



TECHNICAL MEMORANDUM

DATE: January 5, 2012 **Project:** 605.31

TO: Greg Ghidotti
RESOLUTION COPPER MINING LLC

FROM: Charlie King, Janis Fleming, Kate Duke, and Todd Keay
MONTGOMERY & ASSOCIATES

SUBJECT: RESULTS OF DRILLING, CONSTRUCTION, AND TESTING AT
HYDROLOGIC TEST WELLS HRES-14 AND HRES-15
RESOLUTION COPPER MINING, PINAL COUNTY, ARIZONA

In accordance with a request from Mr. Greg Ghidotti, Resolution Copper Mining LLC (RCM), Montgomery & Associates (M&A) has prepared this Technical Memorandum to summarize results of drilling, construction, and testing at hydrologic test wells HRES-14 and HRES-15. The wells were installed to characterize hydrogeologic conditions in the Apache Leap Tuff on the east side of Devils Canyon, near the Devils Canyon Fault. Monitoring data obtained from HRES-14 and HRES-15 have been incorporated into the RCM hydrologic monitoring program.

HRES-14 SUMMARY

A summary of drilling, construction, and testing operations and results for HRES-14 is provided below:

1. Hydrologic test well HRES-14 is located on land owned by the U.S. Forest Service, in Township 1 South, Range 13 East, in the NE $\frac{1}{4}$ of the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 22 ((D-1-13)22dba), on the east side of Devils Canyon, near the Devils Canyon Fault.
2. Well HRES-14 was drilled and constructed during the period March 19 through April 3, 2011.
3. Total drilled depth for HRES-14 is 500.8 meters below land surface (bls).

4. Geologic units encountered during drilling from land surface to total depth include Tertiary Apache Leap Tuff (Tal; 0 to 451.1 meters) and Tertiary Early Volcanics (Tev; 451.1 to 500.8 meters).
5. HRES-14 was completed within the Tal with a single interval of perforated casing from 293.1 to 439.0 meters bls; non-pumping water level was 161.65 meters bls on November 22, 2011.
6. A 4-hour open borehole airlift test was conducted in the Tal during drilling operations; analysis of recovery data yielded an estimated transmissivity of 17 meters squared per day (m^2/d).
7. Following installation of production casing, a 4-hour airlift test was conducted to develop the well and provide preliminary aquifer parameters at this location, but the data were not suitable for analysis.
8. HRES-14 was equipped with dedicated pump and water level recording equipment on June 7, 2011.
9. A 48-hour constant-rate pumping test was conducted in the cased well on July 13 and 14, 2011; analysis of drawdown data yielded an estimated transmissivity of 25 m^2/d .
10. Water samples were collected for laboratory analyses near the end of each test.

HRES-15 SUMMARY

A summary of drilling, construction, and testing operations and results for HRES-15 is provided below:

1. Hydrologic test well HRES-15 is located on land owned by the U.S. Forest Service, in Township 1 South, Range 13 East, in the SW $\frac{1}{4}$ of the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Section 27 ((D-1-13)27dbc), on the east side of Devils Canyon, near the Devils Canyon Fault.
2. Well HRES-15 was drilled and constructed during the period May 22 through June 17, 2011.
3. Total drilled depth is 615.1 meters bls.
4. Geologic units encountered during drilling from land surface to total depth include Tal (0 to 536.2 meters), Tertiary Early Sedimentary (Tes; 536.2 to 540.8 meters), Tev (540.8 to 598.5 meters) and Whitetail Conglomerate (Tw; 598.5 to 615.1 meters).
5. HRES-15 was completed with two perforated intervals from 206.9 to 466.3 meters and 533.4 to 596.7 meters bls in the Tal and Tev, respectively; non-pumping water level was 195.65 meters bls on November 22, 2011.
6. A 3-hour open borehole airlift test was conducted in the Tal during drilling operations but the data were not suitable for analysis.
7. A 4-hour airlift test was conducted to develop the well and provide data for computing preliminary aquifer parameters; analysis of recovery data yielded an estimated transmissivity of 90 m^2/d .
8. Water samples were collected for laboratory analyses near the end of each test.

INTRODUCTION

Hydrologic test well HRES-14 was drilled and constructed during the period March 19 through April 3, 2011. Hydrologic test well HRES-15 was drilled and constructed during the period May 22 through June 17, 2011. The wells were drilled to:

- evaluate groundwater conditions in the ALT aquifer on the east side of Devils Canyon near the Devils Canyon Fault
- provide groundwater level and groundwater quality monitoring locations.

