level TROLL 500 (S/N 194493; 100 psi non-vented) pressure transducer is currently installed at DHRES-14.

REFERENCES CITED

Halliburton, 2011, **DHRES-14 Cement production casing, 30-Apr-2011, job site documents**, 7 p.

Schlumberger Water Services, 2011, **Integrated wireline log well montage for well DHRES-14**: Processed advanced borehole geophysical data prepared for Resolution Copper Mining for data obtained on April 27, 2011 and processed on October 1, 2011.

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

T. 1 S. T. 2 S. T. 3 S.

3,690,000 3,685,000 3,680,000 3,675,000

DHRES-14

DHRES-09 DHRES-03 DHRES-04 DHRES-05 DHRES-10 DHRES-13 DHRES-11 DHRES-12 DHRES-01 DHRES-02 DHRES-04 DHRES-08 DHRES-07 DHRES-06

HRES-01 HRES-02 HRES-03 HRES-04 HRES-05 HRES-06 HRES-07 HRES-08 HRES-09 HRES-10 HRES-11 HRES-12 HRES-13 HRES-14 HRES-15

A-06 MJ-11

Shaft No. 3 Shaft No. 9

Corral Middle Hackberry Windmill

Oak Flat

Top of the World

JI Ranch

Town of Superior

Queen Creek Hackberry Canyon Devils Canyon Arnett Creek Mineral Creek

Gila County Pinal County

60 177

1,400 1,600

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-14 WELL LOCATION

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2012

FIGURE 1

\GIS-Tuc\Projects\605\605.3\Welloc_DHRES_14.mxd\12Jan2012

DEPTH BELOW LAND SURFACE, METERS

Depth Below Land Surface: meters (feet)

Cement
19-inch borehole
0 (0)
14-inch blank steel casing
9.1 (30)
12-1/4-inch borehole
57.9 (190)
7-5/8-inch threaded & coupled blank steel casing (coupling OD is 8.5 inches)
Specialized pressure grout; grout mix ratio by weight - 2.5 water: 1 cement: 0.3 bentonite
Cross-coupling cable protectors installed at each coupling and centralizers installed approximately every 36 meters
Piezometers: vibrating-wire pressure transducer attached to outside of casing for monitoring piezometric pressure; cables extend to land surface
213.1 (699)
213.6 (701)
22Nov2011
313.4 (1,028)
316.8 (1,039)
321.8 (1,056)
347.5 (1,140)
349.47 (1,146.55) 22Nov2011
356.1 (1,168)
456.0 (1,496)
466.1 (1,529)
481.2 (1,579)
484.6 (1,590)
4-1/2-inch threaded and coupled blank steel casing
523.8 (1,718)
539.0 (1,768)
605.1 (1,985)
614.5 (2,016)
Neat cement
Mechanical casing liner hanger (TIW Corp)
632.0 (2,074)
651.0 (2,136)
652.6 (2,141)
4-1/2-inch threaded and coupled blank steel casing
6-3/4-inch borehole
797.6 (2,617)
4-1/2-inch threaded and coupled slotted steel casing
958.0 (3,143)
4-1/2-inch blank steel casing (tapered)
990.2 (3,249)
996.7 (3,270)
999.7 (3,280)

Hydrogeologic Units: White Unit; Gray Unit; Brown Unit; Vitrophyre; Basal Tuff; Tuffaceous Sandstone (Tes); Basalt (Tev); Tertiary Early Volcanics and Sediments; Conglomerate (Tw3); Whitetail Conglomerate; Apache Leap Tuff (Tal); Oldest Precambrian; Pinal Schist (pCpi)

Drilling Penetration Rate (minutes per drill rod): 0 400 400 400 400

Water Production Rate During Drilling Operations (liters per second): 0 1 2 3 4
Direct Air Rotary (Tricone)
Reverse Circulation Air-Percussion (Hammer)
Flooded Reverse Circulation (Tricone)
Direct Mud Rotary (Tricone)

Fracture Summary

Borehole Imaging Available: Acoustic Televiewer; Optical Televiewer; Formation Micro-Imager

Caliper (inches): 0 5 10 15 20

Temperature (degrees C): 0 10 20 30 40 50

Fluid Resistivity (ohm-meters): -10 -5 0 5 10

Natural Gamma (API units): 0 50 100 150 200

Spontaneous Potential (millivolts): -600 -400 -200 0

Single Point Resistance (ohms): 0 30 60 90

16-inch and 64-inch Normal Resistivity (ohm-meters): 0 100 200 300 400

RX2 Sonic Velocity: 100 µSec 800

(See SWS, 2011 for logs in this interval)

CADASTRAL: (D-1-13)28ccc	ADWR NO: 55-913073
NORTHING: 3685248.404	EASTING: 498361.259
LAND SURFACE ELEVATION: 1426.65	
DATUM: UTM12N, NAD 27, meters VERTICAL: NGVD 29 METERS	

EXPLANATION

DHRES-14_1213
DHRES-14_1071
DHRES-14_888
DHRES-14_822
Total hydraulic head expressed as depth to water, corresponding to pressure transducer measurements at each discrete elevation

Non-pumping Water Level

No Data
No Fracturing Evident
Minor Fracturing
Moderate Fracturing
Major Fracturing

REGISTERED GEOLOGIST
CERTIFICATE NO.
25063
TODD
KEAY
Date Signed 6-30-12
ARIZONA U.S.A.
Expires 6.30.2012

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DHRES-14
SCHEMATIC DIAGRAM OF WELL CONSTRUCTION

Version: Jan. 18, 2012

FIGURE 2

605\wellschematics2011\DHRES14_ws\18Jan2012

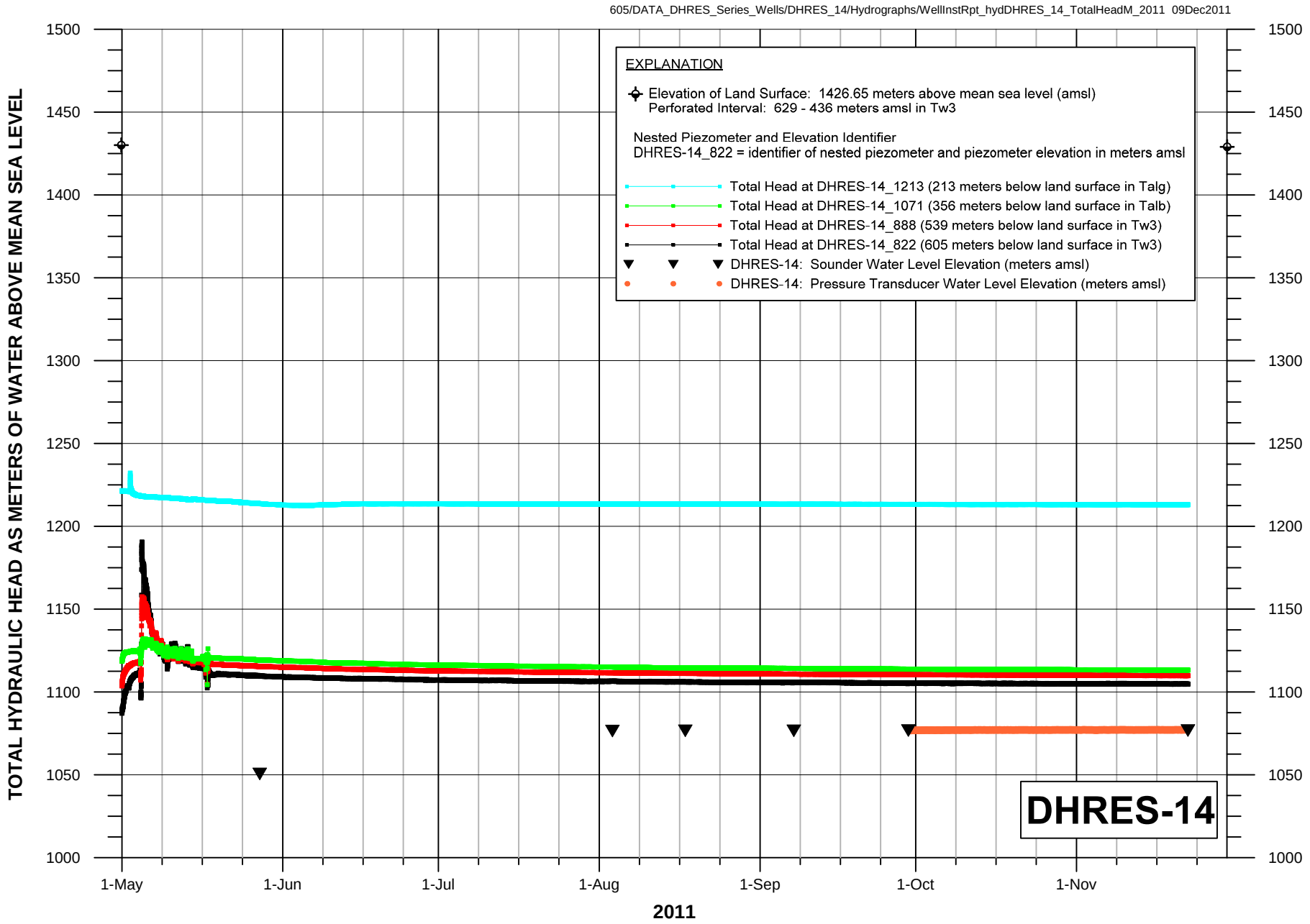

FIGURE 3. HYDROGRAPH OF TOTAL HYDRAULIC HEAD FOR GROUTED VIBRATING-WIRE PIEZOMETERS AND WATER LEVEL ELEVATION AT DEEP HYDROLOGIC TEST WELL DHRES-14, RESOLUTION PROJECT