Well HRES-14 was drilled into the Tev and completed to permit hydrologic testing within the Tal. HRES-15 was drilled into the Tw and completed with two separate perforated intervals to permit hydrologic testing within the Tal and Tev. Hydrologic test well HRES-14 is located on land owned by the U.S. Forest Service, in Township 1 South, Range 13 East, in the NE ¼ of the NW ¼ of the SE ¼ of Section 22 ((D-1-13)22dba). Hydrologic test well HRES-15 is located on land owned by the U.S. Forest Service, in Township 1 South, Range 13 East, in the SW ¼ of the NW ¼ of the SE ¼ of Section 27 ((D-1-13)27dbc). Both wells are located on the east side of Devils Canyon, near the Devils Canyon Fault. **Photographs 1 and 2** show the layout for HRES-14 and HRES-15 well sites during drilling operations, respectively. **Figure 1** shows the locations for HRES-14 and HRES-15. **Figures 2 and 3** are schematic diagrams of well construction for these wells. Other data summarized on the schematic diagrams include: hydrogeologic units, drilling penetration rate, fracture summary, water production rate during drilling operations, borehole geophysical logs, and groundwater level. Detailed lithologic logs for the test wells are provided in **Appendix A**.



Photograph 1. Site layout at HRES-14 during drilling operations



Photograph 2. Site layout at HRES-15 during drilling operations

DRILLING OPERATIONS

Hydrologic test wells HRES-14 and HRES-15 were 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 wells were 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 wells. RCM provided daily summaries of drilling progress. Daily summary data are provided in **Appendix B**.

Wells HRES-14 and HRES-15 were drilled to 500.8 and 615.1 meters bls, respectively, and then blank and perforated casing were installed to the designed depths. Final completion of the wells 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 boreholes for HRES-14 and HRES-15 were drilled using the conventional air rotary method for the surface casing borehole, and the dual-wall air reverse circulation and air-assisted flooded reverse circulation methods for the production interval of the borehole. Depths, drilling methods, and bit types and sizes are summarized in **Table 1**.

TABLE 1. SUMMARY OF DRILLING METHODS AND BOREHOLE DIAMETERS HYDROLOGIC TEST WELLS HRES-14 AND HRES-15				
Well	Depth Interval (meters)	Drilling Method	Bit Type	Borehole Diameter (inches)
HRES-14	0 – 12.2	conventional air rotary	tricone	17
	12.2 – 399.3	reverse circulation air percussion	hammer	10
	399.3 – 500.8	air-assisted flooded reverse circulation	tricone	9-7/8
HRES-15	0 – 18.3	conventional air rotary	tricone	17-1/2
	18.3 – 333.8	reverse circulation air percussion	hammer	10
	333.8 – 615.1	air-assisted flooded reverse circulation	tricone	9-7/8

For the production portion of the borehole at HRES-14 and HRES-15, the dual-wall air reverse circulation method was used to allow for measurement of groundwater production during drilling. At HRES-14, at a depth of 399.3 meters bls, slow drilling progress necessitated change to the air-assisted flooded reverse drilling method for the remainder of the borehole. At HRES-15, at a depth of 333.8 meters bls, the drilling method was changed to the air-assisted flooded reverse drilling method due to restricted water storage on site. The borehole was drilled to 615.1 meters bls using the air-assisted flooded reverse drilling method and then geophysical

logging was conducted. During logging the borehole became blocked due to sloughing; the hole was re-drilled in the interval from 504.4 to 615.1 meters bls using the conventional mud rotary drilling method.

Drilling Fluid and Drill Cuttings Management

Air and water were used during drilling operations for the production interval of the borehole at HRES-14. At HRES-15, in addition to air and water, polymer-based drilling fluid was added to the borehole during re-drilling of the lower section. 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 material. All drilling fluids and formation fluids were contained in portable tanks to allow fines to settle prior to removal from the well site. Formation fluids were 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 and then spread on site. Drill cuttings from the Tes, Tev, and Tw were stored on site temporarily, removed from site using vacuum trucks, and then deposited 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 for each well is shown on **Figures 2 and 3**. In addition to drill penetration rate, rotational torque was monitored by drilling personnel, and zones of variable or increasing torque were noted as potential indicators 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. At HRES-14, borehole deviation was 1.7 degrees or less for the depth interval from land surface to 213.4 meters bls using the dual-wall air reverse circulation drilling method. Maximum borehole deviation was 4 degrees at a depth of 335.3 meters bls using the air-assisted flooded reverse circulation drilling method. At HRES-15, borehole deviation was 1.0 degree or less for the depth interval from land surface to 152.4 meters bls using the dual-wall air reverse circulation drilling method. Maximum borehole deviation was 2.5 degrees at a depth of 579.1 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 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. Observations of natural groundwater production were made after drilling out each 6.1-meter drill rod. Prior to measurement of production rate, injection water was cut off from the airstream, and air circulation was continued for 10 to 15 minutes. When discharge stabilized, discharge rate was measured using a 2-gallon bucket and a stop watch. Water production could not be monitored during air-assisted flooded reverse circulation drilling at HRES-14 or HRES-15.

At HRES-14, the depth interval from 12.2 to 399.3 meters bls was drilled using the dual-wall air reverse circulation method and groundwater production was measured; results are summarized on **Figure 2**. First measurable water production rate at HRES-14 was 0.6 liters per second (L/s) at a depth of 303.3 meters bls. Maximum measured groundwater production rate was 3.2 L/s at 399.3 meters bls. At HRES-15, the depth interval from 18.3 to 333.8 meters bls was drilled using the dual-wall air reverse circulation method and groundwater production was measured; results are summarized on **Figure 3**. First measurable water production rate at HRES-15 was 0.1 L/s at a depth of 211.8 meters bls. Maximum measured groundwater production rate was 3.4 L/s at 327.7 and 333.8 meters bls.

The discharge water was monitored for changes in water quality parameters including temperature, pH, specific conductance, and sand content. At HRES-14, temperature of the discharge water ranged from about 20 to 23 degrees Celsius (°C). The pH of the discharge water ranged from 7.89 to 8.10. The specific conductance of the discharge water ranged from 234 to 236 microsiemens per centimeter (µS/cm). At HRES-15, temperature of the discharge water ranged from about 20 to 25°C; pH ranged from 7.96 to 8.35; and specific conductance ranged from 252 to 276 µS/cm.

BOREHOLE GEOPHYSICAL LOGGING

Borehole geophysical logging was conducted when the boreholes for HRES-14 and HRES-15 reached total depth. Borehole geophysical logging services were provided by Southwest Exploration Services, LLC (SWE) of Gilbert, Arizona, and Schlumberger Water Services (SWS) of Farmington, New Mexico. Borehole geophysical logging was conducted at HRES-14 on March 28 and 29, and at HRES-15 on June 6 and 10, 2011. The suite of geophysical logs obtained at HRES-14 and HRES-15 by SWE included: short and long normal resistivity (E-logs), spontaneous potential, natural gamma ray, sonic, single point resistance, fluid resistivity, and temperature. At HRES-14, optical and acoustic borehole imaging (OBI and ABI) and borehole deviation logs were obtained by SWE. At HRES-15, formation micro-resistivity imaging (FMI) and borehole deviation logs were obtained by SWS. **Table 2** shows logs obtained and depth intervals for each type of log. SWE and SWS submitted field logs in

digital and hard copy format to RCM staff. Final logs were submitted electronically. Summary geophysical logs for HRES-14 and HRES-15 are provided on **Figures 2 and 3**.

TABLE 2. SUMMARY OF BOREHOLE GEOPHYSICAL LOGS OBTAINED AT WELLS HRES-14 AND HRES-15			
Geophysical Log	HRES-14	HRES-15	
	SWE Depth Interval (meters bls)	SWE Depth Interval (meters bls)	SWS Depth Interval (meters bls)
Caliper	0 – 456.3	0 – 612.5	N/A
Temperature	159.4 – 456.3	0 – 612.5	N/A
Fluid resistivity	159.4 – 456.3	195.0 – 612.5	N/A
Natural gamma ray	0 – 456.3	0 – 612.5	N/A
Short-long normal resistivity	0 – 456.3	195.0 – 612.5	N/A
Single point resistance	0 – 456.3	195.0 – 612.5	N/A
Spontaneous potential	0 – 456.3	195.0 – 612.5	N/A
Borehole Imaging (OBI, ABI, or FMI)	OBI 11.0 – 160.0 ABI 158.0 – 423.0	N/A	FMI 201.4 – 503.6
Sonic	0 – 424.0	195.0 – 612.5	N/A
Borehole deviation	158.0 – 456.3	N/A	201.4 – 503.6

N/A= not available; OBI = Optical borehole image; ABI = Acoustic borehole image;
 FMI = Formation micro-resistivity image

ANALYSIS OF GEOLOGIC CONDITIONS

Geologic Contacts and Degree of Fracturing

Geologic contacts were picked based on analysis of drill cuttings samples, geophysical logs, and information obtained during drilling. Detailed lithologic descriptions based on drill cuttings samples are provided in **Appendix A**. Geophysical logs were used to confirm the formation depth intervals given in **Table 3** and shown on **Figures 2 and 3**.