MONTGOMERY & ASSOCIATES

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-14
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
0 - 10	0.0 - 3.0	White Unit; weak red [10R5/3] and light gray [10R7/1]; well lithified; crystal-rich, porphyritic tuff with 55% reddish-tan, aphanitic to microcrystalline groundmass, some gray groundmass and 40% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite, euhedral black amphibole; 5% pumice; trace lithic fragments of brown siltstone; reaction to acid: none	weathered, trace iron oxide (hematite and limonite)	DIRECT AIR ROTARY; subangular chips up to 2.4 cm; Munsell 2000; 19" tricone - surface borehole
10 - 20	3.0 - 6.1	White Unit; weak red [10R5/3] and light gray [10R7/1]; well lithified; crystal-rich, porphyritic tuff with 55% reddish-tan, aphanitic to microcrystalline groundmass, some gray groundmass and 40% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite, euhedral black amphibole; 5% pumice; trace lithic fragments of brown siltstone; reaction to acid: none	weathered, some chips coated by brown silt, very trace iron oxide (hematite)	subangular to subrounded chips up to 2.1 cm
20 - 30	6.1 - 9.1	White Unit; weak red [10R5/3] and light gray [10R7/1]; well lithified; crystal-rich, porphyritic tuff with 55% reddish-brown, aphanitic to microcrystalline groundmass, some gray groundmass and 40% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 5% pumice; trace lithic fragments of brown siltstone; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 2.6 cm
30 - 40	9.1 - 12.2	White Unit; weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 55% reddish-brown, aphanitic to microcrystalline groundmass, trace gray groundmass and 40% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 5% pumice; trace lithic fragments of brown siltstone and red siltstone; reaction to acid: none		DUAL-WALL REVERSE CIRCULATION AIR HAMMER; subangular chips up to 0.5 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-14
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
40 - 50	12.2 - 15.2	White Unit; weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% reddish-brown, aphanitic to microcrystalline groundmass, trace gray groundmass and 36% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 4% pumice; trace lithic fragments of brown siltstone and red siltstone; reaction to acid: none		subangular chips up to 0.6 cm
50 - 60	15.2 - 18.3	White Unit; weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% reddish-brown, aphanitic to microcrystalline groundmass, trace gray groundmass and 36% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 4% pumice; trace lithic fragments of brown siltstone and red siltstone; reaction to acid: none		subangular chips up to 0.9 cm
60 - 70	18.3 - 21.3	White Unit; weak red [10R4/3] and yellowish red [5YR5/6]; moderately to well lithified; 95% crystal-rich, porphyritic tuff with 60% reddish-brown, aphanitic to microcrystalline groundmass, trace gray groundmass and 36% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 4% pumice; trace lithic fragments of brown siltstone and red siltstone; reaction to acid: none	5% orange-tan sandy silty clay	subangular chips up to 1.3 cm
70 - 80	21.3 - 24.4	White Unit; weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% reddish-brown, aphanitic to microcrystalline groundmass, very trace gray groundmass and 36% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 4% pumice; very trace lithic fragments of brownish-gray siltstone; reaction to acid: none	very trace orange-tan sandy silty clay	subangular chips up to 0.7 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
80 - 90	24.4 - 27.4	White Unit; weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% reddish-brown, aphanitic to microcrystalline groundmass, very trace gray groundmass and 36% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 4% pumice; very trace lithic fragments of brownish-gray siltstone; reaction to acid: none		subangular chips up to 1.0 cm
90 - 100	27.4 - 30.5	White Unit; pale red [10R6/2] and weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% reddish-brown and pinkish-gray, aphanitic to microcrystalline groundmass, very trace gray groundmass and 35% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 5% pumice; very trace lithic fragments of brownish-gray siltstone; reaction to acid: none	very trace orange-tan sandy silty clay	subangular chips up to 0.8 cm
100 - 110	30.5 - 33.5	White Unit; pale red [10R6/2] and weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass, some reddish-brown groundmass, very trace gray groundmass and 36% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 4% pumice; very trace lithic fragments of brownish-gray siltstone; reaction to acid: none	very trace orange-tan sandy silty clay	subangular chips up to 0.7 cm
110 - 120	33.5 - 36.6	White Unit; pale red [10R6/2] and weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass, some reddish-brown groundmass, very trace gray groundmass and 36% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronze biotite; 4% pumice; very trace lithic fragments of brownish-gray siltstone; reaction to acid: none	very trace orange-tan sandy silty clay	subangular chips up to 1.2 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-14
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
120 - 130	36.6 - 39.6	White Unit; pale red [10R6/2] and weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 55% pinkish-gray, aphanitic to microcrystalline groundmass, trace red groundmass, 40% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 5% pumice, trace lithic fragments of reddish-brown and dark brown siltstone; reaction to acid: none	very trace orange-tan sandy silty clay, trace iron oxide (hematite and limonite)	subangular chips up to 0.7 cm
130 - 140	39.6 - 42.7	White Unit; pale red [10R6/2] and weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass, trace red groundmass, 37% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, very trace lithic fragments of reddish-brown and dark brown siltstone; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular chips up to 1.3 cm
140 - 150	42.7 - 45.7	White Unit; pale red [10R6/2] and weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass, trace red groundmass, 37% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, trace lithic fragments of red and tan-dark brown siltstone; reaction to acid: none		subangular chips up to 0.9 cm
150 - 160	45.7 - 48.8	White Unit; pale red [10R6/2] and weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass, trace red groundmass, 37% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, trace lithic fragments of red and tan-dark brown siltstone; reaction to acid: none		subangular chips up to 0.7 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
160 - 170	48.8 - 51.8	White Unit; pale red [10R6/2] and weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass, trace red groundmass, 37% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, very trace lithic fragments of red and tan-dark brown siltstone; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.4 cm
170 - 180	51.8 - 54.9	White Unit; pale red [10R6/2] and weak red [10R4/3]; well lithified; crystal-rich, porphyritic tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass, trace red groundmass, 37% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, very trace lithic fragments of red and tan-dark brown siltstone; reaction to acid: none		subangular chips up to 2.1 cm
180 - 190	54.9 - 57.9	White Unit; pale red [10R6/2] and dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass, some red groundmass, 37% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, very trace lithic fragments of red and tan-dark brown siltstone; reaction to acid: none		subangular chips up to 0.8 cm
APACHE LEAP TUFF - Gray Unit (Talg)				
190 - 200	57.9 - 61.0	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 62% dark reddish-brown, aphanitic to microcrystalline groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, very trace lithic fragments of tan-yellow siltstone; reaction to acid: none		subangular chips up to 0.8 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-14
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
200 - 210	61.0 - 64.0	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 62% dark reddish-brown, aphanitic to microcrystalline groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, very trace lithic fragments of dark brown and tan-yellow siltstone; reaction to acid: none		subangular chips up to 0.7 cm
210 - 220	64.0 - 67.1	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 62% dark reddish-brown, aphanitic to microcrystalline groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, very trace lithic fragments of dark brown and tan-yellow siltstone; reaction to acid: none to very weak	very trace white calcite vein	subangular chips up to 0.6 cm
220 - 230	67.1 - 70.1	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 62% dark reddish-brown, aphanitic to microcrystalline groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice, very trace lithic fragments of dark brown and tan-yellow siltstone; reaction to acid: none		subangular chips up to 0.7 cm
230 - 240	70.1 - 73.2	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, 31% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 4% pumice, very trace lithic fragments of dark brown and tan-yellow siltstone; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 0.6 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-14
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
240 - 250	73.2 - 76.2	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, 37% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 3% pumice; reaction to acid: none		subangular chips up to 1.0 cm
250 - 260	76.2 - 79.2	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, 37% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 3% pumice; very trace magnetite; reaction to acid: none		subangular chips up to 0.6 cm
260 - 270	79.2 - 82.3	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, 37% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 3% pumice; very trace lithic fragments of gray quartzite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.1 cm
270 - 280	82.3 - 85.3	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace orange groundmass, 37% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 3% pumice; very trace magnetite; reaction to acid: none		subangular chips up to 0.7 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
280 - 290	85.3 - 88.4	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace orange groundmass, 37% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 3% pumice; very trace magnetite; reaction to acid: none		subangular chips up to 1.4 cm
290 - 300	88.4 - 91.4	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace gray groundmass, 37% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 3% pumice; very trace magnetite; reaction to acid: none		subangular chips up to 1.1 cm
300 - 310	91.4 - 94.5	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 4% pumice; very trace magnetite; reaction to acid: none		subangular chips up to 1.5 cm
310 - 320	94.5 - 97.5	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 4% pumice; very trace lithic fragments of dark gray quartzite; very trace magnetite; reaction to acid: none		subangular chips up to 1.2 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
320 - 330	97.5 - 100.6	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 4% pumice; very trace lithic fragments of dark gray quartzite; very trace magnetite; reaction to acid: none		subangular chips up to 0.8 cm
330 - 340	100.6 - 103.6	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 4% pumice; very trace lithic fragments of dark gray quartzite and tan siltstone; very trace magnetite; reaction to acid: none		subangular chips up to 1.3 cm
340 - 350	103.6 - 106.7	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 4% pumice; very trace lithic fragments of tan siltstone; very trace magnetite; reaction to acid: none		subangular chips up to 1.7 cm
350 - 360	106.7 - 109.7	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, trace euhedral, bronzy-black biotite; trace gray groundmass; 4% pumice; very trace lithic fragments of tan siltstone and dark gray quartzite; very trace magnetite; reaction to acid: none		subangular chips up to 2.1 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
360 - 370	109.7 - 112.8	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% pumice; very trace lithic fragments of tan-orange siltstone and dark gray quartzite; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.0 cm
370 - 380	112.8 - 115.8	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% pumice; very trace lithic fragments of tan-orange siltstone and dark gray quartzite; very trace tan-brown chert; very trace magnetite; reaction to acid: none		subangular chips up to 0.9 cm
380 - 390	115.8 - 118.9	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% pumice; very trace lithic fragments of tan-orange siltstone and dark gray quartzite; trace tan-brown chert; very trace magnetite; reaction to acid: none	very trace tan clay	subangular chips up to 3.8 cm
390 - 400	118.9 - 121.9	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% pumice; very trace lithic fragments of dark gray quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (limonite)	subangular chips up to 2.5 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
400 - 410	121.9 - 125.0	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% pumice; very trace lithic fragments of dark gray quartzite; trace magnetite; reaction to acid: none		subangular chips up to 1.9 cm
410 - 420	125.0 - 128.0	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% pumice; trace magnetite; reaction to acid: none	very trace iron oxide (limonite)	subangular chips up to 2.2 cm
420 - 430	128.0 - 131.1	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% pumice; very trace lithic fragments of dark gray quartzite; trace magnetite; reaction to acid: none		subangular chips up to 1.7 cm
430 - 440	131.1 - 134.1	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% pumice; very trace lithic fragments of dark gray quartzite; trace magnetite; reaction to acid: none		subangular chips up to 1.5 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
440 - 450	134.1 - 137.2	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice; trace lithic fragments of dark gray quartzite; trace magnetite; reaction to acid: none		subangular chips up to 1.3 cm
450 - 460	137.2 - 140.2	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice; trace lithic fragments of dark gray quartzite and reddish-brown siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.9 cm
460 - 470	140.2 - 143.3	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice; trace lithic fragments of tan siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.1 cm
470 - 480	143.3 - 146.3	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, very trace orange groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% pumice; trace lithic fragments of subrounded tan siltstone; trace magnetite; reaction to acid: none		subangular chips up to 0.8 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
480 - 490	146.3 - 149.4	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 32% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% flattened gray pumice; trace lithic fragments of tan siltstone; trace magnetite; reaction to acid: none	trace white gypsum	subangular chips up to 1.3 cm
490 - 500	149.4 - 152.4	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 32% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% flattened gray pumice; very trace lithic fragments of tan siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite), very trace white gypsum	subangular chips up to 3.3 cm
500 - 510	152.4 - 155.4	Gray Unit; dusky red [10R3/4]; well lithified; 99% crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 32% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% flattened gray pumice; trace lithic fragments of tan siltstone; trace magnetite; reaction to acid: none	1% white gypsum	subangular chips up to 6.0 cm; most chips ~ 2.1 cm
510 - 520	155.4 - 158.5	Gray Unit; dusky red [10R3/4]; well lithified; 99% crystal-rich, porphyritic tuff with 64% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 32% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% flattened gray pumice; 1% lithic fragments of tan siltstone; trace magnetite; reaction to acid: none	1% white gypsum	subangular chips up to 3.2 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
520 - 530	158.5 - 161.5	Gray Unit; dusky red [10R3/4]; well lithified; 99% crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 32% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% flattened gray pumice; trace lithic fragments of tan siltstone; trace magnetite; reaction to acid: none	1% white gypsum	subangular chips up to 1.6 cm
530 - 540	161.5 - 164.6	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 32% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% flattened gray pumice; trace lithic fragments of tan siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.4 cm
540 - 550	164.6 - 167.6	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 33% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% flattened gray pumice; trace lithic fragments of tan siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.7 cm
550 - 560	167.6 - 170.7	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 33% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% flattened gray pumice; very trace magnetite; reaction to acid: none		subangular chips up to 2.2 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
560 - 570	170.7 - 173.7	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 33% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% flattened gray pumice; very trace magnetite; reaction to acid: none		subangular chips up to 2.1 cm
570 - 580	173.7 - 176.8	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 65% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 33% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% flattened gray pumice; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.6 cm
580 - 590	176.8 - 179.8	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 62% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% flattened gray pumice; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.4 cm
590 - 600	179.8 - 182.9	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 62% dark reddish-brown, aphanitic to microcrystalline groundmass, very trace whitish-gray groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% flattened gray pumice; very trace lithic fragments of dark grayish-brown siltstone; very trace magnetite; reaction to acid: none		subangular chips up to 1.2 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
600 - 610	182.9 - 185.9	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 63% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.7 cm
610 - 620	185.9 - 189.0	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 63% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.4 cm
620 - 630	189.0 - 192.0	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 63% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; very trace lithic fragments of tan-orange siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.5 cm
630 - 640	192.0 - 195.1	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 63% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; very trace lithic fragments of tan-orange siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.4 cm
640 - 650	195.1 - 198.1	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 63% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; trace lithic fragments of tan-orange siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite), very trace yellowish-white gypsum	subangular chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
650 - 660	198.1 - 201.2	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 63% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 35% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; very trace lithic fragments of tan-orange siltstone; trace magnetite; reaction to acid: none		subangular chips up to 2.1 cm
660 - 670	201.2 - 204.2	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 4% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.9 cm
670 - 680	204.2 - 207.3	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 4% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.5 cm
680 - 690	207.3 - 210.3	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 4% gray flattened pumice; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 2.0 cm
690 - 700	210.3 - 213.4	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 4% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.8 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
700 - 710	213.4 - 216.4	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 4% gray flattened pumice; very trace lithic fragments of brownish-tan siltstone; trace magnetite; reaction to acid: none		subangular chips up to 2.2 cm
710 - 720	216.4 - 219.5	Gray Unit; dusky red [10R3/4]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 36% up to 1-2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 4% gray flattened pumice; very trace lithic fragments of brownish-tan siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 3.1 cm
720 - 730	219.5 - 222.5	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% gray flattened pumice; very trace lithics fragments of brownish-tan siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.4 cm
730 - 740	222.5 - 225.6	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.5 cm
740 - 750	225.6 - 228.6	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.6 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
750 - 760	228.6 - 231.6	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.5 cm
760 - 770	231.6 - 234.7	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, some whitish-gray groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.8 cm
770 - 780	234.7 - 237.7	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, some whitish-gray groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; trace magnetite; reaction to acid: none		subangular chips up to 1.7 cm
780 - 790	237.7 - 240.8	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, some whitish-gray groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; very trace lithic fragments of brownish-tan siltstone; trace magnetite; reaction to acid: none		subangular chips up to 2.0 cm
790 - 800	240.8 - 243.8	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; very trace lithic fragments of brownish-tan siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.4 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
800 - 810	243.8 - 246.9	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; very trace lithic fragments of brownish-tan siltstone and dark gray quartzite; trace magnetite; reaction to acid: none		subangular chips up to 3.7 cm
810 - 820	246.9 - 249.9	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, very trace pink groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% gray flattened pumice; very trace lithic fragments of brownish-tan siltstone and dark gray quartzite; trace magnetite; reaction to acid: none		subangular chips up to 1.1 cm
820 - 830	249.9 - 253.0	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, very trace pink groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% gray flattened pumice; trace lithic fragments of brownish-tan siltstone and dark gray quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.3 cm
830 - 840	253.0 - 256.0	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 60% dark reddish-brown, aphanitic to microcrystalline groundmass, trace whitish-gray groundmass, 37% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% gray flattened pumice; trace lithic fragments of brownish-tan siltstone and dark gray quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.3 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
840 - 850	256.0 - 259.1	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 62% dark reddish-brown, aphanitic to microcrystalline groundmass, some whitish-gray groundmass, 35% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% gray flattened pumice; trace lithic fragments of brownish-red siltstone and dark gray quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (hematite), very trace white calcite on fracture surfaces	subangular chips up to 2.7 cm
850 - 860	259.1 - 262.1	Gray Unit; dusky red [10R3/3]; well lithified; crystal-rich, porphyritic tuff with 62% dark reddish-brown, aphanitic to microcrystalline groundmass, some whitish-gray groundmass, 35% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 3% gray flattened pumice; trace lithic fragments of brownish-red siltstone and dark gray quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (hematite), very trace white calcite on fracture surfaces	subangular chips up to 1.6 cm
860 - 870	262.1 - 265.2	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 2% light gray flattened pumice; reaction to acid: none to very weak	very trace iron oxide (hematite), very trace white calcite on fracture surfaces	subangular chips up to 1.8 cm
870 - 880	265.2 - 268.2	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 36% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 4% light gray flattened pumice; reaction to acid: very weak	very trace iron oxide (hematite), trace white calcite on fracture surfaces	subangular chips up to 2.4 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-14
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
880 - 890	268.2 - 271.3	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 2% light gray flattened pumice; reaction to acid: none to very weak	very trace iron oxide (hematite), very trace white calcite on fracture surfaces	subangular chips up to 1.6 cm; mostly larger chips
890 - 900	271.3 - 274.3	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 38% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 2% light gray flattened pumice; reaction to acid: none to very weak	very trace iron oxide (hematite), very trace white calcite on fracture surfaces	subangular chips to 1.5 cm
900 - 910	274.3 - 277.4	Gray Unit; weak red [2.5YR4/2]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 36% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 4% light gray flattened pumice; reaction to acid: very weak	very trace nontronite, very trace calcite	subrounded to subangular chips up to 2.1 cm
910 - 920	277.4 - 280.4	Gray Unit; weak red [2.5YR4/2]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 36% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 4% light gray flattened pumice; reaction to acid: very weak	very trace nontronite, very trace calcite	subrounded to subangular chips up to 1.7 cm
920 - 930	280.4 - 283.5	Gray Unit; reddish brown [5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 55% orange-brown, cryptocrystalline groundmass, 44% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 1% light gray flattened pumice; reaction to acid: none to very weak	very trace iron oxide	subrounded to 1.5 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
930 - 940	283.5 - 286.5	Gray Unit; reddish brown [5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 55% orange-brown, cryptocrystalline groundmass, 44% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 1% light gray flattened pumice; reaction to acid: none to very weak	trace gypsum, very trace iron oxide (limonite)	subangular to 2.1 cm
940 - 950	286.5 - 289.6	Gray Unit; reddish brown [5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 55% orange-brown, cryptocrystalline groundmass, 44% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 1% light gray flattened pumice; reaction to acid: very weak	very trace gypsum	subangular to 1.3 cm
950 - 960	289.6 - 292.6	Gray Unit; reddish brown [5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 39% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace lithic fragments; 1% light gray flattened pumice; reaction to acid: none to very weak	very trace gypsum	subangular to 1.9 cm
960 - 970	292.6 - 295.7	Gray Unit; weak red [2.5YR4/2]; well lithified; crystal-rich, porphyritic tuff with 55% orange-brown, cryptocrystalline groundmass, 44% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 1% light gray flattened pumice; very trace magnetite; reaction to acid: none	very trace iron oxide, trace gypsum	subangular to 1.6 cm
970 - 980	295.7 - 298.7	Gray Unit; weak red [2.5YR4/2]; well lithified; crystal-rich, porphyritic tuff with 55% orange-brown, cryptocrystalline groundmass, 44% up to 1-3 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 1% light gray flattened pumice; trace lithic fragments; very trace magnetite; reaction to acid: none to very weak	very trace iron oxide (limonite), trace gypsum	subangular to 2.1 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-14
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
980 - 990	298.7 - 301.8	Gray Unit; weak red [2.5YR4/2]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 38% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% light gray flattened pumice; very trace lithic fragments; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite), trace gypsum	AIR-ASSISTED FLOODED REVERSE CIRCULATION; subangular to 1.7 cm; trace tool marks on chips; 12-1/4" tricone mud flooded reverse
990 - 1,000	301.8 - 304.8	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 38% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% light gray flattened pumice; trace lithic fragments of dark grayish-purple quartzite; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite), trace gypsum	subangular to 1.5 cm; trace tool marks on chips
1,000 - 1,010	304.8 - 307.8	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 39% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 1% light gray flattened pumice; trace lithic fragments of dark grayish-purple quartzite; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite), very trace quartz vein	subangular to 1.0 cm
1,010 - 1,020	307.8 - 310.9	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 39% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 1% light gray flattened pumice; trace lithic fragments of dark grayish-purple quartzite; very trace magnetite; reaction to acid: none to very weak	very trace iron oxide (hematite and limonite)	subangular to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
1,020 - 1,030	310.9 - 313.9	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 39% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 1% light gray flattened pumice; trace lithic fragments of dark grayish-purple quartzite; very trace magnetite; reaction to acid: none to very weak	very trace iron oxide (hematite and limonite), very trace gypsum	subangular to 1.3 cm
1,030 - 1,040	313.9 - 317.0	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; 97% crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 38% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% light gray flattened pumice; trace lithic fragments of dark grayish-purple quartzite; very trace magnetite; reaction to acid: none	3% tannish-brown montmorillonite, very trace iron oxide (hematite and limonite)	subangular to 1.2 cm
1,040 - 1,050	317.0 - 320.0	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; 95% crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 38% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; 2% light gray flattened pumice; trace lithic fragments of dark grayish-purple quartzite and dark red siltstone; very trace magnetite; reaction to acid: none	5% tannish-brown montmorillonite, very trace iron oxide (hematite and limonite), very trace gypsum	subangular to 1.0 cm
1,050 - 1,060	320.0 - 323.1	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, 40% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace light gray flattened pumice; trace lithic fragments of black quartzite and dark red siltstone; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite), trace tannish-brown montmorillonite	subangular to 1.4 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
1,060 - 1,070	323.1 - 326.1	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, trace pink groundmass; 40% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace light gray flattened pumice; trace lithic fragments of black quartzite and dark red siltstone; very trace magnetite; reaction to acid: none	very trace tannish-brown montmorillonite	subangular to 1.7 cm
1,070 - 1,080	326.1 - 329.2	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 60% orange-brown, cryptocrystalline groundmass, trace pink groundmass; 39% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, euhedral, bronzy-black biotite; trace light gray flattened pumice; 1% lithic fragments of brownish-tan siltstone; very trace magnetite; reaction to acid: none	very trace tannish-brown montmorillonite, trace gypsum	subangular to 0.8 cm
1,080 - 1,090	329.2 - 332.2	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 65% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 35% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; very trace magnetite; reaction to acid: none to very weak	very trace iron oxide (hematite)	subangular to 0.9 cm; trace LCM in cuttings
1,090 - 1,100	332.2 - 335.3	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 65% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 35% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular to 0.7 cm; trace LCM in cuttings

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
1,100 - 1,110	335.3 - 338.3	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 65% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 35% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none	trace iron oxide (hematite)	subangular to 0.6 cm; trace LCM in cuttings
1,110 - 1,120	338.3 - 341.4	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 65% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 35% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none	trace iron oxide (hematite)	subangular to 0.4 cm; trace LCM in cuttings
1,120 - 1,130	341.4 - 344.4	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 65% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 35% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular to 0.6 cm; trace LCM in cuttings
1,130 - 1,140	344.4 - 347.5	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite), very trace tannish-brown montmorillonite	subangular to 0.8 cm; trace LCM in cuttings

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,140 - 1,150	347.5 - 350.5	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite), very trace tannish-brown montmorillonite, very trace gypsum	subangular to 1.2 cm; trace LCM in cuttings
1,150 - 1,160	350.5 - 353.6	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; 99% crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none	1% trace tannish-brown montmorillonite, very trace iron oxide (hematite and limonite)	subangular to 1.3 cm; some chips up to 4.0 cm; trace LCM in cuttings
1,160 - 1,170	353.6 - 356.6	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 65% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 35% up to 2 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none	very trace tannish-brown montmorillonite	subangular to 0.9 cm
1,170 - 1,180	356.6 - 359.7	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 65% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 35% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,180 - 1,185	359.7 - 361.2	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 65% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 35% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular to 1.5 cm
1,190 - 1,200	362.7 - 365.8	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 65% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 35% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; very trace lithic fragments of reddish-tan siltstone and black quartzite; very trace magnetite; reaction to acid: none to very weak	very trace iron oxide (hematite), very trace calcite	subangular to 1.3 cm
1,200 - 1,210	365.8 - 368.8	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 29% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; 1% lithic fragments of reddish-tan siltstone; very trace magnetite; reaction to acid: none to very weak	very trace iron oxide (hematite and limonite), very trace calcite	subangular to 1.1 cm
1,210 - 1,220	368.8 - 371.9	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; very trace magnetite; reaction to acid: none to very weak	trace iron oxide (hematite and limonite), very trace calcite	subangular to 0.8 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,220 - 1,230	371.9 - 374.9	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; very trace magnetite; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular to 0.9 cm
1,230 - 1,240	374.9 - 378.0	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace brownish-tan groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; very trace magnetite; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular to 1.0 cm
1,240 - 1,250	378.0 - 381.0	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace brownish-tan groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; very trace magnetite; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular to 1.3 cm
1,250 - 1,260	381.0 - 384.0	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace brownish-tan groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; very trace magnetite; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular to 0.8 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,260 - 1,270	384.0 - 387.1	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace brownish-tan groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace magnetite; reaction to acid: none to very weak	trace iron oxide (hematite and limonite), trace calcite vein	subangular to 0.8 cm
1,270 - 1,280	387.1 - 390.1	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace brownish-tan groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace magnetite; reaction to acid: none		subangular to 1.1 cm
1,280 - 1,290	390.1 - 393.2	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; trace magnetite; reaction to acid: none to very weak	very trace calcite vein	subangular to 1.2 cm
1,290 - 1,300	393.2 - 396.2	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; trace magnetite; reaction to acid: none to very weak	very trace calcite vein	subangular to 0.9 cm
1,300 - 1,310	396.2 - 399.3	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace lithic fragments of dark grayish-brown quartzite; trace magnetite; reaction to acid: none to very weak	very trace iron oxide (hematite), very trace calcite vein	subangular to 0.7 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,310 - 1,320	399.3 - 402.3	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; trace light gray flattened pumice; very trace lithic fragments of dark grayish-brown quartzite; trace magnetite; reaction to acid: none to very weak	very trace iron oxide (hematite), very trace calcite vein	subangular to 0.9 cm
1,320 - 1,330	402.3 - 405.4	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; trace magnetite; reaction to acid: none to very weak	very trace iron oxide (hematite), very trace calcite vein	subangular to 0.9 cm; very trace LCM in cuttings
1,330 - 1,340	405.4 - 408.4	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular to 1.0 cm
1,340 - 1,350	408.4 - 411.5	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; trace magnetite; reaction to acid: none to very weak	very trace iron oxide (hematite), very trace calcite	subangular to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,350 - 1,360	411.5 - 414.5	Brown Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass, trace pink groundmass; 30% up to 1 mm sized phenocrysts of anhedral, milky, white feldspar, translucent quartz, bronzy-black biotite; very trace light gray flattened pumice; trace lithic fragments of reddish-tan siltstone; trace magnetite; reaction to acid: none to very weak	very trace calcite	subangular chips up to 1.3 cm
1,360 - 1,370	414.5 - 417.6	Brown Unit; reddish brown [2.5YR4/3]; well lithified; porphyritic tuff with 70% reddish-brown, glassy to cryptocrystalline groundmass and 30% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; trace pumice; trace lithic fragments of red siltstone and gray quartzite; reaction to acid: none	trace gray quartzite has iron oxide (hematite) staining, very trace iron oxide (hematite) on biotite	subangular to angular chips up to 3.4 cm
1,370 - 1,380	417.6 - 420.6	Brown Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 68% orangish-brown, glassy to cryptocrystalline groundmass and 30% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 2% lithic fragments of red siltstone and gray and brown quartzite; very trace pumice; reaction to acid: none	very trace iron oxide (hematite and limonite), very trace talc	subangular to angular chips up to 1.4 cm
1,380 - 1,390	420.6 - 423.7	Brown Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 65% orangish-brown, glassy to cryptocrystalline groundmass and 33% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 2% lithic fragments of red siltstone and gray and brown quartzite; very trace pumice; very trace magnetite; reaction to acid: none	minor iron oxide staining (hematite)	subangular to angular chips up to 1.4 cm
1,390 - 1,400	423.7 - 426.7	Brown Unit; reddish brown [2.5YR5/4]; well lithified; porphyritic tuff with 64% orangish-brown, glassy to cryptocrystalline groundmass and 32% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 3% lithic fragments of red siltstone and gray and brown quartzite; 1% pumice; reaction to acid: none	minor iron oxide staining (hematite and very trace limonite)	subangular to angular chips up to 1.8 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,400 - 1,410	426.7 - 429.8	Brown Unit; brown [7.5YR5/4]; well lithified; porphyritic tuff with 65% grayish-brown, glassy to cryptocrystalline groundmass and 33% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 2% lithic fragments of red siltstone and gray and brown quartzite; trace pumice; very trace magnetite; reaction to acid: none	trace iron oxide (hematite and very trace limonite), very trace flat fracture surfaces with manganese oxide	subangular to angular chips up to 1.8 cm; very trace paint chips; very trace LCM; add more weight on bit (+3600 lbs)
1,410 - 1,420	429.8 - 432.8	Brown Unit; brown [7.5YR4/4]; well lithified; porphyritic tuff with 64% grayish-brown, glassy to cryptocrystalline groundmass and 33% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 3% lithic fragments of red siltstone and gray and brown quartzite; trace pumice; very trace magnetite; reaction to acid: none	minor iron oxide staining (hematite and trace limonite), very trace white soapstone	subangular to angular chips up to 2.1 cm; very trace LCM; very trace tool marks
1,420 - 1,430	432.8 - 435.9	Brown Unit; brown [7.5YR4/4]; well lithified; porphyritic tuff with 63% grayish-brown, glassy to cryptocrystalline groundmass and 33% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 4% lithic fragments of red siltstone and gray and brown quartzite; trace pumice; very trace magnetite; reaction to acid: none	trace iron oxide staining (hematite)	subangular to angular chips up to 1.3 cm
1,430 - 1,440	435.9 - 438.9	Brown Unit; brown [7.5YR4/4]; well lithified; porphyritic tuff with 63% grayish-brown, glassy to cryptocrystalline groundmass and 33% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 4% lithic fragments of red siltstone and gray, yellow and brown quartzite; very trace pumice; very trace magnetite; reaction to acid: none	trace iron oxide staining (hematite and limonite), very trace on fracture surfaces	angular chips up to 1.1 cm
1,440 - 1,450	438.9 - 442.0	Brown Unit; brown [7.5YR4/4]; well lithified; porphyritic tuff with 60% light brown, glassy to cryptocrystalline groundmass and 36% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 5% lithic fragments of red siltstone and gray, maroon and brown quartzite; trace pumice; very trace magnetite; reaction to acid: none	minor iron oxide staining (hematite and very trace limonite)	angular chips up to 1.9 cm; very trace tool marks

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,450 - 1,460	442.0 - 445.0	Brown Unit; brown [7.5YR4/4]; well lithified; porphyritic tuff with 61% light brown, glassy to cryptocrystalline groundmass and 36% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 4% lithic fragments of red siltstone and gray, maroon and brown quartzite; trace pumice and fiamme fragments; very trace magnetite; reaction to acid: none	minor iron oxide staining (hematite and very trace limonite)	subangular to angular chips up to 1.8 cm
1,460 - 1,470	445.0 - 448.1	Brown Unit; brown [7.5YR4/4]; well lithified; porphyritic tuff with 58% light brown, glassy to cryptocrystalline groundmass and 36% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 7% lithic fragments of red siltstone, chert, gray, maroon and brown quartzite; very trace pumice; very trace magnetite; reaction to acid: none	minor iron oxide staining (hematite and trace limonite)	angular chips up to 1.5 cm; very trace tool marks
1,470 - 1,480	448.1 - 451.1	Brown Unit; brown [7.5YR4/3]; well lithified; porphyritic tuff with 58% light brown, glassy to cryptocrystalline groundmass and 36% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 7% lithic fragments of red siltstone, chert, gray, maroon and brown quartzite; very trace pumice; very trace magnetite; reaction to acid: none	minor iron oxide staining (hematite and trace limonite)	angular chips up to 2.1 cm
1,480 - 1,490	451.1 - 454.2	Brown Unit; brown [7.5YR4/3]; well lithified; porphyritic tuff with 59% light brown, glassy to cryptocrystalline groundmass and 36% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite; 6% lithic fragments of red siltstone, chert, gray, maroon and brown quartzite; very trace pumice and fiamme fragments; very trace magnetite; reaction to acid: none	minor iron oxide staining (hematite and very trace limonite)	angular chips up to o 1.7 cm; trace tool marks
1,490 - 1,500	454.2 - 457.2	Brown Unit and Vitrophyre; brown [7.5YR4/3] and very dark gray [N3]; well lithified; 60% porphyritic tuff with 60% light brown, glassy to cryptocrystalline groundmass and 35% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral black biotite, 5% lithic fragments of red siltstone, chert, gray, maroon and brown quartzite; 40% black porphyritic vitrophyre; very trace pumice; reaction to acid: none	trace iron oxide staining (hematite) on brown tuff	angular chips up to 2.0 cm; vitrophyre at 1496 ft

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-14
Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Vitrophyre (Talv)				
1,500 - 1,510	457.2 - 460.2	Vitrophyre; very dark gray [N3]; well lithified; black porphyritic vitrophyre with quartz and feldspar; very trace lithic fragments; reaction to acid: none		angular chips up to 1.6 cm; washed sample is black [N2.5]; 2% contamination of brown tuff
1,510 - 1,520	460.2 - 463.3	Vitrophyre; very dark gray [N3]; well lithified; black porphyritic vitrophyre with quartz and feldspar; very trace magnetite; reaction to acid: none		angular chips up to 1.7 cm; 5% contamination of brown tuff
1,520 - 1,530	463.3 - 466.3	Vitrophyre; very dark gray [N3]; well lithified; black porphyritic vitrophyre with quartz and feldspar; very trace magnetite; very trace basal tuff; reaction to acid: none		angular chips up to 1.5 cm; 2% contamination of brown tuff
APACHE LEAP TUFF - Basal Tuff (Talbt)				
1,530 - 1,540	466.3 - 469.4	Basal Tuff; brown [7.5YR4/3]; well lithified; 93% porphyritic tuff with 79% greenish-gray, aphanitic groundmass; 6% pink groundmass; 15% phenocrysts of feldspar, quartz, and biotite; trace dark brown glassy tuff; trace vitrophyre; reaction to acid: none	7% fines of grayish-brown clayey silt, trace pinkish-white clayey silt	angular chips up to 1.6 cm
1,540 - 1,550	469.4 - 472.4	Basal Tuff; pinkish gray [7.5YR6/2] and gray [5YR5/1]; well lithified; 30% porphyritic tuff with 70% greenish-gray aphantic groundmass; 30% phenocrysts of feldspar, quartz, and biotite; very trace vitrophyre; trace orange tuff; reaction to acid: none	70% fines of light brown and plastic silty clay	subangular to angular chips up to 1.9 cm; 21% contamination of dark brown glassy tuff
1,550 - 1,560	472.4 - 475.5	Basal Tuff; greenish gray [10Y5/1]; well lithified; porphyritic tuff with 70% white, aphanitic groundmass and 30% phenocrysts of feldspar, quartz, biotite; trace lithic fragments; trace black glassy vitrophyre; very trace black basalt; reaction to acid: none		angular to subangular chips up to 1.2 cm; 28% fines
1,560 - 1,570	475.5 - 478.5	Basal Tuff; pinkish gray [7.5YR6/2]; well lithified; 99% porphyritic tuff with 70% very light gray, aphanitic groundmass and 30% phenocrysts of feldspar, quartz, black biotite; 1% black vitrophyre with magnetite; trace lithic fragments; trace glassy tuff fragments; reaction to acid: none		subangular chips up to 0.7 cm; 30% fines

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
TERTIARY EARLY SEDIMENTS (Tes)				
1,570 - 1,580	478.5 - 481.6	Gravelly tuffaceous sandstone; pinkish gray [7.5YR6/2]; well lithified; 57% pinkish-tan, very fine-grained quartzite; 40% dark grayish-brown, well-lithified, tuffaceous sandstone; 3% very light gray, porphyritic tuff; very trace black vitrophyre; very trace dark gray silty quartzite; overall sample is 60% sand, 31% fines, 9% gravel; reaction to acid: none	minor iron oxide staining (hematite) on quartzite and tuffaceous sandstone	angular to subangular chips up to 1.2 cm; trace LCM
1,580 - 1,590	481.6 - 484.6	Gravelly tuffaceous sandstone; weak red [10R4/3]; well lithified; 44% pink to pinkish-white and brown quartzite; 40% light to dark brown tuffaceous sandstone; 7% weathered red quartzite; 5% black basalt; 4% dark brown, weathered basalt; reaction to acid: moderate to strong	trace vein calcite, trace pinkish-gray clayey silt	subangular to angular chips up to 2.1 cm
TERTIARY EARLY VOLCANICS (Tev)				
1,590 - 1,600	484.6 - 487.7	Basalt; very dark greenish gray [10Y3/1] and reddish brown [5YR5/3]; well lithified; 92% black basalt with minor vesicles; 7% weathered dark brown basalt; 1% light to dark brown tuffaceous sandstone; reaction to acid: none to moderate	minor teal green unidentified mineral, very trace green unidentified mineral coating, trace white clayey silt	subangular chips up to 1.1 cm
1,600 - 1,610	487.7 - 490.7	Basalt; very dark gray [N3]; well lithified; black basalt with very trace vesicles; reaction to acid: none to weak	trace vein quartz up to 0.6 cm, trace teal green unidentified mineraltrace gray silt	subangular to angular chips up to 0.7 cm; 1% contamination of brown tuff, white unwelded tuff (Talbt), and brown tuffaceous sandstone (Tes)
1,610 - 1,620	490.7 - 493.8	Basalt; very dark gray [N3]; well lithified; black basalt; reaction to acid: none to moderate	trace vein quartz, trace iron oxide staining (hematite and very trace limonite), very trace teal green unidentified mineral	angular chips up to 1.3 cm
1,620 - 1,630	493.8 - 496.8	Basalt; very dark gray [N3]; well lithified; 90% medium to dark gray and black basalt; 10% dark brown, well-lithified siltstone; reaction to acid: none to weak	very trace vein quartz, very trace iron oxide (hematite), very trace teal green unidentified mineral, trace gray clayey silt	angular chips up to 1.4 cm
1,630 - 1,640	496.8 - 499.9	Basalt; dark gray [N4]; well lithified; 93% light to medium gray basalt with some vesicles; 7% dark brown, well-lithified siltstone; trace black basalt; trace grayish-brown tuffaceous sandstone; reaction to acid: none to very weak	some teal green unidentified mineral, trace gray clayey silt	angular chips up to 1.5 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL DHRES-14
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Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
TERTIARY EARLY VOLCANICS (Tev)				
1,640 - 1,650	499.9 - 502.9	Basalt; very dark gray [N3]; well lithified; 97% medium to dark gray basalt with trace vesicles; very trace dark brown siltstone; reaction to acid: none to very weak	3% gray clayey silt, trace light teal green unidentified mineral, trace orange vein quartz	subangular to angular chips up to 1.5 cm, mostly subangular; very trace LCM; trace contamination of Talbt and Tes
1,650 - 1,660	502.9 - 506.0	Basalt; very dark gray [N3]; well lithified; 96% medium to dark gray basalt (mostly dark gray); 1% grayish-brown, moderately-lithified siltstone; reaction to acid: none	3% gray clayey silt, very trace light teal green unidentified mineral, very trace orange and translucent vein quartz	subangular to angular chips up to 1.3 cm; very trace LCM
1,660 - 1,670	506.0 - 509.0	Basalt; very dark gray [N3]; well lithified; dark gray basalt; trace grayish-brown, moderately-lithified siltstone; reaction to acid: none to strong	very trace orange vein quartz, very trace gray clayey silt	subangular to angular chips up to 1.2 cm
1,670 - 1,680	509.0 - 512.1	Basalt; dark greenish gray [10Y4/1]; well lithified; medium to dark gray basalt; trace grayish-brown moderately-lithified siltstone; trace greenish-gray, moderately-lithified tuffaceous sandstone; reaction to acid: none	very trace translucent vein quartz, very trace teal green unidentified mineral	subangular to angular chips up to 1.3 cm
1,680 - 1,690	512.1 - 515.1	Basalt; very dark gray [N3]; well lithified; dark gray and brownish-gray basalt; very trace red siltstone; reaction to acid: none	trace black clayey siltvery trace teal green unidentified mineral	subangular to angular chips up to 1.2 cm
1,690 - 1,700	515.1 - 518.2	Basalt; black [N2.5]; well lithified; 95% dark gray basalt with minor vesicles; 5% dark brown, well-lithified, very fine-grained sandstone; trace red siltstone; reaction to acid: none to very weak	minor light teal green and white unidentified mineral, trace iron oxide staining (hematite), trace dark gray silt	subangular to angular chips up to 1.4 cm
1,700 - 1,710	518.2 - 521.2	Paleosol and Basalt; dark reddish gray [2.5YR3/1]; well lithified; 50% reddish-brown, well-lithified siltstone; 40% dark gray basalt; 5% dark grayish-brown, weathered basalt; reaction to acid: none to strong	5% dark brown and maroon silt, minor iron oxide staining (hematite and very trace limonite)	subangular chips up to 1.4 cm
1,710 - 1,720	521.2 - 524.3	Basalt; dark reddish gray [10R3/1]; well lithified; 97% light to dark gray basalt; 3% reddish-brown, well-lithified siltstone; reaction to acid: none to very weak	minor iron oxide staining (hematite and trace limonite), very trace brown and maroon silt	subangular to angular chips up to 1.0 cm; trace dark gray silt

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
1,720 - 1,730	524.3 - 527.3	Conglomerate Unit no. 3; weak red [2.5YR4/2] and red [10R4/6]; weakly to moderately lithified; sandy conglomerate; clasts are a mixed lithology of dark gray, brown, black, and pinkish-white, silty to very fine-grained, quartzite and arkosic quartzite, black siltstone, dark gray basalt; overall sample is 5% fines of brown silt, 70% sand, 20% gravel; reaction to acid: very weak to strong	trace iron oxide (hematite and limonite)	angular to subangular chips up to 1.5 cm
1,730 - 1,740	527.3 - 530.4	Conglomerate Unit no. 3; brown [7.5YR4/2]; weakly to moderately lithified; sandy conglomerate; clasts are a mixed lithology of gray, pinkish-gray, and beige quartzite and arkosic quartzite, trace diabase with plagioclase laths, very trace schist; overall sample is 5% fines of brown silt, 70% sand, 20% gravel; reaction to acid: very weak to strong		angular to subangular chips up to 1.2 cm
1,740 - 1,750	530.4 - 533.4	Conglomerate Unit no. 3; dark gray [7.5YR4/1]; weakly to moderately lithified; sandy conglomerate; clasts are a mixed lithology of brown, grayish-brown, and pinkish-red, silty to very fine-grained quartzite, black siltstone, maroon siltstone, black basalt, trace diabase with plagioclase laths, very trace schist; overall sample is 3% fines of gray silt, 72% sand, 20% gravel; reaction to acid: strong	trace iron oxide (hematite and limonite)	subangular chips up to 1.4 cm
1,750 - 1,760	533.4 - 536.4	Conglomerate Unit no. 3; dark gray [7.5YR4/1]; weakly to moderately lithified; sandy conglomerate; clasts are a mixed lithology of brown, grayish-brown, beige, and pinkish-red quartzite, maroon siltstone, trace diabase very trace schist, very trace gray limestone; overall sample is 5% fines of gray silt, 70% sand, 20% gravel; reaction to acid: very strong	minor iron oxide (hematite and trace limonite), trace vein calcite, trace reddish-brown clayey silt	angular to subangular chips up to 1.0 cm
1,760 - 1,770	536.4 - 539.5	Conglomerate Unit no. 3; brown [7.5YR4/2]; weakly to moderately lithified; sandy conglomerate; cut chips are 97% clasts of brown, grayish-brown, pinkish-gray, white, and beige, silty to medium-grained quartzite and arkosic quartzite, trace diabase, trace quartz, trace schist; 3% matrix chips of maroon siltstone; overall sample is 4% fines of brown clayey silt, 75% sand, 21% gravel; reaction to acid: strong	minor iron oxide (hematite and limonite) on clasts	angular to subangular chips up to 1.5 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
1,770 - 1,780	539.5 - 542.5	Conglomerate Unit no. 3; dark gray [7.5YR4/1]; weakly to moderately lithified; sandy conglomerate; cut chips are 97% clasts of 99% brown, grayish-brown, and beige, silty of fine-grained quartzite and arkosic quartzite, 1% diabase with plagioclase laths, very trace gray chert, very trace silvery schist; 3% matrix chips of maroon siltstone; overall sample is 4% fines of brown clayey silt, 75% sand, 21% gravel; reaction to acid: strong	minor iron oxide (hematite) on clasts	angular to subangular chips up to 1.8 cm
1,780 - 1,790	542.5 - 545.6	Conglomerate Unit no. 3; greenish gray [10Y5/1]; weakly to moderately lithified; sandy conglomerate; cut chips are 98% clasts of greenish-gray, brown, and gray, silty to very fine-grained quartzite, trace diabase, trace silvery schist; 2% matrix chips of maroon siltstone, trace grayish-brown siltstone, and trace greenish-gray sandstone very trace quartz; overall sample is 17% fines of very light gray clayey silt, 76% sand, 7% gravel; reaction to acid: none to strong	trace iron oxide staining (hematite) on clasts	angular to subangular chips up to 1.8 cm
1,790 - 1,800	545.6 - 548.6	Conglomerate Unit no. 3; dark greenish gray [10Y4/1]; weakly to moderately lithified; sandy conglomerate; clasts are brownish-gray, gray and white quartzite, trace reddish-brown siltstone, trace diabase with very trace olivine, trace silvery schist, trace translucent and white quartz, very trace orange, very fine-grained quartzite; overall sample is 15% fines of very light gray silt and clayey silt, 78% sand, 7% gravel; reaction to acid: weak to strong	very trace white vein calcite, very trace iron oxide (hematite) on clasts	angular to subangular chips up to 1.0 cm
1,800 - 1,810	548.6 - 551.7	Conglomerate Unit no. 3; gray [5Y5/1]; weakly to moderately lithified; sandy conglomerate; cut chips are 97% clasts of 98% medium to dark gray, brown, and greenish-white quartzite, 1% silvery schist, 1% white to clear vein quartz; trace diabase with plagioclase laths; 1% matrix chips of maroon siltstone; overall sample is 25% fines of greenish-gray silt and clayey silt, 74% sand, 2% gravel; reaction to acid: very weak to moderate	trace iron oxide (hematite) on clasts	angular to subangular chips up to 1.4 cm; overcast

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
1,810 - 1,820	551.7 - 554.7	Conglomerate Unit no. 3; greenish gray [10Y5/1]; weakly to moderately lithified; sandy conglomerate; cut chips are 99% clasts of 99% medium to dark gray, brown and greenish-gray quartzite and arkosic quartzite, 1% silvery schist, trace white to clear vein quartz, trace diabase, trace orange chert; 1% matrix chips of maroon to red siltstone; overall sample is 28% fines of grayish-brown silt and clayey silt, 71% sand, 1% gravel; reaction to acid: none to moderate		angular to subangular chips up to 1.4 cm; overcast; trace contamination of basalt
1,820 - 1,830	554.7 - 557.8	Conglomerate Unit no. 3; dark greenish gray [10Y4/1]; weakly to moderately lithified; sandy conglomerate; clasts are 98% medium to dark gray, brown, and beige quartzite and arkosic quartzite, 1% silvery schist, 1% clear to white vein quartz, very trace diabase, very trace orangish-white chert, trace maroon siltstone; overall sample is 22% fines of very light gray silt, 74% sand, 4% gravel; reaction to acid: none to weak	very trace greenish-white selenite	angular to subangular chips up to 1.3 cm; overcast
1,830 - 1,840	557.8 - 560.8	Conglomerate Unit no. 3; greenish gray [10Y5/1]; weakly to moderately lithified; sandy conglomerate; clasts are 98% of medium to dark gray, brown and tan, silty to very fine-grained quartzite, 1% silvery schist, 1% clear to white vein quartz, trace arkosic quartzite, very trace diabase, trace maroon siltstone; overall sample is 22% fines of very light gray silt and clayey silt, 73% sand, 5% gravel; reaction to acid: none to very weak		subangular to subrounded chips up to 0.9 cm; overcast
1,840 - 1,850	560.8 - 563.9	Conglomerate Unit no. 3; greenish gray [10Y5/1]; weakly to moderately lithified; sandy conglomerate; cut chips are 98% clasts of medium to dark gray, brown and greenish-gray quartzite, trace diabase, trace silvery schist; 2% matrix chips of maroon siltstone; overall sample is 20% fines of gray silt and clayey silt, 73% sand, 7% gravel; reaction to acid: none to moderate	trace iron oxide (hematite and limonite) on clasts	subangular to subrounded chips up to 1.4 cm; overcast