**TABLE 3. SUMMARY OF GEOLOGIC UNITS DRILLED FOR
HYDROLOGIC TEST WELLS HRES-14 AND HRES-15**

Geologic Formation	Depth Interval (meters)	
	HRES-14	HRES-15
Apache Leap Tuff – White Unit (Talw)	Not present	0 – 115.8
Apache Leap Tuff – Gray Unit (Talg)	0 – 265.2	115.8 – 253.0
Apache Leap Tuff – Brown Unit (Talb)	265.2 – 413.5	253.0 – 496.4
Apache Leap Tuff – Vitrophyre (Talv)	trace	496.4 – 499.2
Apache Leap Tuff – Basal tuff (Talbt)	413.5 – 451.1	499.2 – 536.2
Tertiary Early Sedimentary (Tes)	trace	536.2 – 540.8
Tertiary Early Volcanics (Tev)	451.1– 500.8	540.8 – 598.5
Whitetail Conglomerate (Tw)	N/A	598.5 – 615.1

N/A = not applicable

Fracture summary logs were prepared using geophysical logs including imaging logs (ABI, OBI, or FMI), sonic, and E-logs. Where available, the imaging logs were the primary sources for the fracture summary logs. If imaging logs were not available, sonic logs were used to classify fractures. E-logs were used to confirm fracture zones. Fractures were qualitatively classified as minor, moderate, or major based on inspection of the logs. Minor fractures include joints and flow layer margins with no mineral filling generally less than 1 inch across. Moderate fractures include joints and faults with mineral filling or open voids ranging from about 1 to 6 inches across. Major fractures include faults or fault zones with mineral filling or open voids larger than about 6 inches across. Where imaging logs were not available, fractures zones were assigned using the sonic log to zones where acoustic travel time was larger than background. Intensity of the fracture was assigned based upon thickness of the anomalous zone. Major fractures were assigned to wide zones of slower acoustic travel. Fracture summary logs are shown on **Figures 2 and 3**.

Apache Leap Tuff (Tal)

At HRES-14, the Tal is 451.1 meters thick and consists of Gray Unit (Talg) from 0 to 265.2 meters bls, Brown Unit (Talb) from 265.2 to 413.5 meters bls, and basal tuff (Talbt) from 413.5 to 451.1 meters bls. A trace amount of vitrophyre (Talv) was noted in the drill cuttings sample collected between 411.5 and 414.5 meters bls at HRES-14. The Talg, Talb and Talbt are dacite porphyry tuff with phenocrysts of potassium and plagioclase feldspar, quartz, and biotite, and trace amounts of pumice and lithic fragments. The Talg is a welded crystal-rich tuff with approximately 60 percent phenocrysts and 40 percent reddish-brown cryptocrystalline groundmass. The Talb is a densely welded crystal-rich tuff with approximately 55 percent phenocrysts and 45 percent reddish-brown glassy to cryptocrystalline groundmass. The Talbt is unwelded and has approximately 70 percent light gray aphanitic groundmass and 30 percent

phenocrysts. A zone of glassy eutaxitic tuff and quartz was encountered within the Talbt at HRES-14 from 420.6 to 423.7 meters bls.

At HRES-14, fracturing in the Tal was indicated by fracture-fill minerals (calcite, quartz, and gypsum) and mineral staining (iron oxide and manganese oxide) on fracture surfaces. Trace evidence of fracturing was noted in drill cuttings for the entire interval of Tal. The ABI log indicates that fractures are common throughout the Tal and that most of the fractures are low angle with some high angle features. It also indicates very dense fracturing from approximately 297.6 to 450.4 meters bls. The ABI log was not collected below a depth of 450.4 meters bls due to fill at the bottom of the borehole. In the unsaturated portion of the Tal, the OBI log indicates common minor to moderate fracturing with two major fractures. The fracture summary log for HRES-14 is shown on **Figure 2**.