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
1,850 - 1,860	563.9 - 566.9	Conglomerate Unit no. 3; dark gray [7.5YR4/1]; weakly to moderately lithified; sandy conglomerate; clasts are 98% greenish-gray, pinkish-white and brown, silty to fine-grained quartzite and arkosic quartzite, 1% diabase with plagioclase laths, trace silvery schist, 1% white vein quartz, trace maroon siltstone; overall sample is 15% fines of brownish-gray silt, 50% sand, 25% gravel; reaction to acid: very weak to moderate	trace iron oxide (hematite and limonite) on clasts	subrounded to subangular chips up to 2.5 cm
1,860 - 1,870	566.9 - 570.0	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; sandy conglomerate; clasts are 96% brown, greenish-gray, gray and tan, silty to very fine-grained quartzite and arkosic quartzite (mostly quartzite), 2% silvery schist, 2% white and clear vein quartz, trace diabase, trace maroon siltstone; overall sample is 6% fines of brownish-gray silt, 74% sand, 20% gravel; reaction to acid: weak to moderate	trace iron oxide (hematite) on clasts	subangular chips up to 1.6 cm
1,870 - 1,880	570.0 - 573.0	Conglomerate Unit no. 3; grayish brown [10YR5/2] and dark gray [7.5YR4/1]; weakly to moderately lithified; sandy conglomerate; clasts are 98% brown, greenish-gray and gray, silty to very fine-grained quartzite, 1% pinkish-white arkosic quartzite, 1% silvery schist, trace white vein quartz, very trace diabase, trace maroon siltstone; overall sample is 5% fines of brownish-gray silt, 75% sand, 20% gravel; reaction to acid: very weak to strong		angular to subangular chips up to 1.4 cm
1,880 - 1,890	573.0 - 576.1	Conglomerate Unit no. 3; grayish brown [10YR5/2] and dark gray [7.5YR4/1]; weakly to moderately lithified; silty gravelly sand, clasts are 98% brown, greenish-gray and gray quartzite, 1% silvery schist, 1% white vein quartz, very trace diabase, very trace maroon siltstone; overall sample is 9% fines of brownish-gray silt and clayey silt, 76% sand, 13% gravel; reaction to acid: very weak	trace iron oxide (hematite and limonite)	angular to subangular chips up to 2.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
1,890 - 1,900	576.1 - 579.1	Conglomerate Unit no. 3; grayish brown [10YR5/2] and dark gray [7.5YR4/1]; weakly to moderately lithified; sandy conglomerate; clasts are 98% gray, greenish-gray, brown and tan quartzite, 2% white vein quartz, trace silvery schist, trace diabase, trace maroon siltstone; overall sample is 6% fines of brownish-gray silt and clayey silt, 74% sand, 20% gravel; reaction to acid: very weak to moderate		angular to subangular chips up to o 1.3 cm
1,900 - 1,910	579.1 - 582.2	Conglomerate Unit no. 3; dark grayish brown [10YR4/2]; weakly to moderately lithified; sandy conglomerate; clasts are 99% gray, brown and greenish-gray silt to very fine-grained quartzite, 1% silvery schist, trace white vein quartz, very trace diabase, trace maroon siltstone; overall sample is 5% fines of brown clayey silt, 76% sand, 20% gravel; reaction to acid: very weak to moderate	trace iron oxide (hematite and very trace limonite)	angular to subangular chips up to 1.2 cm;
1,910 - 1,920	582.2 - 585.2	Conglomerate Unit no. 3; dark gray [10YR4/1] and dark grayish brown [10R4/2]; weakly to moderately lithified; sandy conglomerate; clasts are 97% medium to dark gray and greenish-gray, silty to very fine-grained quartzite, 3% silvery schist, trace white vein quartz, trace diabase, trace tan fine-grained quartzite, very trace maroon siltstone; overall sample is 6% fines of brownish-gray clayey silt, 75% sand, 21% gravel; reaction to acid: none to very weak	trace iron oxide (hematite) on clasts	angular to subangular chips up to 1.4 cm
1,920 - 1,930	585.2 - 588.3	Conglomerate Unit no. 4; dark gray [7.5YR4/1]; weakly to moderately lithified; sandy conglomerate; cut chips are 99% clasts of 99% brown, gray and greenish-gray quartzite and silvery schist, 1% white vein quartz, trace pinkish-white quartzite; 1% matrix chips of maroon siltstone; overall sample is 22% fines of gray silty clay, 73% sand, 5% gravel; reaction to acid: weak to strong	trace native copper on clasts	angular to subrounded chips up to 1.2 cm

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Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
1,930 - 1,940	588.3 - 591.3	Conglomerate Unit no. 5; brown [7.5YR5/2]; weakly to moderately lithified; sandy conglomerate; cut chips are 99% clasts of 99% gray and brown quartzite and silvery schist, 1% tan-white silty limestone, very trace diabase; 1% matrix chips of maroon and reddish-brown siltstone; overall sample is 24% fines of gray silty clay, 74% sand, 2% gravel; reaction to acid: very strong	trace greenish-white soapstone, very trace vein calcite	angular to subrounded chips up to 1.1 cm
1,940 - 1,950	591.3 - 594.4	Schist breccia; gray [10YR5/1]; weakly to moderately lithified; clast-supported conglomerate; clasts are 80% silvery schist; 20% gray, pink and brown quartzite; trace white vein quartz; trace maroon siltstone; reaction to acid: weak		angular to subangular chips up to 1.8 cm; at 1941 ft harder drilling
1,950 - 1,960	594.4 - 597.4	Schist breccia; grayish brown [10YR5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist; trace white vein quartz; trace fines; reaction to acid: none to very weak	trace iron oxide staining (limonite and very trace hematite), very trace greenish-white gypsum	angular chips up to 2.0 cm
1,960 - 1,970	597.4 - 600.5	Schist breccia; grayish brown [10YR5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 99% gray, silvery schist; very trace tan quartzite; 1% white vein quartz; trace fines; reaction to acid: none to weak	minor iron oxide staining (limonite and trace hematite), very trace epidote	angular chips up to 1.5 cm
1,970 - 1,980	600.5 - 603.5	Schist breccia; dark grayish brown [10YR4/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 99% gray, silvery schist; 1% white vein quartz; trace yellowish-brown silt; trace fines; reaction to acid: none	trace iron oxide staining (hematite and limonite)	angular chips up to 1.4 cm
1,980 - 1,990	603.5 - 606.6	Schist breccia; dark grayish brown [10YR4/2] and dark gray [N4]; weakly to moderately lithified; clast-supported conglomerate; clasts are 99% gray, silvery schist; 1% white vein quartz; trace fines; reaction to acid: weak to moderate	trace iron oxide staining (limonite and very trace hematite), trace white gypsum, very trace native copper	angular chips up to 1.6 cm
1,990 - 2,000	606.6 - 609.6	Schist breccia; dark grayish brown [10YR4/2] and dark gray [N4]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist; very trace white vein quartz; trace fines; reaction to acid: weak to moderate	trace iron oxide staining (hematite and limonite), trace native copper	angular chips up to 1.3 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,000 - 2,010	609.6 - 612.6	Schist breccia; dark grayish brown [10YR4/2] and dark gray [N4]; weakly to moderately lithified; clast-supported conglomerate; clasts are 98% gray, silvery schist; 2% white vein quartz; trace fines; reaction to acid: none to moderate	trace iron oxide (hematite and limonite), trace white gypsum, very trace native copper, <1 mm sized vein calcite in unwashed sample	angular chips up to 1.0 cm
2,010 - 2,020	612.6 - 615.7	Schist breccia; dark gray [N4] and grayish brown [2.5Y5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist; trace white vein quartz; very trace red siltstone; very trace yellowish-brown silt; reaction to acid: none to moderate	very trace iron oxide (hematite and limonite), very trace light greenish-white gypsum	angular chips up to 1.4 cm
2,020 - 2,030	615.7 - 618.7	Schist breccia; dark gray [N4] and grayish brown [2.5Y5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist with very trace dark red garnet; trace white vein quartz; very trace yellowish-brown silt; reaction to acid: none to weak	trace iron oxide staining (limonite and very trace hematite), trace native copper	angular chips up to 1.3 cm
2,030 - 2,040	618.7 - 621.8	Schist breccia; dark gray [N4] and grayish brown [2.5Y5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 99% gray, silvery schist with very trace garnet; 1% white vein quartz; reaction to acid: none to very weak	minor iron oxide staining (limonite and trace hematite), trace native copper, very trace epidote	angular chips up to 1.3 cm
2,040 - 2,050	621.8 - 624.8	Schist breccia; dark gray [N4] and grayish brown [2.5Y5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist; very trace white vein quartz; reaction to acid: none	trace white gypsum, trace iron oxide staining (limonite and very trace hematite)	angular chips up to 1.3 cm
2,050 - 2,060	624.8 - 627.9	Schist breccia; dark gray [N4] and grayish brown [2.5Y5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist; very trace white vein quartz; trace maroon siltstone; trace brown silt; reaction to acid: none to moderate	trace white gypsum, trace iron oxide staining (limonite and very trace hematite), very trace native copper	angular chips up to 1.5 cm
2,060 - 2,070	627.9 - 630.9	Schist breccia; dark gray [N4] and grayish brown [2.5Y5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist; very trace vein quartz; very trace maroon siltstone; reaction to acid: none to moderate	trace white gypsum, trace iron oxide staining (hematite and very trace limonite), very trace native copper	angular chips up to 1.3 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,070 - 2,080	630.9 - 634.0	Schist breccia; dark gray [N4] and grayish brown [2.5Y5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 99% gray, silvery schist; 1% white vein quartz; very trace maroon siltstone; reaction to acid: none to weak	very trace iron oxide staining (limonite), very trace native copper	angular chips up to 1.5 cm
2,080 - 2,090	634.0 - 637.0	Schist breccia; dark gray [N4] and dark grayish brown [2.5Y4/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 99% gray, silvery schist; 1% white vein quartz; trace brown silt; very trace maroon siltstone; reaction to acid: none to very weak	very trace greenish-white gypsum, very trace vein calcite in unwashed sample	angular chips up to 1.1 cm
2,090 - 2,100	637.0 - 640.1	Schist breccia; dark gray [N4] and dark grayish brown [2.5Y4/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist;; very trace white vein quartz, trace maroon siltstone; 1% brown clayey silt; reaction to acid: none to weak	very trace iron oxide staining (hematite and limonite)	angular chips up to 2.0 cm
2,100 - 2,110	640.1 - 643.1	Schist breccia; dark gray [N4] and dark grayish brown [2.5Y4/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 99% gray, silvery schist; trace white vein quartz; very trace maroon siltstone; reaction to acid: none to very weak	very trace iron oxide staining (hematite and limonite), very trace epidote, very trace magnetite	angular chips up to 1.2 cm
2,110 - 2,120	643.1 - 646.2	Schist breccia; dark gray [N4] and dark grayish brown [2.5Y4/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 98% gray, silvery schist; 1% white vein quartz; 1% maroon siltstone and pink quartzite; reaction to acid: none to very weak	trace iron oxide staining (hematite and limonite), very trace magnetite	angular chips up to 1.4 cm
2,120 - 2,130	646.2 - 649.2	Schist breccia; dark gray [N4] and dark grayish brown [2.5Y4/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist; trace white vein quartz; trace maroon siltstone and pink quartzite; reaction to acid: none to weak	trace iron oxide staining (hematite), very trace magnetite	angular chips up to 1.2 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,130 - 2,140	649.2 - 652.3	Schist breccia; dark gray [N4] and dark grayish brown [2.5Y4/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 98% gray, silvery schist; 1% white vein quartz; 1% maroon siltstone and pink quartzite; reaction to acid: none to moderate	trace iron oxide staining (hematite), very trace white vein calcite in unwashed sample, very trace magnetite	angular chips up to 1.0 cm
2,140 - 2,150	652.3 - 655.3	Conglomerate; brown [7.5YR5/3] and dark gray [N4]; weakly to moderately lithified; clast-supported conglomerate; clasts are whitish-gray and dark gray quartzite, gray, silvery schist, very trace diabase, very trace pink quartzite, very trace magnetite, trace red siltstone; overall sample is 23% fines of light brown silt, 70% sand, 7% gravel; reaction to acid: none to weak	very trace iron oxide (limonite)	DIRECT MUD ROTARY; angular to subangular chips up to 0.8 cm; very trace metal shavings; 15% cement chips, 5% reddish-brown tuff; Conventional mud rotary (polymer) with 6-3/4-inch tricone
2,150 - 2,160	655.3 - 658.4	Conglomerate; yellowish brown [10YR5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are whitish-gray, tan and dark gray quartzite and arkosic quartzite, gray, silvery schist, very trace vein quartz, very trace magnetite, maroon siltstone; overall sample is 26% fines of light brown silt, 69% sand, 5% gravel; reaction to acid: none to moderate		angular to subangular chips up to 0.7 cm; very trace metal shavings; very trace tool marks
2,160 - 2,170	658.4 - 661.4	Conglomerate; yellowish brown [10YR5/4] and dark gray [N4]; weakly to moderately lithified; clast-supported conglomerate; clasts are pinkish-white fine-grained arkosic quartzite, gray, silvery schist, gray and tan quartzite, very trace diabase, very trace greenish-gray schist, very trace magnetite, very trace vein quartz, maroon siltstone; overall sample is 6% fines of light brown silt, 90% sand, 4% gravel; reaction to acid: none to weak		subangular to angular chips up to 0.7 cm; sample slightly watered down
2,170 - 2,180	661.4 - 664.5	Schist breccia; light olive brown [2.5Y5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are dark gray, silvery schist, pinkish-white and gray, very fine-grained to fine-grained quartzite and arkosic quartzite, very trace orange chert, trace maroon siltstone; overall sample is 7% fines of light brown silt, 89% sand, 4% gravel; reaction to acid: none to very weak	very trace iron oxide (hematite)	subangular to angular chips up to 0.7 cm; sample watered down; trace contamination of cement

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,180 - 2,190	664.5 - 667.5	Schist breccia; light olive brown [2.5Y5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are dark gray, silvery schist, light to medium gray quartzite, very trace magnetite, trace maroon siltstone; overall sample is 7% fines of light brown silt and very trace clayey silt, 89% sand, 4% gravel; reaction to acid: very weak to weak	very trace iron oxide (limonite)	subangular to angular chips up to 1.3 cm; very trace metal scraps
2,190 - 2,200	667.5 - 670.6	Schist breccia; light olive brown [2.5Y5/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are 93% dark gray, silvery schist, 7% maroon siltstone and pinkish-white and gray quartzite, very trace magnetite; overall sample is 27% fines of light brown silt, 70% sand, 3% gravel; reaction to acid: none to very weak	trace iron oxide staining (hematite)	subangular to angular chips up to 0.8 cm
2,200 - 2,210	670.6 - 673.6	Schist breccia; yellowish brown [10YR5/4]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 97% clasts of 96% dark gray, silvery schist, 2% pinkish-white and gray quartzite, 2% vein quartz; 3% matrix chips of maroon siltstone; overall sample is 27% fines of light brown silt, 70% sand, 3% gravel; reaction to acid: none		subangular to angular chips up to 0.7 cm
2,210 - 2,220	673.6 - 676.7	Schist breccia; light olive brown [2.5Y5/3]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 99% clasts of 95% dark gray, silvery schist, 5% pinkish-white and gray quartzite, trace quartz, very trace orange chert; 1% matrix chips of maroon siltstone; overall sample is 5% fines of light brown silt and very trace reddish-brown clayey silt, 90% sand, 5% gravel; reaction to acid: none to weak	trace iron oxide staining (hematite)	subangular to angular chips up to 0.8 cm; no sample for the last four feet
2,220 - 2,230	676.7 - 679.7	Schist breccia; light olive brown [2.5Y5/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are 99% dark gray, silvery schist, 1% pink, fine-grained arkosic quartzite, trace gray quartzite, very trace diabase, very trace magnetite, trace maroon siltstone; overall sample is 5% fines of light brown silt, 90% sand, 5% gravel; reaction to acid: none to strong	trace iron oxide staining (hematite and limonite), very trace green epidote, very trace white calcite in unwashed sample	angular chips up to 1.2 cm; very trace driller fluid additive

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,230 - 2,240	679.7 - 682.8	Conglomerate; light olive brown [2.5Y5/3] and dark gray [N4]; weakly to moderately lithified; clast-supported conglomerate; clasts are dark gray, silvery schist, gray and brownish-gray quartzite, 2% vein quartz, very trace pink arkosic quartzite, very trace pink quartzite, very trace diabase, very trace magnetite, very trace maroon siltstone, very trace light brown siltstone; overall sample is 2% fines of light brown silt, 93% sand, 5% gravel; reaction to acid: none to strong	trace weathered schist, very trace iron oxide (hematite)	angular chips up to 0.8 cm; very trace tool marks
2,240 - 2,250	682.8 - 685.8	Conglomerate Unit no. 3; grayish brown [10YR5/2] and dark gray [N4]; weakly to moderately lithified; clast-supported conglomerate; clasts are dark gray, silvery schist and gray quartzite, trace white vein quartz, very trace magnetite, very trace brown siltstone, very trace maroon siltstone; overall sample is 2% fines of light brown silt, 93% sand, 5% gravel; reaction to acid: none to weak	very trace weathered schist, very trace iron oxide staining (hematite)	angular chips up to 1.0 cm; minor driller fluid additives; very trace tool marks
2,250 - 2,260	685.8 - 688.8	Conglomerate Unit no. 3; dark gray [7.5YR4/1] and dark gray [N4]; weakly to moderately lithified; clast-supported conglomerate; clasts are 85% dark gray, silvery schist, 15% brownish-gray quartzite, trace white vein quartz, very trace pink quartzite, trace gray sandstone, trace maroon siltstone, very trace light brown siltstone; overall sample is 31% fines of brown silt, 65% sand, 4% gravel; reaction to acid: weak to strong	trace iron oxide (limonite and very trace hematite), very trace weathered schist, very trace garnet on schist	angular chips up to 0.8 cm; very trace tool marks
2,260 - 2,270	688.8 - 691.9	Conglomerate Unit no. 3; grayish brown [10YR5/2] and dark gray [N4]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 99% clasts of dark gray, silvery schist, grayish-brown and gray quartzite, trace white quartzite, trace white vein quartz, very trace magnetite; 1% matrix chips of maroon siltstone; overall sample is 31% fines of brown silt, 65% sand, 4% gravel; reaction to acid: moderate	trace iron oxide (limonite and very trace hematite)	angular chips up to 0.8 cm; very trace tool marks

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,270 - 2,280	691.9 - 694.9	Conglomerate Unit no. 3; dark gray [N4] and grayish brown [10YR5/2]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 98% clasts of 99% dark gray, silvery schist, grayish-brown and gray quartzite, 1% white vein quartz, very trace magnetite, very trace diabase; 2% matrix chips of maroon siltstone; overall sample is 36% fines of brown silt, 60% sand, 4% gravel; reaction to acid: moderate	very trace iron oxide (limonite)	angular chips up to 1.0 cm; very trace tool marks
2,280 - 2,290	694.9 - 698.0	Conglomerate Unit no. 3; dark gray [N4] and grayish brown [10YR5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are medium to dark gray, silvery schist with very trace dark red garnet, trace diabase, trace gray quartzite, trace white vein quartz, very trace pink quartzite, very trace magnetite, very trace maroon siltstone; overall sample is 34% fines of brown silt, 60% sand, 6% gravel; reaction to acid: moderate to strong	minor iron oxide staining (limonite), trace weathered schist	angular chips up to 1.0 cm; very trace tool marks
2,290 - 2,300	698.0 - 701.0	Conglomerate Unit no. 3; light olive brown [2.5Y5/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist and gray to grayish-brown quartzite, very trace magnetite, very trace brown siltstone, very trace maroon siltstone; overall sample is 21% fines of brown silt, 75% sand, 4% gravel; reaction to acid: moderate to strong	trace weathered schist, trace iron oxide (hematite and limonite)	angular chips up to 0.8 cm; washed sample is very dark gray [N3]
2,300 - 2,310	701.0 - 704.1	Conglomerate Unit no. 3; dark gray [N4] and dark greenish gray [10Y4/1]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist and gray to grayish-brown quartzite, very trace magnetite, very trace white vein quartz, very trace diabase, very trace brown siltstone, very trace maroon siltstone; overall sample is 23% fines of brown silt, 73% sand, 4% gravel; reaction to acid: strong	very trace iron oxide (limonite)	angular chips up to 0.8 cm
2,310 - 2,320	704.1 - 707.1	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are dark gray, silvery schist, very trace white vein quartz, trace brown siltstone, very trace maroon siltstone; overall sample is 26% fines of brown silt, 70% sand, 4% gravel; reaction to acid: strong	very trace iron oxide (limonite)	angular chips up to 1.3 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,320 - 2,330	707.1 - 710.2	Conglomerate Unit no. 3; light olive brown [2.5Y5/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are dark gray, silvery schist, very trace white vein quartz, trace brown siltstone, very trace maroon siltstone; overall sample is 40% fines of brown silt, 59% sand, 1% gravel; reaction to acid: very strong		angular chips up to 1.5 cm
2,330 - 2,340	710.2 - 713.2	Conglomerate Unit no. 3; dark grayish brown [2.5Y4/2]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 98% clasts of gray, silvery schist, trace white vein quartz, trace gray quartzite, very trace diabase, very trace magnetite; 2% matrix chips of maroon siltstone; overall sample is 49% fines of light brown silt, 49% sand, 2% gravel; reaction to acid: strong		angular chips up to 0.8 cm; sand is mostly fine
2,340 - 2,350	713.2 - 716.3	Conglomerate Unit no. 3; light olive brown [2.5Y5/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are 85% gray, silvery schist, 15% gray quartzite, trace diabase, very trace pink arkosic quartzite; very trace magnetite, trace maroon siltstone; overall sample is 23% fines of light brown silt, 74% sand, 3% gravel; reaction to acid: very strong	very trace iron oxide (limonite), very trace native copper	angular chips up to 1.3 cm; very trace tool marks
2,350 - 2,360	716.3 - 719.3	Conglomerate Unit no. 3; light olive brown [2.5Y5/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist and gray quartzite, trace diabase, trace white vein quartz, trace pinkish-white quartzite, trace black basalt, very trace magnetite, trace brown, weakly lithified siltstone, very trace maroon siltstone; overall sample is 28% fine of brown silt, 70% sand, 2% gravel; reaction to acid: strong		subangular to angular chips up to 2.4 cm, mostly to 0.8 cm
2,360 - 2,370	719.3 - 722.4	Conglomerate Unit no. 3; light olive brown [2.5Y5/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are 99% gray, silvery schist, 1% diabase, trace white vein quartz, very trace pink quartzite, very trace black basalt, trace maroon siltstone, very trace sandstone; overall sample is 25% fines of brown silt, 70% sand, 5% gravel; reaction to acid: strong	trace iron oxide (hematite and limonite), very trace weathered schist	angular chips up to 1.2 cm; very trace metal scraps

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,370 - 2,380	722.4 - 725.4	Conglomerate Unit no. 3; grayish brown [2.5Y5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are gray, silvery schist, trace diabase, trace white vein quartz, very trace pink quartzite, trace maroon siltstone, very trace sandstone, very trace dark brown, weakly lithified siltstone; overall sample is 23% fines of brown silt, 74% sand, 3% gravel; reaction to acid: strong	trace iron oxide (hematite and limonite)	angular chips up to 0.9 cm; very trace tool marks
2,380 - 2,390	725.4 - 728.5	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 80% clasts of dark gray diabase with trace epidote, gray, silvery schist, gray quartzite, trace white vein quartz, very trace magnetite; 20% matrix chips of brown, calcareous, weak to moderately-lithified siltstone, trace sandstone, trace maroon siltstone; overall sample is 43% fines of brown silt, 55% sand, 2% gravel; reaction to acid: strong to very strong	trace iron oxide staining on diabase (hematite), trace calcite	subangular to angular chips up to 0.9 cm; very trace driller fluid additive
2,390 - 2,400	728.5 - 731.5	Conglomerate Unit no. 3; light olive brown [2.5Y5/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are dark gray diabase with trace epidote, gray, silvery schist, gray quartzite, trace black basalt, trace yellow and white vein quartz, trace magnetite, trace brown, weak to moderately-lithified siltstone, trace sandstone, trace maroon siltstone; overall sample is 39% fines of brown silt, 58% sand, 3% gravel; reaction to acid: strong	very trace iron oxide (hematite), very trace pale green gypsum, very trace calcite	subangular to angular chips up to 1.2 cm
2,400 - 2,410	731.5 - 734.6	Conglomerate Unit no. 3; grayish brown [2.5Y5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 90% gray schist, 7% matrix chips of brown, weak to moderately-lithified siltstone, 3% gray quartzite, trace diabase, very trace black basalt, very trace white vein quartz, very trace magnetite, trace maroon siltstone; overall sample is 41% fines of grayish-brown silt, 50% sand, 9% gravel; sand fraction contains more quartz; reaction to acid: very strong	trace iron oxide staining (hematite and limonite)	subangular to angular chips up to 1.1 cm

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WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,410 - 2,420	734.6 - 737.6	Conglomerate Unit no. 3; dark grayish brown [10YR4/2]; weakly to moderately lithified; silty conglomerate; cut chips are 95% clasts of gray, silvery schist, gray quartzite, trace diabase with epidote, very trace black basalt, very trace white vein quartz; 5% matrix chips of brown, weak to moderately-lithified siltstone, very trace maroon siltstone; overall sample is 52% fines of brown clayey silt, 46% sand, 2% gravel; reaction to acid: very strong	trace iron oxide staining (hematite and limonite), very trace calcite	subangular to angular chips up to 1.4 cm
2,420 - 2,430	737.6 - 740.7	Conglomerate Unit no. 3; brown [10YR5/3] and greenish gray [10Y5/1]; weakly to moderately lithified; silty conglomerate; cut chips are 96% clasts of gray schist, gray quartzite, diabase, very trace white vein quartz, very trace magnetite; 3% matrix chips of brown, weak to moderately-lithified siltstone, 1% brownish-gray sandstone; overall sample is 50% fines of brown clayey silt, 48% sand, 2% gravel; reaction to acid: very strong	trace iron oxide staining (hematite and limonite), very trace calcite	subangular to angular chips up to 1.1 cm
2,430 - 2,440	740.7 - 743.7	Conglomerate Unit no. 3; grayish brown [2.5Y5/2]; weakly to moderately lithified; silty conglomerate; cut chips are 93% clasts of gray schist, gray quartzite, , trace diabase, very trace magnetite, 7% matrix chips of brown, moderately to well lithified siltstone, grayish-brown sandstone; overall sample is 50% fines of brown clayey silt, 48% sand, 2% gravel; reaction to acid: very strong	very trace iron oxide (hematite)	subangular to angular chips up to 1.2 cm
2,440 - 2,450	743.7 - 746.8	Conglomerate Unit no. 3; grayish brown [2.5Y5/2]; weakly to moderately lithified; silty conglomerate; cut chips are 93% clasts of 99% gray sandstone, 1% gray schist, trace diabase, very trace black basalt, very trace magnetite; 7% matrix chips of brown, weak to well lithified siltstone; overall sample is 66% fines of brown clayey silt, 45% sand, 5% gravel; reaction to acid: very strong	very trace calcite	subangular to angular chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,450 - 2,460	746.8 - 749.8	Conglomerate Unit no. 3; brown [7.5YR5/2]; weakly to moderately lithified; silty conglomerate; cut chips are matrix chips of brownish-gray sandstone, dark brown, weak to moderately-lithified siltstone, trace maroon siltstone, very trace white vein quartz; overall sample is 50% fines of brown clayey silt and silt, 45% sand, 5% gravel; reaction to acid: strong to very strong	very trace iron oxide (hematite), trace calcite	subangular to angular chips up to 0.9 cm
2,460 - 2,470	749.8 - 752.9	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; silty conglomerate; cut chips are 99% matrix chips of brownish-gray sandstone, brown and brownish-gray, weak to moderately-lithified siltstone, very trace maroon siltstone; 1% gray schist, gray quartzite, very trace gray limestone; overall sample is 47% fines of brown clayey silt, 49% sand, 4% gravel; reaction to acid: strong	trace iron oxide (limonite and very trace hematite)	subangular to angular chips up to 1.0 cm
2,470 - 2,480	752.9 - 755.9	Conglomerate Unit no. 3; light olive brown [2.5Y5/3]; weakly to moderately lithified; silty conglomerate; cut chips are 97% clasts of 95% gray schist, 5% tan quartzite, very trace magnetite; 2% matrix chips of brown weakly lithified siltstone, 1% brownish-gray sandstone; overall sample is 47% fines of brown clayey silt, 49% sand, 4% gravel; reaction to acid: strong	very trace calcite	subangular to angular chips up to 1.3 cm
2,480 - 2,490	755.9 - 759.0	Conglomerate Unit no. 3; grayish brown [2.5Y5/2]; weakly to moderately lithified; silty conglomerate; cut chips are 99% clasts of gray schist, very trace black basalt, very trace gray limestone; 1% matrix chips of brown, moderately-lithified siltstone, trace brownish-gray sandstone, very trace maroon siltstone; overall sample is 50% fines of brown silt, 47% sand, 3% gravel; reaction to acid: moderate to strong		subangular to angular chips up to 1.3 cm; very trace tool marks
2,490 - 2,500	759.0 - 762.0	Conglomerate Unit no. 3; grayish brown [2.5Y5/2]; weakly to moderately lithified; silty conglomerate; cut chips are 99% clasts of gray schist, trace gray quartzite, very trace white vein quartz; 1% matrix chips of brown, weakly lithified siltstone, trace brownish-gray sandstone; overall sample is 51% fines of brown silt, 48% sand, 1% gravel; reaction to acid: weak to moderate	very trace iron oxide (hematite and limonite), very trace garnet on schist	subangular to angular chips up to 1.4 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,500 - 2,510	762.0 - 765.0	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; silty sandy conglomerate; clasts are gray schist, very trace diabase, very trace white vein quartz, very trace magnetite, trace brown siltstone, trace brownish-gray sandstone; overall sample is 17% fines, 79% sand, 4% gravel; sand fraction contains more quartz; reaction to acid: strong	trace iron oxide (limonite and very trace hematite)	subangular to angular chips up to 0.7 cm; very trace tool marks; very trace metal scraps
2,510 - 2,520	765.0 - 768.1	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 98% clasts of 98% gray schist, 1% tan and gray quartzite, 1% white vein quartz; 2% matrix chips of brown siltstone, trace maroon siltstone; overall sample is 28% fines, 70% sand, 3% gravel; reaction to acid: strong	trace iron oxide (hematite)	subangular to angular chips up to 1.1 cm
2,520 - 2,530	768.1 - 771.1	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; silty sandy conglomerate; clasts are 97% gray, silvery schist, 2% white vein quartz, 1% gray quartzite, trace yellow quartzite, very trace diabase, very trace magnetite, trace brown siltstone; overall sample is 21% fines of brown silt, 75% sand, 4% gravel; reaction to acid: moderate to strong	trace iron oxide staining (limonite), very trace manganese oxide on quartzite, very trace native copper, trace calcite	subangular to angular chips up to 1.2 cm
2,530 - 2,540	771.1 - 774.2	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; silty sandy conglomerate; clasts are 97% gray, silvery schist, 2% yellow and gray quartzite, 1% white vein quartz, very trace diabase, very trace magnetite, trace brown, weak to moderately-lithified siltstone, trace brownish-gray sandstone; overall sample is 16% fines of brown silt, 79% sand, 5% gravel; reaction to acid: moderate to strong	trace iron oxide (limonite), trace weathered schist, very trace native copper	subangular to angular chips up to 0.8 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,540 - 2,550	774.2 - 777.2	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 99% clasts of gray schist, gray and brownish-gray quartzite, trace yellow stained vein quartz, trace brownish-gray sandstone, trace white vein quartz, very trace light gray limestone, very trace diabase, very trace magnetite; 1% matrix chips of medium to dark brown, moderately-lithified siltstone; overall sample is 16% fines of brown silt, 74% sand, 10% gravel; sand fraction contains more quartz; reaction to acid: strong	trace iron oxide (limonite), very trace weathered schist, very trace native copper	subangular to angular chips up to 0.8 cm; trace tool marks
2,550 - 2,560	777.2 - 780.3	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; sandy conglomerate; cut chips are 99% clasts of gray, silvery schist, gray and brownish-gray quartzite, trace white vein quartz, trace milky quartz eye porphyry; 1% matrix chips of medium to dark brown and gray, moderately-lithified siltstone, very trace orange well lithified siltstone, very trace brownish-gray sandstone; overall sample is 12% fines of brown silt, 78% sand, 10% gravel; reaction to acid: weak	trace iron oxide (limonite and very trace hematite), very trace native copper, trace white calcite	subangular to angular chips up to 0.8 cm
2,560 - 2,570	780.3 - 783.3	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; sandy conglomerate; cut chips are 99% clasts of 97% gray, silvery schist, gray and grayish-brown quartzite, 3% white vein quartz, trace milky quartz eye porphyry, very trace magnetite; 1% matrix chips of medium brown, moderately-lithified siltstone, trace grayish-brown sandstone, very trace maroon siltstone; overall sample is 2% fines of brown silt, 80% sand, 18% gravel; sand fraction contains more quartz; reaction to acid: weak	trace iron oxide (limonite), very trace native copper	subangular to angular chips up to 0.8 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,570 - 2,580	783.3 - 786.4	Conglomerate Unit no. 3; brown [10Y5/3]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 99% clasts of 99% gray, silvery schist, gray and grayish-brown quartzite, 1% milky quartz eye porphyry, trace brownish-gray sandstone, trace white vein quartz, very trace black basalt; 1% matrix chips of medium brown, moderately-lithified siltstone; overall sample is 20% fines of brown silt, 75% sand, 5% gravel; reaction to acid: weak	very trace iron oxide (limonite), very trace native copper	subangular to angular chips up to 1.0 cm, mostly angular
2,580 - 2,590	786.4 - 789.4	Conglomerate Unit no. 3; brown [10Y5/3] and dark gray [N4]; weakly to moderately lithified; silty sandy conglomerate; clasts are 99% gray, silvery schist, gray and grayish-brown quartzite, trace milky quartz eye porphyry, trace white vein quartz, very trace black basalt; 1% matrix chips of medium brown, moderately-lithified siltstone, trace brownish-gray sandstone; overall sample is 30% fines of brown silt, 67% sand, 3% gravel; sand fraction contains more quartz; reaction to acid: very weak to weak		subangular to angular chips up to 0.8 cm, mostly angular; very trace tool marks
2,590 - 2,600	789.4 - 792.5	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; silty sandy conglomerate; clasts are 99% gray, silvery schist, gray and brownish-gray quartzite, 1% white vein quartz, trace quartz eye porphyry, trace yellow stained quartz, trace brown, moderately-lithified siltstone, very trace grayish-brown sandstone, very trace maroon siltstone; overall sample is 25% fines of brown silt, 72% sand, 3% gravel; reaction to acid: moderate to strong	trace iron oxide (hematite and limonite), trace native copper, very trace weathered schist	subangular to angular chips up to 0.9 cm, mostly angular; very trace tool marks

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,600 - 2,610	792.5 - 795.5	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 99% clasts of gray, silvery schist, gray and brownish-gray quartzite, trace quartz eye porphyry, very trace diabase, very trace magnetite, very trace white vein quartz; 1% matrix chips of brown and grayish-brown moderately-lithified siltstone, trace grayish-brown sandstone, very trace maroon siltstone; overall sample is 20% fines of brown silt, 77% sand, 3% gravel; sand fraction contains more quartz; reaction to acid: moderate to strong	trace iron oxide (hematite), very trace calcite	subangular to angular chips up to 1.2 cm, mostly angular
2,610 - 2,620	795.5 - 798.6	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; silty sandy conglomerate; clasts are gray, silvery schist, gray and brownish-gray quartzite, trace quartz eye porphyry, very trace white vein quartz, very trace light gray limestone, very trace diabase, very trace magnetite, trace medium brown, moderately-lithified siltstone, tray grayish-brown sandstone, very trace maroon siltstone; overall sample is 20% fines o brown silt, 77% sand, 3% gravel; reaction to acid: moderate	trace iron oxide (hematite and limonite), very trace native copper	subangular to angular chips up to 0.9 cm, mostly angular;
2,620 - 2,630	798.6 - 801.6	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 98% clasts of gray silvery schist, gray and brownish-gray quartzite, trace milky quartz eye porphyry, trace diabase; 2% medium brown, moderately-lithified siltstone, very trace maroon siltstone; overall sample is 19% fines of brown silt, 80% sand, 1% gravel; sand composition consists mostly of quartz; reaction to acid: weak to moderate	trace iron oxide (hematite and limonite), very trace native copper, very trace calcite	subangular to angular chips up to 0.7 cm, mostly angular

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,630 - 2,640	801.6 - 804.7	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; silty sandy conglomerate; clasts are 99% silvery, gray schist, gray quartzite, trace diabase, very trace pink quartzite, very trace white vein quartz; 1% matrix chips of brown, weak to moderately-lithified siltstone, very trace gray siltstone, very trace maroon siltstone; overall sample is 23% fines of brown silt, 76% sand, 1% gravel; reaction to acid: very weak to moderate	trace iron oxide (hematite and limonite), very trace native copper	subangular to angular chips up to 0.7 cm, mostly angular
2,640 - 2,650	804.7 - 807.7	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 98% clasts of gray schist, gray and brownish-gray quartzite, very trace white vein quartz; 2% matrix chips of medium brown, weak to moderately-lithified siltstone, trace grayish-brown sandstone, very trace gray, weak to moderately-lithified siltstone; overall sample is 18% fines of brown silt, 80% sand, 2% gravel; reaction to acid: moderate to strong	trace iron oxide (hematite), very trace native copper	subangular to angular chips up to 1.0 cm, mostly angular
2,650 - 2,660	807.7 - 810.8	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; sandy conglomerate; clasts are gray, silvery schist, gray and brownish-gray quartzite, trace tan quartzite, trace white vein quartz, very trace diabase, trace brown siltstone; overall sample is 11% fines of brown silt, 87% sand, 2% gravel; reaction to acid: weak to strong	very trace iron oxide (hematite)	subangular to angular chips up to 1.3 cm
2,660 - 2,670	810.8 - 813.8	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; sandy conglomerate; clasts are gray, silvery schist, gray quartzite, very trace diabase, very trace pink quartzite, trace brownish-gray sandstone, very trace maroon siltstone; overall sample is 7% fines of brown silt, 92% sand, 1% gravel; reaction to acid: weak to strong	trace iron oxide (hematite), very trace native copper	subangular to angular chips up to 0.8 cm; very trace tool marks

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,670 - 2,680	813.8 - 816.9	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; sandy conglomerate; cut chips are 98% clasts of gray schist, gray quartzite, trace white and yellowish-white vein quartz, 2% matrix chips of brown, weakly lithified siltstone; overall sample is 5% fines of brown silt, 95% sand, <1% gravel; reaction to acid: moderate	trace iron oxide (hematite and limonite), very trace calcite	subangular to angular chips up to 1.0 cm
2,680 - 2,690	816.9 - 819.9	Conglomerate Unit no. 3; brown [10YR5/3]; weakly to moderately lithified; silty sandy conglomerate; clasts are gray, silvery schist, gray quartzite, trace milky quartz eye porphyry, very trace white vein quartz, very trace diabase, very trace gray siltstone, very trace pink quartzite, trace brown siltstone, trace brownish-gray siltstone, very trace maroon siltstone, very trace red siltstone; overall sample is 26% fines of brown silt, 74% sand, <1% gravel; sand fraction contains more quartz; reaction to acid: very weak to weak	very trace iron oxide (limonite), very trace native copper	subangular to angular chips up to 1.0 cm
2,690 - 2,700	819.9 - 823.0	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 97% clasts of gray schist, gray quartzite, trace milky quartz eye porphyry; 3% matrix chips of brown and reddish-brown, moderately-lithified siltstone, very trace maroon siltstone, very trace gray, weakly lithified siltstone; overall sample is 18% fines of brown silt, 82% sand, <1% gravel; reaction to acid: weak to moderate	very trace iron oxide (hematite)	subangular to angular chips up to 0.9 cm
2,700 - 2,710	823.0 - 826.0	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 99% clasts of gray, silvery schist, gray quartzite, trace milky quartz eye porphyry, very trace black basalt, very trace diabase; 1% matrix chips of brown siltstone, very trace maroon siltstone; overall sample is 18% fines of brown silt, 82% sand, <1% gravel; sand fraction contains more quartz; reaction to acid: very weak to moderate	very trace native copper, very trace calcite	subangular to angular chips up to 1.1 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,710 - 2,720	826.0 - 829.1	Conglomerate Unit no. 3; grayish brown [10YR5/2]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 99% clasts of brownish-gray and gray quartz, gray quartzite, gray schist, trace magnetite; 1% matrix chips of brown siltstone; overall sample is 22% fines of brown silt, 77% sand, 1% gravel; reaction to acid: weak	trace iron oxide (hematite), very trace native copper	subangular to angular chips up to 1.4 cm, mostly up to 0.3 cm
2,720 - 2,730	829.1 - 832.1	Conglomerate Unit no. 3; dark grayish brown [10YR4/2]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 95% clast of gray, silvery schist, gray quartzite, trace white vein quartz, trace brownish-gray sandstone, trace milky quartz eye porphyry, very trace pink quartzite, very trace diabase; 5% matrix chips of brown, weakly lithified siltstone, very trace gray weakly lithified siltstone; overall sample is 21% fines of brown silt, 75% sand, 4% gravel; sand fraction contains more quartz; reaction to acid: moderate	trace iron oxide (limonite), very trace native copper	subangular to angular chips up to 0.8 cm
2,730 - 2,740	832.1 - 835.2	Conglomerate Unit no. 3; dark grayish brown [10YR4/2]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 98% clasts of gray silvery schist, gray and brownish-gray quartzite, trace white vein quartz, very trace milky quartz eye porphyry, very trace gray siltstone, very trace yellow stained quartz, very trace diabase; 2% matrix chips of brown, weakly lithified siltstone, very trace brownish-gray sandstone; overall sample is 23% fines of brown silt, 73% sand, 4% gravel; reaction to acid: weak	trace iron oxide (limonite), very trace native copper	subangular to angular chips up to 1.2 cm
2,740 - 2,750	835.2 - 838.2	Conglomerate Unit no. 3; dark grayish brown [10YR4/2]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 99% clasts of gray quartzite, gray schist, trace white vein quartz, trace quartz eye porphyry, very trace diabase; 1% matrix chips of brown, weakly lithified siltstone, trace grayish-brown sandstone, very trace maroon siltstone, very trace gray siltstone; overall sample is 19% fines of brown silt, 76% sand, 5% gravel; reaction to acid: very weak to weak	very trace native copper, very trace calcite	subangular to angular chips up to 0.8 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,750 - 2,760	838.2 - 841.2	Conglomerate Unit no. 3; grayish brown [2.5Y5/2]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 99% clasts of gray and brownish-gray quartzite, gray, silvery schist, trace white vein quartz, very trace yellow stained quartz, very trace quartz eye porphyry, very trace magnetite; 1% matrix chips of brown, weakly lithified siltstone, trace reddish-brown well lithified siltstone; overall sample is 24% fines of brown silt, 71% sand, 5% gravel; reaction to acid: very weak to weak	very trace iron oxide (hematite and limonite), very trace native copper	subangular to angular chips up to 0.7 cm
2,760 - 2,770	841.2 - 844.3	Conglomerate Unit no. 3; grayish brown [2.5Y5/2]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 99% clasts of gray and brownish-gray quartzite, gray, silvery schist, trace quartz eye porphyry, trace white vein quartz; 1% matrix chips of brown, weakly lithified siltstone, trace reddish-brown well lithified siltstone, very trace grayish-brown sandstone; overall sample is 19% fines of brown silt, 76% sand, 5% gravel; reaction to acid: none to very weak	trace iron oxide (limonite), very trace native copper, very trace calcite	subangular to angular chips up to 1.2 cm
2,770 - 2,780	844.3 - 847.3	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 97% chips of 93% gray, silvery schist, gray quartzite, 7% white quartzite, very trace quartz eye porphyry; 3% matrix chips of brown, weakly lithified siltstone, very trace grayish-brown sandstone, very trace maroon siltstone; overall sample is 22% fines of reddish-brown silt, 77% sand, 1% gravel; reaction to acid: none to weak	very trace native copper	subangular chips up to 0.8 cm
2,780 - 2,790	847.3 - 850.4	Conglomerate Unit no. 3; light reddish brown [5YR6/3] and reddish brown [5YR5/3]; weakly to moderately lithified; sandy conglomerate; cut chips are 99% clasts of 86% white and gray quartzite and quartz, 13% gray quartzite, 1% gray, silvery schist, very trace milky quartz eye porphyry; 1% matrix chips of maroon siltstone; overall sample is 7% fines of pinkish-brown silt, 90% sand, 3% gravel; reaction to acid: none to weak	minor iron oxide (limonite)	subangular chips up to 0.9 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,790 - 2,800	850.4 - 853.4	Conglomerate Unit no. 3; light reddish brown [5YR6/3] and reddish brown [5YR5/3]; weakly to moderately lithified; sandy conglomerate; cut chips are 96% clasts of 84% white quartz and quartzite, 13% gray quartzite, 3% gray schist; 4% matrix chips of brown, weakly lithified siltstone, trace maroon siltstone, very trace brownish-gray sandstone; overall sample is 9% fines of pinkish-brown silt, 89% sand, 2% gravel; reaction to acid: none to very weak		subangular chips up to 0.8 cm
2,800 - 2,810	853.4 - 856.5	Conglomerate Unit no. 3; light reddish brown [5YR6/3]; weakly to moderately lithified; sandy conglomerate; cut chips are 93% clasts of 97% white and light very light gray quartz and quartzite, 3% gray quartzite, trace gray schist; 7% matrix chips of brown, weak to moderately-lithified siltstone, trace maroon siltstone, very trace brownish-gray sandstone; very trace orange silt; overall sample is 12% fines of pinkish-brown silt, 86% sand, 2% gravel; reaction to acid: none to weak	very trace iron oxide (hematite)	subangular chips up to 0.9 cm
2,810 - 2,820	856.5 - 859.5	Conglomerate Unit no. 3; light reddish brown [5YR6/3]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 93% clasts of 97% white to light very light gray, silty to fine-grained quartzite, 3% gray quartzite, trace gray schist; 7% matrix chips of brown, weak to moderately-lithified siltstone, very trace brownish-gray sandstone, very trace maroon siltstone; overall sample is 18% fines of pinkish-brown silt, 80% sand, 2% gravel; reaction to acid: none to weak	trace iron oxide (limonite), very trace native copper	subangular chips up to 0.7 cm
2,820 - 2,830	859.5 - 862.6	Conglomerate Unit no. 3; brown [7.5YR5/3]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 88% clasts of very light gray to gray quartzite, trace gray schist, very trace diabase; 12% matrix chips of brown, weakly lithified siltstone; overall sample is 20% fines of pinkish-brown silt, 78% sand, 2% gravel; reaction to acid: moderate	trace iron oxide (hematite and very trace limonite), very trace native copper	subangular chips up to 0.8 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,830 - 2,840	862.6 - 865.6	Conglomerate Unit no. 3; brown [7.5YR5/3]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 80% clasts of light gray, white, and gray, silty to fine-grained quartzite and white quartz, trace schist; 20% matrix chips of brown, weakly lithified siltstone, trace brownish-gray sandstone; overall sample is 18% fines, 80% sand, 2% gravel; reaction to acid: none to weak	very trace iron oxide (limonite), very trace native copper	subangular chips up to 1.0 cm
2,840 - 2,850	865.6 - 868.7	Conglomerate Unit no. 3; brown [7.5YR4/2]; weakly to moderately lithified; sandy conglomerate; clasts are 99% gray and brownish-gray quartzite, brown, weakly lithified siltstone, 1% gray schist, trace white vein quartz, trace quartz eye porphyry, very trace black basalt, trace maroon siltstone, very trace gray weakly lithified siltstone; overall sample is 1% fines of pinkish-brown silt, 99% sand, <1% gravel; sand fraction is mostly quartz; reaction to acid: very weak to strong	very trace iron oxide (hematite), trace calcite	subangular chips up to 1.0 cm; very trace black rubber
2,850 - 2,860	868.7 - 871.7	Conglomerate Unit no. 3; brown [7.5YR5/2]; weakly to moderately lithified; sandy conglomerate; clasts are 99% gray, brownish-gray and white quartzite, brown, weakly lithified siltstone, 1% light to medium gray schist, very trace basalt, very trace brownish-gray sandstone; very trace red silt; overall sample is 1% fines of light brown, silt, 98% sand, 1% gravel; reaction to acid: weak to moderate	trace iron oxide (hematite), very trace native copper	subangular chips up to 0.9 cm
2,860 - 2,870	871.7 - 874.8	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; silty sandy conglomerate; clasts are 98% gray, brownish-gray and light gray quartzite, brown, weakly lithified siltstone, 2% light to medium gray, silvery schist, trace quartz eye porphyry, trace brownish-gray sandstone, very trace brownish-gray weakly lithified siltstone; very trace orange silt; overall sample is 17% fines of reddish-brown silt, 80% sand, 3% gravel; reaction to acid: weak	trace iron oxide (hematite and very trace limonite)	subangular chips up to 1.1 cm

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Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,870 - 2,880	874.8 - 877.8	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 95% clasts of very light gray and brownish-gray quartzite, light very light gray, silvery schist, trace dark gray schist; 5% matrix chips of brown, weakly lithified siltstone; overall sample is 4% fines of reddish-brown silt, 92% sand, 4% gravel; reaction to acid: none to very weak	trace iron oxide (hematite and limonite), very trace native copper, very trace calcite	subangular chips up to 0.9 cm
2,880 - 2,890	877.8 - 880.9	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are 55% light very light gray schist, trace gray schist, 40% white and very light gray quartzite, 5% white quartz vein, trace gray quartzite, trace brown, weakly lithified siltstone, very trace grayish-brown sandstone; overall sample is 4% fines of reddish-brown silt, 92% sand, 4% gravel; sand fraction is mostly quartz; reaction to acid: none to very weak	trace iron oxide (hematite), very trace native copper	subangular chips up to 1.1 cm
2,890 - 2,900	880.9 - 883.9	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are 91% white, pinkish-white, very light gray quartzite, 7% light very light gray schist, 1% dark gray schist, 2% white quartz vein, trace gray quartzite; overall sample is 4% fines of reddish-brown silt, 92% sand, 4% gravel; reaction to acid: none to very weak	trace iron oxide (hematite)	subangular chips up to 0.8 cm
2,900 - 2,910	883.9 - 887.0	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; silty conglomerate; cut chips are 90% clasts of 65% dark gray schist, 30% gray and pink quartzite, 5% white and pink quartz vein, trace light gray schist with trace garnet; 10% matrix chips of brown, weak to moderately-lithified siltstone, trace grayish-brown sandstone; overall sample is 16% fines of reddish-brown silt, 83% sand, 1% gravel; reaction to acid: very weak to strong	very trace iron oxide (hematite and limonite), very trace native copper	subangular chips up to 1.2 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,910 - 2,920	887.0 - 890.0	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; silty sandy conglomerate; cut chips are 92% clasts of 58% light very light gray schist, 40% gray quartzite, 2% white and pink quartz vein, trace grayish-brown sandstone, very trace pink quartzite; 8% matrix chips of medium brown, weak to moderately-lithified siltstone; overall sample is 20% fines of reddish-brown siltstone, 78% sand, 2% gravel; reaction to acid: very weak to strong	very trace calcite	subangular chips up to 1.0 cm
2,920 - 2,930	890.0 - 893.1	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are light gray, white, light grayish-pink quartzite, light very light gray schist, trace dark gray schist, trace light brown siltstone; very trace orangish-red clayey silt; overall sample is 2% fines of reddish-brown silt, 95% sand, 3% gravel; reaction to acid: weak	trace iron oxide (hematite), very trace native copper	subangular chips up 1.2 cm
2,930 - 2,940	893.1 - 896.1	Conglomerate Unit no. 3; red [2.5YR5/6]; weakly to moderately lithified; clast-supported conglomerate; clasts are 50% light gray, white, light grayish-pink quartzite, 48% light very light gray schist, 2% white and pink quartz vein, very trace dark gray schist, trace light brown siltstone; overall sample is 2% fines of reddish-brown silt, 95% sand, 3% gravel; reaction to acid: very weak	trace iron oxide (hematite)	subangular chips up to 0.8 cm
2,940 - 2,950	896.1 - 899.2	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; silty conglomerate; cut chips are 92% clasts of 58% pink quartzite, 40% dark gray schist, 2% white and pink quartz vein, trace light very light gray schist, trace gray quartzite; 8% matrix chips of medium brown to grayish-brown, weak to moderately-lithified siltstone; overall sample is 5% fines of reddish-brown silt, 92% sand, 3% gravel; reaction to acid: very weak	very trace calcite	subangular chips up to 0.8 cm

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Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,950 - 2,960	899.2 - 902.2	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 95% clasts of 96% gray schist, gray quartzite, 2% light very light gray schist, 2% pink quartzite, trace grayish-brown sandstone, trace white vein quartz; 5% matrix chips of brown, weak to moderately-lithified siltstone; overall sample is 1% fines of reddish-brown silt, 98% sand, 1% gravel; reaction to acid: moderate	trace iron oxide (hematite and very trace limonite)	subangular chips up to 0.9 cm
2,960 - 2,970	902.2 - 905.3	Conglomerate Unit no. 3; light reddish brown [5YR6/3]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 98% clasts of 77% gray, green, and pink schist, 15% pink, white, and green quartzite, 5% gray and purple micaceous siltstone, 3% white and pink quartz vein; 2% matrix chips of brown, poorly lithified, micaceous siltstone, trace diabase, very trace magnetite; overall sample is 2% fines of tan-brown silt, 94% sand, 4% gravel; reaction to acid: moderate	trace iron oxide (hematite)	subangular chips up to 0.8 cm
2,970 - 2,980	905.3 - 908.3	Conglomerate Unit no. 3; reddish gray [5YR5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 58% white and green quartzite, 40% green and silver schist, 2% white and pink quartz vein, trace gray and purple micaceous siltstone, very trace diabase, very trace magnetite; overall sample is 4% fines of reddish-gray silt, 94% sand, 2% gravel; reaction to acid: weak to moderate	trace iron oxide (hematite and limonite), very trace native copper	subangular chips up to 0.7 cm
2,980 - 2,990	908.3 - 911.4	Conglomerate Unit no. 3; reddish gray [5YR5/2]; weakly to moderately lithified; clast-supported conglomerate; clasts are 60% pink, white, and green quartzite, 35% green and silver schist, 5% white and pink quartz vein, trace gray and purple micaceous siltstone, very trace diabase, very trace magnetite; overall sample is 5% fines of reddish-gray silt, 94% sand, 1% gravel; reaction to acid: weak to moderate	some iron oxide (hematite)	subangular chips up to 1.0 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
2,990 - 3,000	911.4 - 914.4	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 98% clasts of 52% pink and white quartzite, 38% green and silver schist, 10% white quartz vein; 2% matrix chips of brown, poorly lithified, micaceous siltstone; overall sample is 5% fines of reddish-brown silt, 94% sand, 1% gravel; reaction to acid: weak to moderate	some iron oxide (hematite), very trace native copper	subangular chips up to 0.8 cm
3,000 - 3,010	914.4 - 917.4	Conglomerate Unit no. 3; light reddish brown [5YR6/4]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 98% clasts of 64% pink, white, and green quartzite, 32% green and silver schist, 3% white quartz vein, 1% diabase, very trace magnetite; 2% matrix chips of brown, poorly-lithified, micaceous siltstone; overall sample is 2% fines of reddish-brown silt, 96% sand, 2% gravel; reaction to acid: weak	trace iron oxide (hematite, very trace limonite)	subangular chips up to 0.7 cm
3,010 - 3,020	917.4 - 920.5	Conglomerate Unit no. 3; reddish brown [5YR4/4]; weakly to moderately lithified; clast-supported conglomerate; cut chips 98% clasts of 67% green, pink, and silver schist, 30% pink, white, and green quartzite, 3% white and pink quartz vein, very trace diabase, very trace magnetite; 2% matrix chips of brown, poorly-lithified, micaceous siltstone; trace dark red clay balls; overall sample is 3% fines of reddish-brown silt, 96% sand, 1% gravel; reaction to acid: moderate	trace iron oxide (hematite)	subangular chips up to 1.1 cm
3,020 - 3,030	920.5 - 923.5	Conglomerate Unit no. 3; reddish brown [2.5YR5/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are 75% green, pink, white, and silver schist, 21% pink, white, and green quartzite, 4% white quartz vein, trace dark purple, poorly lithified, micaceous siltstone; overall sample is 1% fines of reddish-brown silt, 98% sand, 1% gravel; reaction to acid: weak	trace iron oxide (hematite)	subangular chips up to 1.2 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
3,030 - 3,040	923.5 - 926.6	Conglomerate Unit no. 3; reddish brown [2.5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are 60% green, white, and silver schist, 30% pink and white quartzite, 10% white and pink quartz vein, trace greenish-brown, poorly lithified, micaceous siltstone; very trace red clay balls; overall sample is 4% fines of reddish-brown silt, 95% sand, 1% gravel; reaction to acid: weak	trace iron oxide (hematite)	subangular chips up to 1.0 cm
3,040 - 3,050	926.6 - 929.6	Conglomerate Unit no. 3; reddish brown [2.5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are 80% green, gray, and silver schist, 13% pink and white quartzite, 7% white quartz vein, trace green and dark brown, poorly lithified, micaceous siltstone; overall sample is 5% fines of reddish-brown silt, 93% sand, 2% gravel; reaction to acid: weak to moderate	trace iron oxide (hematite)	subangular chips up to 0.9 cm
3,050 - 3,060	929.6 - 932.7	Conglomerate Unit no. 3; reddish brown [2.5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are 75% green, gray, pink, purple, and silver schist, 20% pink, gray, and white quartzite, 5% pink and white quartz vein; overall sample is 2% fines of reddish-brown silt, 96% sand, 2% gravel; reaction to acid: weak to moderate	trace iron oxide (hematite)	subangular chips up to 0.8 cm
3,060 - 3,070	932.7 - 935.7	Conglomerate Unit no. 3; reddish brown [2.5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; clasts are 72% green, gray, pink, and silver schist, 20% pink, gray, and white quartzite, 3% pink and white quartz vein, very trace diabase; 2% red clay balls; overall sample is 4% fines of reddish-brown silt, 95% sand, 1% gravel; reaction to acid: weak to moderate	trace iron oxide (hematite)	subangular chips up to 0.7 cm

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
3,070 - 3,080	935.7 - 938.8	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 98% clasts of 72% green, gray, and silver schist, 25% pink, gray, and white quartzite, 3% pink and white quartz vein, very trace diabase; 2% matrix chips of brownish-purple, poorly-lithified, micaceous siltstone; overall sample is 4% fines of reddish-brown silt, 94% sand, 2% gravel; reaction to acid: weak to moderate	trace iron oxide (hematite)	subangular chips up to 0.7 cm
3,080 - 3,090	938.8 - 941.8	Conglomerate Unit no. 3; reddish brown [5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 92% clasts of 83% green, gray, purple, and silver schist, 12% pink, gray, and white quartzite, 5% white quartz vein; 8% matrix chips of brownish-purple, poorly-lithified, micaceous siltstone; overall sample is 3% fines of reddish-brown silt, 96% sand, 1% gravel; reaction to acid: weak to moderate	trace iron oxide (hematite)	subangular chips up to 0.8 cm
3,090 - 3,100	941.8 - 944.9	Conglomerate Unit no. 3; light reddish brown [2.5YR6/3]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 92% clasts of 58% pink, green, and white quartzite, 30% green, pink, and silver schist, 2% white quartz vein; 8% matrix chips of brownish-purple, poorly-lithified, micaceous siltstone; overall sample is 4% fines of reddish-brown silt, 96% sand, 2% gravel; reaction to acid: weak to moderate	trace iron oxide (hematite), very trace calcite vein	subangular chips up to 0.7 cm
3,100 - 3,110	944.9 - 947.9	Conglomerate Unit no. 3; brown [7.5YR5/3]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 88% clasts of 57% pink, green, and white quartzite, 38% green, purple, and silver schist, 5% white quartz vein, trace diabase with very trace magnetite; 12% matrix chips of brownish-purple, poorly-lithified, micaceous siltstone; overall sample is 5% fines of brown silt, 94% sand, 1% gravel; reaction to acid: weak to strong	trace iron oxide (hematite and limonite), very trace calcite vein	subangular chips up to 1.1 cm

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Resolution Copper Mining
Pinal County, Arizona

DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
3,110 - 3,120	947.9 - 951.0	Conglomerate Unit no. 3; light reddish brown [5YR6/3]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 95% clasts of 55% green, white, and silver schist, 40% pink, green, and white quartzite, 5% white quartz vein, very trace diabase with very trace magnetite; 5% matrix chips of brown, tan, and green, poorly lithified, micaceous siltstone; overall sample is 6% fines of brown silt, 92% sand, 2% gravel; reaction to acid: weak	trace iron oxide (hematite and limonite), very trace native copper	subangular chips up to 0.9 cm
3,120 - 3,130	951.0 - 954.0	Conglomerate Unit no. 3; light reddish brown [5YR6/3]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 98% clasts of 77% pink, green, and white quartzite, 15% white quartz vein, 8% green and silver schist, very trace diabase with very trace magnetite; 2% matrix chips of brown and purple, poorly-lithified, micaceous siltstone; overall sample is 3% fines of brown silt, 96% sand, 1% gravel; reaction to acid: weak	trace iron oxide (hematite and limonite)	subangular chips up to 0.8 cm
3,130 - 3,140	954.0 - 957.1	Conglomerate Unit no. 3; light reddish brown [5YR6/3]; weakly to moderately lithified; clast-supported conglomerate; clasts are 75% green and white quartzite, 15% green and silver schist, very trace diabase with very trace magnetite, 5% white quartz vein, trace brown, poorly lithified, micaceous siltstone; overall sample is 3% fines of brown silt, 95% sand, 2% gravel; reaction to acid: weak	trace iron oxide (limonite, very trace hematite)	subangular chips up to 1.0 cm
3,140 - 3,150	957.1 - 960.1	Conglomerate Unit no. 3; reddish brown [2.5YR5/4]; weakly to moderately lithified; clast-supported conglomerate; cut chips are 97% clasts of 78% green and white quartzite, 12% green and silver schist, 5% white quartz vein, very trace diabase with very trace magnetite; 3% matrix chips of brown, poorly-lithified, micaceous siltstone; overall sample is 16% fines of brown silt, 83% sand, 1% gravel; reaction to acid: weak	trace iron oxide (hematite and limonite), very trace native copper	subangular chips up to 0.8 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
PINAL SCHIST (pCpi)				
3,150 - 3,160	960.1 - 963.2	Schist; reddish brown [2.5YR5/4]; weakly to moderately lithified; cut chips are 99% chips of 81% green, pink, and white quartz-rich schist, 9% green and silver micaceous schist, 10% white quartz vein, very trace diabase with very trace magnetite; 1% matrix chips of brown, poorly-lithified, micaceous siltstone; overall sample is 7% fines of brown silt, 92% sand, 1% gravel; reaction to acid: none to weak	trace iron oxide (hematite and limonite), very trace pyrite and chalcopyrite	subangular chips up to 1.0 cm
3,160 - 3,170	963.2 - 966.2	Schist; reddish brown [2.5YR5/4]; weakly to moderately lithified; cut chips are 86% chips of 70% brown, pink, and white quartz-rich schist, 25% green and silver micaceous schist, 5% white quartz vein, very trace diabase with very trace magnetite; 14% matrix chips of brown, tan, and purple, poorly lithified, micaceous siltstone; overall sample is 3% fines of brown silt, 95% sand, 2% gravel; reaction to acid: none to weak	trace iron oxide (hematite and limonite)	subangular chips up to 0.8 cm
3,170 - 3,180	966.2 - 969.3	Schist; reddish brown [2.5YR5/4]; weakly to moderately lithified; cut chips are 85% chips of 70% green and silver micaceous schist, 25% green, pink, and white quartz-rich schist, 5% white and pink quartz vein, very trace diabase with very trace magnetite; 15% matrix chips of brown, green, and purple, poorly lithified, micaceous siltstone; overall sample is 8% fines of brown silt, 90% sand, 2% gravel; reaction to acid: moderate	trace iron oxide (hematite and limonite), very trace calcite vein	subangular chips up to 1.3 cm
3,180 - 3,190	969.3 - 972.3	Schist; reddish brown [2.5YR5/4]; weakly to moderately lithified; cut chips are 95% chips of 55% green and white quartz-rich schist, 35% green and silver micaceous schist, 10% white and pink quartz vein, very trace diabase with very trace magnetite; 5% matrix chips of brown, green, and purple, poorly lithified, micaceous siltstone; overall sample is 8% fines of brown silt, 91% sand, 1% gravel; reaction to acid: weak	trace iron oxide (hematite and limonite), very trace pyrite on quartz	subangular chips up to 0.9 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
PINAL SCHIST (pCpi)				
3,190 - 3,200	972.3 - 975.4	Schist; reddish brown [2.5YR5/4]; weakly to moderately lithified; cut chips are 80% pink and white quartz-rich schist, 15% green and silver micaceous schist, 5% white and pink quartz vein, very trace diabase with very trace magnetite, trace brown and black, poorly lithified sandstone; overall sample is 12% fines of brown silt, 86% sand, 2% gravel; reaction to acid: weak	trace iron oxide (hematite and limonite), very trace pyrite on quartz	subangular chips up to 0.8 cm
3,200 - 3,210	975.4 - 978.4	Schist; light reddish brown [2.5YR6/4]; weakly to moderately lithified; cut chips are 80% pink and white quartz-rich schist, 10% green and silver micaceous schist, 10% white quartz vein, very trace diabase with very trace magnetite, trace brown and purple, poorly lithified, poorly sorted sandstone; overall sample is 8% fines of brown silt, 90% sand, 2% gravel; reaction to acid: weak	very trace pyrite and bornite on quartz	subangular chips up to 1.3 cm
3,210 - 3,220	978.4 - 981.5	Schist; light reddish brown [2.5YR6/4]; weakly to moderately lithified; cut chips are 87% chips of 98% pink and white quartz schist, 2% white quartz vein, trace green and silver micaceous schist, very trace diabase with very trace magnetite; 13% matrix chips of brown and purple, poorly-lithified, poorly-sorted sandstone; overall sample is 11% fines of brown silt, 86% sand, 3% gravel; reaction to acid: weak	trace iron oxide (hematite and limonite), very trace pyrite and bornite on quartz	subangular chips up to 1.2 cm
3,220 - 3,230	981.5 - 984.5	Schist; pale red [2.5YR6/2]; weakly to moderately lithified; cut chips are 70% white and green quartz-rich schist, 18% brown, tan, green, and red siltstone, 10% white quartz vein, 1% green and silver micaceous schist, 1% diabase with trace magnetite, trace black and brown, poorly sorted, poorly lithified sandstone; overall sample is 13% fines of brown silt, 84% sand, 3% gravel; reaction to acid: none to very weak	trace iron oxide (hematite and limonite), very trace pyrite and bornite on quartz, very trace native copper	subangular chips up to 0.9 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
PINAL SCHIST (pCpi)				
3,230 - 3,240	984.5 - 987.6	Schist; pale red [2.5YR6/2]; weakly to moderately lithified; cut chips are 98% chips of 87% white and green quartz-rich schist, 7% brown, green, and red siltstone, 3% white quartz vein, 3% green and silver micaceous schist, very trace diabase with very trace magnetite; 2% matrix chips of brown, poorly sorted, moderately-lithified sandstone; overall sample is 9% fines of brown silt, 89% sand, 2% gravel; reaction to acid: none to very weak	trace iron oxide (hematite and limonite), very trace pyrite and bornite on quartz	subangular chips up to 1.3 cm
3,240 - 3,250	987.6 - 990.6	Schist; pale red [2.5YR6/2]; weakly to moderately lithified; cut chips are 95% white and green quartz-rich schist, 4% green, silver, and purple micaceous schist, 1% white quartz vein, very trace brown, green, and red siltstone, very trace diabase with very trace magnetite; overall sample is 7% fines of brown silt, 92% sand, 1% gravel; reaction to acid: none to very weak	trace iron oxide (hematite and limonite), very trace pyrite and bornite in quartz	subangular chips up to 0.8 cm
3,250 - 3,260	990.6 - 993.6	Schist; pale red [2.5YR6/2]; weakly to moderately lithified; cut chips are 99% white and green quartz-rich schist, 1% green, silver, and purple micaceous schist, trace brown, green, and red siltstone, very trace white quartz vein; overall sample is 10% fines of brown silt, 88% sand, 2% gravel; reaction to acid: none	trace iron oxide (hematite and limonite), trace pyrite and bornite on quartz	subangular chips up to 1.0 cm
3,260 - 3,270	993.6 - 996.7	Schist; pale red [2.5YR6/2]; weakly to moderately lithified; cut chips are white and green quartz schist, trace green, silver, and purple micaceous schist, trace brown, green, and red siltstone; overall sample is 13% fines of brown silt, 84% sand, 3% gravel; reaction to acid: none	trace pyrite and bornite on quartz	subangular chips up to 1.1 cm
3,270 - 3,281	996.7 - 1,000.0	Schist; pale red [2.5YR6/2]; weakly to moderately lithified; cut chips are white and green quartz-rich schist, trace green, silver, and purple micaceous schist, trace brown, green, and red siltstone; overall sample is 10% fines of brown silt, 88% sand, 2% gravel; reaction to acid: none	trace pyrite and bornite on quartz	subangular chips up to 1.0 cm

APPENDIX B. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL DHRES-14

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
5-Apr	DHRES-14	D. Stalling	0.00	0.00	0.00	0.00	Crews are continually mobilizing to site. As of noon, the drill rig, deck and starter bit assembly have been brought to site. Crew will work on site organization and set up to begin drilling. Final site inspection for HRES-14 will take place tomorrow.	Mobilization	N/A	N/A
6-Apr	DHRES-14	D. Stalling	0.00	0.00	0.00	0.00	Site set-up continues. Most equipment has been mobilized to site. Anticipate the site ready for final inspection by tomorrow afternoon.	Mobilization	N/A	N/A
7-Apr	DHRES-14	D. Stalling	0.00	0.00	0.00	0.00	Final site inspections have been completed by RCM, Peek's Performance and Marcanti for electrical. Only minor issues were found and will be addressed before drilling starts. Anticipate drilling to start by 1600hrs.	19" Tri-Cone starter bit	N/A	N/A
8-Apr	DHRES-14	D. Stalling	9.14	30.00	9.14	30.00	Drilled down 9.14m and set in place 14" surface casing. Crew will set up to pump cement and allow an eight hour cure time before drilling. Anticipate drilling late tonight with 12-1/2" hammer reverse air set up.	14" Surface casing	N/A	Apache Leap Tuff (Tal)
9-Apr	DHRES-14	D. Stalling	44.50	146.00	35.36	116.00	Cemented surface casing successfully and set up BHA with 12-1/2" hammer this morning. Drilling started at 0830hrs with an average penetration rate of 15min/rod. Currently drilling.	12-1/2" Hammer reverse air	N/A	Apache Leap Tuff (Tal)
10-Apr	DHRES-14	E. Jung	172.52	566.00	128.02	420.00	Drilling with an overall penetration rate of ~45min/rod. Took surveys at 29.26m Inc 0.5°, 59.74m Inc 0.75°, 90.22m Inc 1.0°, 121.91m Inc 1.5°, and 152.39m Inc 2.0°. Plan to trip for bit this afternoon. Currently drilling.	12-1/2" Hammer reverse air	Lost circulation in fracture zone at 150.87m. Regained full returns by 166.41m.	Apache Leap Tuff (Tal) Driller noted fracture zones from 150.87m - 152.39m, and 154.83m - 155.76m.
11-Apr	DHRES-14	A.Jergenson	245.67	806.00	73.15	240.00	Drilled down to 197m and tripped out for a bit change. Tripped back in to bottom while reaming the bottom 7m. Commenced drilling with a penetration rate of ~1hr/rod. Single shot surveys conducted at 197m and 213m show an inclination of 2˚. Currently drilling.	12-1/2" Hammer reverse air	Drilling with full returns. No water production.	Apache Leap Tuff (Tal)
12-Apr	DHRES-14	D. Stalling	300.53	986.00	54.86	180.00	Drilled RC with the hammer down to current depth, but due to bad returns caused by the lost circulation zone higher in the hole the decsion has been made to switch over to flooded reverse. By switching over to flooded reverse the crew's will keep fluid level just below LCZ, and drill with water. This will allow an airlift test to take place deeper in the hole. Surveys taken at 243.8m Inc 2.25° and 274.3m Inc 2.75°. Anticipate drilling to commence by tomorrow morning.	12 1/4" Tri-Cone Flooded Reverse	N/A	Apache Leap Tuff (Tal)

APPENDIX B. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL DHRES-14

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
13-Apr	DHRES-14	D. Stalling	310.29	1018.00	9.75	32.00	The decision was made to utilize drilling muds to stabilize upper fracture zone. Crew tripped in with BHA and reamed bore hole from 195.1m to bottom. Drilling commenced by 0700hrs with a penetration rate of 2.5hrs/rod. Currently drilling.	12 1/4" Tri-Cone Flooded Reverse	Currently no water production. Currently drilling with ~60% fluid returns from upper fracture zone.	Apache Leap Tuff (Tal)
14-Apr	DHRES-14	D. Stalling	349.30	1146.00	39.01	128.00	Drilling, making good progress. Penetration rate is averaging 2.5-3.5 hours per rod. Surveys taken at 312.7m and 335.3m show Inc of 2.75°.	12 1/4" Tri-Cone Flooded Reverse	Static water level is ~182.9m but losing 300-400gal per hour to upper facture zone. Small amounts of LCM are being added to reduce fluid loss.	Apache Leap Tuff (Tal)
15-Apr	DHRES-14	D. Stalling	378.26	1241.00	28.96	95.00	Drilling, penetration rate has decreased to 4.5-5hrs per rod. Circulation and fluid level has been stable, and the foreman believes there may be a minor airline leak in the drill string causing the fluid level to stabilize lower in the hole. Currently 45hrs on bit and drilling.	12 1/4" Tri-Cone Flooded Reverse	Fluid loss has decreased to ~200gal per hour.	Apache Leap Tuff (Tal)
16-Apr	DHRES-14	D. Stalling	408.43	1340.00	30.18	99.00	Drilling with a penetration rate of 4.5hrs per rod. Survey taken at 365.8m Inc 2.75°. Currently drilling.	12 1/4" Tri-Cone Flooded Reverse	Baroid foreman on site to conduct mud report. Mud is in good condition. Minor fluid loss from fracture zone has not affected circulation or returns.	Apache Leap Tuff (Tal)
17-Apr	DHRES-14	E. Jung	428.55	1406.00	20.12	66.00	Drilled with average penetration rate more than 5hrs/rod. Took survey at 396.22m Inc 2.25°. The decision was made to trip out, add more collars to increase penetration, and inspect the bit. Currently tripping out.	12 1/4" Tri-Cone Flooded Reverse	Minor fluid loss while drilling. Circulation and returns are good. Static water level is ~223.71m bls.	Apache Leap Tuff (Tal)
18-Apr	DHRES-14	A.Jergenson	428.55	1406.00	0.00	0.00	Completed trip out and inspected tri-cone. Tripped back in with the same tri-cone (minimal damage) and added 9 collars to B.H.A. to increase penetration rate. While tripping in to bottom rod arm malfunctioned and is currently down. Anticipate commencement of drilling by early afternoon (1400hrs).	12 1/4" Tri-Cone Flooded Reverse	N/A	Apache Leap Tuff (Tal)
19-Apr	DHRES-14	D. Stalling	456.59	1498.00	28.04	92.00	Drilling commenced at 1445hrs with an improved penetration rate of 3.5 - 4hrs/rod. Survey taken at 426.7m Inc 2°. Currently 105hrs on bit and drilling.	12 1/4" Tri-Cone Flooded Reverse	Drilling with full returns. Static fluid level was measured at 225.6m.	Apache Leap Tuff (Tal) vitrophyre contact at 456.0m.

APPENDIX B. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL DHRES-14

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-Apr	DHRES-14	D. Stalling	471.83	1548.00	15.24	50.00	Rock formation became extremely soft near basal tuff contact which plugged the bit. Driller was unsuccessful in clearing plugged bit. Crew is currently tripping out the drill string. Crew will switch out the 7" drill rods and use 5-1/2" rods and with a new bit. Previous bit life reached 114hrs. Survey taken at 457.2m Inc 2°. Anticipate drilling to commence tomorrow morning.	12 1/4" Tri-Cone Flooded Reverse	N/A	Apache Leap Tuff (Tal) vitrophyre contact with basal tuff unit at 466.3m.
21-Apr	DHRES-14	D. Stalling	490.12	1608.00	18.29	60.00	Crew finished trip in with new bit and commenced drilling at 0430hrs with a penetration rate of 3hrs/rod. Currently drilling with full returns.	12 1/4" Tri-Cone Flooded Reverse	Mud in good condition.	Basal tuff contact with **Tev (Basalt) at 484.6m**.
22-Apr	DHRES-14	D. Stalling	543.46	1783.00	53.34	175.00	Drilling, making good progress with a penetration rate of 1.5-2 hours per rod. Surveys taken at 487.7m Inc 2° and 518.2m Inc 1.5°. Currently drilling.	12 1/4" Tri-Cone Flooded Reverse	Mud in good condition.	**Tev (Basalt) contact with Whitetail Conglomerate Tw3 at 524.3m.**
23-Apr	DHRES-14	D. Stalling	587.65	1928.00	44.20	145.00	Drilling, making good progress. Driller cleared bit after drilling though a clay rich zone but quickly resumed drilling. Survey taken at 548.6 Inc 1.75°. Currently drilling.	12 1/4" Tri-Cone Flooded Reverse	Mud in good condition.	Whitetail Conglomerate (Tw3)
24-Apr	DHRES-14	E. Jung	615.09	2018.00	27.43	90.00	Encountered geologic contact much sooner than anticipated. Crew was on standby while decisions on advancement and rescheduling of geophysics occurred. TD for the upper portion piezometer installation will be ~652.55m. Drilling resumed with a 3hr penetration rate. Currently drilling.	12 1/4" Tri-Cone Flooded Reverse	Mud in good condition.	**Whitetail Conglomerate (Tw3) contact at 591.6m with Pinal Shist (pЄpi): gray-silver foliated schist with trace native copper, trace iron oxide staining, and trace to 1% quartz .**
25-Apr	DHRES-14	A.Jergenson	652.58	2141.00	37.49	123.00	Drilled down to 652m and circulated on the hole. Single shot survey completed at 610m, Inc. 1.75˚. Crews are currently circulating on the hole and preparing for casing installation. Geophysical logging scheduled for mid morning 1100hrs.	12 1/4" Tri-Cone Flooded Reverse	Mud in good condition.	Pinal Schist (pЄpi)-gray-silver foliated schist with, milky quartz (~1%) and trace iron oxide staining present.
26-Apr	DHRES-14		652.58	2141.00	0.00	0.00	Crew completed tripping out of the hole in preparation for geophysical logging. Southwest Exploration will set up and run OBI tool down to water level at 1430hrs. Anticipate Schlumberger to arrive to site by 2100hrs to run standard suite of logs.	12 1/4" Tri-Cone Flooded Reverse	N/A	Pinal Schist
27-Apr	DHRES-14	D. Stalling	652.58	2141.00	0.00	0.00	Successfully completed running geophysics by Schlumberger from 2145hrs to 0830hrs. Crew will be moving BHA and tooling to laydown yard in preparation to install 7-5/8" casing and instrumentation tomorrow.	12 1/4" Open Hole	N/A	Geology currently under review after completion of the geophysicis.

APPENDIX B. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL DHRES-14

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
28-Apr	DHRES-14	D. Stalling	652.58	2141.00	0.00	0.00	Crew's set up rig for running 7-5/8" casing and instrumentation. M&A is onsite to monitor piezometer installation progress. Anticipate crew to begin casing installation late tonight.	12 1/4" Open Hole	N/A	Geology currently under review after completion of the geophysicis.
29-Apr	DHRES-14	D. Stalling	652.58	2141.00	0.00	0.00	Crews set up and began the installation of casing and instrumentation by midnight. Currently installing casing, anticipate completion of casing and instrumentation by 0300hrs. Anticipate grouting to take place tomorrow morning.	12 1/4" Open Hole	N/A	Geology currently under review after completion of the geophysicis.
30-Apr	DHRES-14	D. Stalling	652.58	2141.00	0.00	0.00	Crews installed the casing to 651.1m. Halliburton successfully grouted casing by 1100hrs with 38.1m of tail cement; all piezometers are functioning correctly. Crews will allow 48hrs of cure time before cementing to surface with a tremme pipe. Tabs will be welded after cementing to surface to prevent contamination. A total of 72hrs cure will be allowed before the casing is released from the slips and bowl.	7-5/8" Casing with Instrumentation	N/A	Geology currently under review after completion of the geophysics.
1-May	DHRES-14	E. Jung	652.58	2141.00	0.00	0.00	On standby for cement cure. Plan to install cement in the remainder of open borehole starting ~1200hrs tomorrow.	7-5/8" Casing with Instrumentation	Fluid level after grout job was above 213m - the uppermost piezometer at this level recorded submergence.	Geology is currently under review.
2-May	DHRES-14	J.Kent	652.58	2141.00	0.00	0.00	Currently on standby waiting for cement to cure. Crew's set up and started pumping cement at 1230hrs. Currently cementing back to surface.	7-5/8" Casing with Instrumentation	N/A	Tw consisting of dominantly Schist clasts.
3-May	DHRES-14	D. Stalling	652.58	2141.00	0.00	0.00	On standby for cement cure. Crews finished cementing to surface and will be preparing rig to drill 6-3/4" tricone conventional with polymers. Anticipate trip late tonight, drilling by tomorrow morning.	7-5/8" Casing with Instrumentation	N/A	Tw consisting of dominantly Schist clasts.
4-May	DHRES-14	D. Stalling	652.58	2141.00	0.00	0.00	Crews finished switching over plumbing and tripped in BHA. Currently tripping in remaining drill rods and mixing mud to begin circulation. Anticipate drilling by this afternoon.	6-3/4" Tri-cone conventional polymers	N/A	Tw consisting of dominantly Schist clasts.
5-May	DHRES-14	D. Stalling	681.53	2236.00	28.96	95.00	Crews finished tripping in and commenced drilling by 1645hrs. Drilled through cement and grout shoe without any problems. Currently drilling, making good progress with a penetration rate of 3 hours per rod.	6-3/4" Tri-cone conventional polymers	Dumped 4000gal of mud to decrease pH from drilling cement and increase viscocity.	Tw consisting of dominantly Schist clasts. Slight increase in quartzite clasts to 661.4m.
6-May	DHRES-14	D. Stalling	724.20	2376.00	42.67	140.00	Drilling, making good progress. Penetration rate has held at 3 hours per rod. Currently 34 hours on bit.	6-3/4" Tri-cone conventional polymers	Mud in good condition. Increase in fines has had minimal affects on mud.	Tw consisting of dominantly Schist clasts. Significant increase in fines from 688.9m to current depth.

APPENDIX B. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL DHRES-14

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
7-May	DHRES-14	D. Stalling	769.92	2526.00	45.72	150.00	Drillng with good progress. Surveys taken 701.0m Inc 3° and 731.5m Inc 3.25°. Currently drilling just under 3hrs/rod.	6-3/4" Tri-cone conventional polymers	Mud in good condition.	Tw consisting of dominantly Schist clasts.
8-May	DHRES-14	E. Jung	811.99	2664.00	42.06	138.00	Drilling, making good progress with a 2-1/2hr/rod penetration rate. Took surveys at 761m and 792m, both returned an inclination of 4.0°. Currently drilling - 72hrs on bit.	6-3/4" Tri-cone conventional polymers	Mud conditions are stable. Utilizing polymers with no bentonite.	Whitetail Conglomerate (Tw) consisting of schist and quartzite clasts.
9-May	DHRES-14	J.Kent	844.60	2771.00	32.61	107.00	Crew's drilled down to 844.60m and tripped for a new bit. Bit had 80hrs on it. Completed tripping out of the hole, and set up to trip in with the new bit. Currently tripping into the hole, anticipate drilling late tonight.	6-3/4" Tri-cone conventional polymers	N/A	Whitetail Conglomerate (Tw) consisting of schist and quartzite clasts.
10-May	DHRES-14	D. Stalling	864.41	2836.00	19.81	65.00	Crew finished trip in with new bit and resumed drilling at 0545hrs. Took survey at 823.0m Inc 3.5°. Currently drilling with a penetration rate of 3 hours per rod.	6-3/4" Tri-cone conventional polymers	Mud in good condition.	Whitetail Conglomerate (Tw) consisting of schist and quartzite clasts.
11-May	DHRES-14	D. Stalling	902.51	2961.00	38.10	125.00	Drilling, making good progress. Penetration has remained constant at 3 hours per rod. Survey taken at 853.4m Inc 2.25°. Currently drilling.	6-3/4" Tri-cone conventional polymers	Mud in good condition.	Whitetail Conglomerate (Tw) consisting of schist and quartzite clasts. Moderate increase in reddish-brown siltstone clasts from 883.7m to current depth.
12-May	DHRES-14	D. Stalling	937.56	3076.00	35.05	115.00	Drilling, making good progress. Surveys taken at 883.9m Inc 2.75° and 914.4m Inc 3°. Currently 55hrs on bit and drilling.	6-3/4" Tri-cone conventional polymers	Mud in good condition.	Whitetail Conglomerate (Tw) consisting of schist and quartz veining.
13-May	DHRES-14	D. Stalling	971.09	3186.00	33.53	110.00	Drilling, making good progress. Survey taken at 944.9m Inc 5.5°. Currently 76hrs on bit and drilling.	6-3/4" Tri-cone conventional polymers	Mud in good condition.	Whitetail Conglomerate (Tw) consisting of schist and quartz veining.
14-May	DHRES-14	D. Stalling	999.74	3280.00	28.65	94.00	Crew reached TD and begun tripping out by 1015hrs. Geophysics will be conducted by SW Exploration later tonight from 651.1m to TD. Crews will be transporting 4-1/2" casing to site late tonight. Anticipate casing installation to begin tomorrow morning.	6-3/4" Tri-cone conventional polymers	N/A	Whitetail Conglomerate (Tw) consisting of schist and quartz veining.
15-May	DHRES-14	E. Jung	999.74	3280.00	0.00	0.00	Geophysical logging was conducted from 2115hrs to 0400hrs. All tools were run successfully. Casing schedule was drawn up by 0600hrs, and crews began running 4-1/2" blank and perforated casing. Anticipate 362.7m of casing to be run by late this afternoon. DNH Tools is expected to arrive with a casing hanger tomorrow between 0800-1000hrs. Casing w/ hanger will then be run to set point.	4-1/2" Blank and Perforated Casing	N/A	Whitetail Conglomerate (Tw) consisting of schist and quartz veining.

APPENDIX B. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL DHRES-14

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
16-May	DHRES-14	E. Jung	999.74	3280.00	0.00	0.00	4-1/2" casing was run into hole by 1700hrs. Crew was then on standby for casing hanger - conducting maintenance and repairs. DNH Tools was on site at 1100hrs with casing hanger and set tool. Crew attached hanger to casing string and began tripping in to set point. Anticipate casing string to be hung at ~1630hrs.	4-1/2" Blank and Perforated Casing w/ Casing Hanger	N/A	Whitetail Conglomerate (Tw) consisting of schist and quartz veining.
17-May	DHRES-14	J.Kent	999.74	3280.00	0.00	0.00	Safely and successfully completed setting the casing hanger at 632.2m with the 4-1/2" casing yesterday evening. Crew tripped out and set up for the airlift test. Tripped down to 304m and commenced first arilift test.	4-1/2" Blank and Perforated Casing w/ Casing Hanger	Water production did not sustain 304m. Crew was able to unload the hole. Currently setting up to complete an airlift test at 457m.	Whitetail Conglomerate (Tw) consisting of schist and quartz veining.
18-May	DHRES-14	D. Stalling	999.74	3280.00	0.00	0.00	The air lift tests were completed but resulted in no sustainable production even when the rods were tripped in to 609.6m. Crew tripped out and began site breakdown in preparation to mobilize equipment to next site. Mechanic onsite conducting rig repairs and maintenance.	4-1/2" Blank and Perforated Casing w/ Casing Hanger	Air lift tests were conducted at progressing depths without any success of sustaining production for longer than ten minutes.	Whitetail Conglomerate (Tw) consisting of schist and quartz veining.
19-May	DHRES-14	D. Stalling	999.74	3280.00	0.00	0.00	Site break down continues. Crew has taken the baker tanks, drill rods, and cyclone off site. Anticipate mobilizing the drill rig on Saturday.	Mobilization	N/A	N/A
20-May	DHRES-14	D. Stalling	999.74	3280.00	0.00	0.00	Site breakdown continues. Crew's have mobilized all equipment to HRES-15 except for the drill rig and the dog house. Drill rig will be mobilized to site tomorrow morning. Anticipate final inspection to take place on Sunday.	Mobilization	N/A	N/A

HALLIBURTON

KENNECOTT UTAH COPPER CORP

DHRES 14

Gila County , Arizona

Cement Production Casing

30-Apr-2011

Job Site Documents

HALLIBURTON

Cementing Job Summary

The Road to Excellence Starts with Safety

Sold To #: 303273	**Ship To #:** 303273	**Quote #:**	**Sales Order #:** 8127066
Customer: KENNECOTT UTAH COPPER CORP		**Customer Rep:**	
Well Name: DHRES	**Well #:** 14		**API/UWI #:**
Field:	**City (SAP):** MAGNA	**County/Parish:** Gila	**State:** Arizona
Contractor: Boart Longyear	**Rig/Platform Name/Num:**		
Job Purpose: Cement Production Casing			
Well Type: Exploratory / Wildcat	**Job Type:** Cement Production Casing		
Sales Person: KIDDOO, JUSTIN	**Srvc Supervisor:** RICHESIN, ANTHONY	**MBU ID Emp #:** 412961	

Job Personnel

HES Emp Name	Exp Hrs	Emp #	HES Emp Name	Exp Hrs	Emp #	HES Emp Name	Exp Hrs	Emp #
FABREY, KENDALL Edward	8	488836	LAMBSON, NATHANIEL A	8	343100	MARTIN, EHLER Dean	5	458474
RICHESIN, ANTHONY Ray	8	412961		8				

Equipment

HES Unit #	*Distance-1 way*	HES Unit #	*Distance-1 way*	HES Unit #	*Distance-1 way*	HES Unit #	*Distance-1 way*
10001398C	365 mile	10025104	365 mile	10948693	365mile	11324578	365 mile

Job Hours

Date	*On Location Hours*	Operating Hours	Date	*On Location Hours*	Operating Hours	Date	*On Location Hours*	Operating Hours
4/30/11	8	3						
TOTAL			*Total is the sum of each column separately*					

Job

Formation Name			
Formation Depth (MD)	**Top**	**Bottom**	
Form Type		**BHST**	
Job depth MD	2136. ft	**Job Depth TVD**	2136. ft
Water Depth		**Wk Ht Above Floor**	4. ft
Perforation Depth (MD)	*From*	**To**	

Job Times

	Date	Time	Time Zone
Called Out	29 - Apr - 2011	19:00	MST
On Location	30 - Apr - 2011	07:00	MST
Job Started	30 - Apr - 2011	10:56	MST
Job Completed	30 - Apr - 2011	12:40	MST
Departed Loc	30 - Apr - 2011	14:30	MST

Well Data

Description	New / Used	Max pressure psig	Size in	ID in	Weight lbm/ft	Thread	Grade	Top MD ft	Bottom MD ft	Top TVD ft	Bottom TVD ft
12 1/4" Open Hole				12.25				.	2141.	.	2141.
7 5/8" Production Casing	Unknown		7.625	6.969	26.4		J-55	.	2141.	.	2141.

Sales/Rental/3rd Party (HES)

Description	Qty	Qty uom	Depth	Supplier
SHOE,GID,7 5/8 8RD	1	EA		
CLR,FLT,7-5/8 8RD 24-33.7PPF,2-3/4SSII	1	EA		
KIT,HALL WELD-A	2	EA		
PLUG,CMTG,TOP,7 5/8,HWE,6.24 MIN/7.13 MA	1	EA		
SUGAR, GRANULATED, IMPERIAL	200	LB		

Tools and Accessories

Type	Size	Qty	Make	Depth	Type	Size	Qty	Make	Depth	Type	Size	Qty	Make
Guide Shoe					Packer					Top Plug			
Float Shoe					Bridge Plug					Bottom Plug			
Float Collar					Retainer					SSR plug set			
Insert Float										Plug Container			
Stage Tool										Centralizers			

HALLIBURTON

Cementing Job Summary

Miscellaneous Materials													
Gelling Agt		Conc		Surfactant		Conc		Acid Type		Qty		Conc	%
Treatment Fld		Conc		Inhibitor		Conc		Sand Type		Size		Qty	

Fluid Data

Stage/Plug #: 1

Fluid #	Stage Type	Fluid Name	Qty	Qty uom	Mixing Density lbm/gal	Yield ft3/sk	Mix Fluid Gal/sk	Rate bbl/min	Total Mix Fluid Gal/sk
1	CHEMICAL WASH	CHEMICAL WASH - SBM (21914)	20.00	bbl	8.4	.0	.0	4.0	
2	Specialized Pressure Grout	CMT - PREMIUM - CLASS G, 94 LB SK (100003685)	300.0	sacks	10.8	4.42	28.19	4.0	28.19
	94 lbm	CMT - PREMIUM - CLASS G REG OR TYPE V, BULK (100003685)							
	30 %	BENTONITE, BULK (100003682)							
	28.187 Gal	FRESH WATER							
3	Neat G Cement	CMT - PREMIUM - CLASS G, 94 LB SK (100003685)	55.0	sacks	15.8	1.15	4.98	4.0	4.98
	94 lbm	CMT - PREMIUM - CLASS G REG OR TYPE V, BULK (100003685)							
	0.1 %	HALAD(R)-9, 50 LB (100001617)							
	4.982 Gal	FRESH WATER							
4	Displacement		99.00	bbl	8.33	.0	.0	4.0	

Calculated Values		Pressures		Volumes					
Displacement	99.5	Shut In: Instant	0	Lost Returns		Cement Slurry	247.2	Pad	
Top Of Cement	UNKNOWN	5 Min		Cement Returns	0	Actual Displacement	99	Treatment	
Frac Gradient		15 Min		Spacers	0	Load and Breakdown		Total Job	371.2

Rates							
Circulating		Mixing	4	Displacement	5	Avg. Job	4.5

Cement Left In Pipe	Amount	22.29 ft	Reason	Shoe Joint

Frac Ring # 1 @		ID		Frac ring # 2 @		ID		Frac Ring # 3 @		ID		Frac Ring # 4 @		ID	

The Information Stated Herein Is Correct	***Customer Representative Signature***

HALLIBURTON

Cementing Job Log

The Road to Excellence Starts with Safety

Sold To #: 303273	**Ship To #:** 303273	**Quote #:**	**Sales Order #:** 8127066
Customer: KENNECOTT UTAH COPPER CORP		**Customer Rep:**	
Well Name: DHRES	**Well #:** 14		**API/UWI #:**
Field:	**City (SAP):** MAGNA	**County/Parish:** Gila	**State:** Arizona
Legal Description:			
Lat: N 0 deg. OR N 0 deg. 0 min. 0 secs.		**Long:** E 0 deg. OR E 0 deg. 0 min. 0 secs.	
Contractor: Boart Longyear	**Rig/Platform Name/Num:**		
Job Purpose: Cement Production Casing			**Ticket Amount:**
Well Type: Exploratory / Wildcat	**Job Type:** Cement Production Casing		
Sales Person: KIDDOO, JUSTIN	**Srvc Supervisor:** RICHESIN, ANTHONY		**MBU ID Emp #:** 412961

Activity Description	Date/Time	Cht #	Rate bbl/ min	Volume bbl		Pressure psig		Comments
				Stage	Total	Tubing	Casing	
Call Out	04/29/2011 19:00							GRAND JUNCTION CALLED CREW AT 1900 ON 4/29/11
Safety Meeting - Service Center or other Site	04/29/2011 21:00							SAFETY MEETING INVOVLING THE ENTIRE CMT CREW
Arrive At Loc	04/30/2011 07:00							1- F-350, 1-RED TIGER PUMP TRUCK, 2- 660 BULK TRUCK 10025104/ WITH 200 SACKS LEAD CLASS-G 30% BENTONITE///10001398 WITH 100 SACKS LEAD FRONT BELL 55 SACKS TAIL BACK BELL TYPE-G NEAT CEMENT
Assessment Of Location Safety Meeting	04/30/2011 07:30							ASSESSMENT OF LOCATION INVOLVING THE ENTIRE CMT CREW
Pre-Rig Up Safety Meeting	04/30/2011 08:30							SAFETY MEETING INVOLVING THE ENTIRE CMT CREW
Rig-Up Equipment	04/30/2011 09:00							
Pre-Job Safety Meeting	04/30/2011 10:20							SAFETY MEETING INVOLVING EVERYONE ON LOCATION
Start Job	04/30/2011 10:56							
Test Lines	04/30/2011 10:57							PSI TEST GOOD 3600 PSI

HALLIBURTON

Cementing Job Log

Activity Description	Date/Time	Cht #	Rate bbl/ min	Volume bbl		Pressure psig		Comments
				Stage	Total	Tubing	Casing	
Pump Spacer 1	04/30/2011 11:01		2	20	20		65.0	20 BBL CHEM WASH
Pump Spacer 1	04/30/2011 11:09							5 BBL FRESH WATER
Pump Lead Cement	04/30/2011 11:11		4	236	236		90.0	300 SACKS=@10.8# YIELD 4.42 GAL PER SACK 28.19=236 BBL // MIX H20 201 BBL
Pump Tail Cement	04/30/2011 12:06		2	11.2	11.2		106.0	55 SACKS=@15.8# YILED 1.15 GAL PER SACK 4.98=11.2 BBL // MIX H20 6.5
Shutdown	04/30/2011 12:08							DROP TOP PLUG
Drop Top Plug	04/30/2011 12:10							USED CIRCULATING SWADGE SHUT DOWN TO PULL SWADGE AND DROP PLUG
Pump Displacement	04/30/2011 12:12		5	70	70		88.0	FRESH WATER DISPLACEMENT CACULATED 99.5 BBL FRESH WATER
Slow Rate	04/30/2011 12:24		2	30	30		75.0	SLOW RATE 2 BBL MIN THE LAST 30 BBLS OF DISPLACEMENT TO LAND THE PLUG
Bump Plug	04/30/2011 12:34		2	99	99		180.0	PLUG LANDED @ 178 PSI TOOK TO 907 PSI
Check Floats	04/30/2011 12:35							FLOATS HELD HAD TO PRESSUER UP CASING TWICE TO CLOSE FLOATS 1/4 BBL BACK TO TRUCK
End Job	04/30/2011 12:40							RIG DID NOT HAVE CIRCULATION ON HOLE WHENE HALLIBURTON ARRIVED ON LOCATION // DID NOT GAIN CIRCULATION DURING CEMENT JOB
Comment	04/30/2011 12:41							THANK YOU FOR USING HALLIBURTON, ANTHONY RICHESIN AND CREW
Pre-Rig Down Safety Meeting	04/30/2011 13:55							SAFETY MEETING INVOLVING THE ENTIRE CMT CREW

Sold To # : 303273 Ship To # :303273 Quote # : Sales Order # : 8127066

SUMMIT Version: 7.20.130 Saturday, April 30, 2011 01:27:00

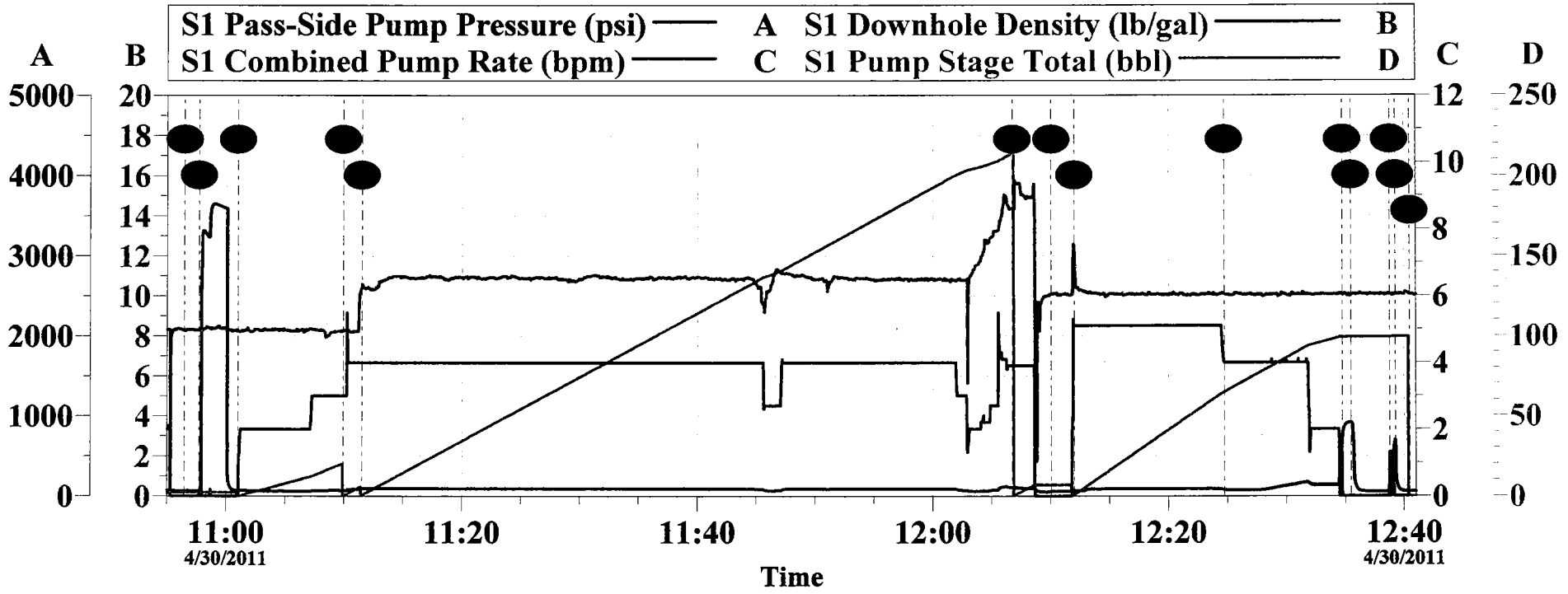
HALLIBURTON

Cementing Job Log

Activity Description	Date/Time	Cht #	Rate bbl/ min	Volume bbl		Pressure psig		Comments
				Stage	Total	Tubing	Casing	
Rig-Down Equipment	04/30/2011 14:00							
Safety Meeting - Departing Location	04/30/2011 14:30							SAFETY MEETING INVOLVING THE ENTIRE CMT CREW

KENNECOTT UTAH COPPER

DHRES WELL# 14 PRODUCTION



Local Event Log

Intersection		SPPP	Intersection		SPPP
START JOB	10:56:28	64.00	TEST LINES	10:57:41	64.00
CHEM WASH	11:01:00	65.00	WATER	11:09:55	68.00
LEAD CEMENT	11:11:30	92.00	TAIL CEMENT	12:06:45	106.0
DROP PLUG	12:10:04	55.00	DISPLACMENT	12:12:01	65.00
SLOW RATE	12:24:43	77.19	BUMP PLUG	12:34:45	785.6
CHECK FLOATS	12:35:29	914.0	PRESSUER UP CASING	12:38:47	65.11
CHECK FLOATS	12:39:17	599.7	END JOB	12:40:30	54.00

Customer:	KENNECOTT	Job Date:	30-Apr-2011	Sales Order #:	8127066
Well Description:	DHRES WELL#14	Job type:	PRODUCTION	ADC Used:	YES
Customer Rep:	JEFF KENT	Service Supervisor:	ANTHONY RICHESIN	Operator/ Pump:	NATE LAMBSON

OptiCem v6.4.0
30-Apr-11 12:56