At HRES-15, the Tal is 536.2 meters thick and consists of White Unit (Talw) from land surface to 115.8 meters bls, Talg from 115.8 to 253.0 meters bls, Talb from 253.0 to 496.4 meters bls, Talv from 496.4 to 499.2 meters bls, and Talbt from 499.2 to 536.2 meters bls. The Talw is a dacite porphyry tuff and consists of approximately 65 percent pinkish-gray to white groundmass and 35 percent phenocrysts. The Talg is a welded crystal-rich tuff with approximately 65 percent pinkish-gray to reddish-gray cryptocrystalline groundmass and 35 percent phenocrysts. The Talb is a densely welded crystal-rich tuff with approximately 70 percent reddish-brown cryptocrystalline groundmass and 30 percent phenocrysts. The Talv has a black glassy groundmass and the same phenocryst assemblage as the tuff units. The Talbt is unwelded tuff with approximately 65 percent pink and pinkish-brown aphanitic groundmass and 35 percent phenocrysts.

At HRES-15, fracturing in the Tal was indicated by fracture-fill minerals (calcite and gypsum) and mineral staining (iron oxide and manganese oxide) on fracture surfaces. The FMI log indicates that minor and moderate fractures are common throughout the Tal and that most of the fractures are low angle. The FMI log shows overall major fracturing for the following depth intervals: 212.3 to 224.2, 226.3 to 234.5, 261.0 to 264.2, and 328.4 to 334.5 meters bls. These intervals correspond to areas of increased borehole diameter observed on the caliper log. The fracture summary log for HRES-15 is shown on **Figure 3**.

Tertiary Early Sediments (Tes)

At HRES-14, the sample for the depth interval from 451.1 to 454.1 meters bls contains 10 percent Tes. The Tes is composed of silty tuffaceous sandstone. At HRES-15, the Tes is 4.6 meters thick and was encountered in the depth interval from 536.2 to 540.8 meters bls. The Tes is a moderately to well lithified matrix-supported conglomerate.

Tertiary Early Volcanics (Tev)

At HRES-14, the Tev is at least 49.7 meters thick and was encountered in the depth interval from 451.1 to 500.8 meters bls. The Tev consists of very dark gray and black amygdaloidal basalt. Amygdules contain trace unidentified teal green mineral and white zeolite.

Evidence of fracturing in the Tev at HRES-14 was noted in drill cuttings by the presence of very trace calcite and quartz crystals, and mineral staining (iron oxide) on fracture surfaces. Geophysical logs were not obtained for the Tev due to unstable borehole conditions in this interval.

At HRES-15, the Tev is 57.7 meters thick and was encountered in the depth interval from 540.8 to 598.5 meters bls. The Tev consists of black to dark gray amygdaloidal basalt. Amygdules contain trace unidentified teal green mineral.

Fracturing at HRES-15 within the Tev was noted in drill cuttings by the presence of very trace quartz crystals and mineral staining (iron oxide). The sonic log indicates a few zones of minor and moderate fracturing. Moderate fracturing is indicated on the log for the following depths: 589.5 to 591.5, 594.5 to 595.5, and 598.0 to 598.8 meters bls (**Figure 3**). The deepest of the fractures occurs at the contact with the Tw.

Whitetail Conglomerate (Tw)

The upper 16.6 meters of the Tw was penetrated at HRES-15 and included Conglomerate Unit (Tw3) only. At HRES-15, Tw3 consists of moderately lithified clast-supported conglomerate. The contact between the Tev and the Tw at a depth of 598.5 meters bls was confirmed by a decrease in normal resistivity and single point resistance. Evidence of fracturing was not indicated in drill cuttings samples or on the geophysical logs.

WELL CONSTRUCTION

Construction at HRES-14 and HRES-15 began with installation of 12-1/4-inch diameter blank steel surface casing. At HRES-14, 12.2 meters of surface casing was installed and cemented in place, and at HRES-15, 18.3 meters of surface casing was installed. The production intervals for the wells were constructed using 4-1/2-inch outside diameter, blank and perforated, flush-threaded steel casing. Perforations are 1/8-inch wide by 3-inch long machine-cut slots, two slots per round, four rounds per foot, staggered (8 slots per foot). The bottom joint of casing was torch cut, tapered, and welded closed. A summary of casing installation is provided in **Table 4**.

TABLE 4. SUMMARY OF 4-INCH CASING INSTALLATION DEPTHS FOR HYDROLOGIC TEST WELLS HRES-14 AND HRES-15		
	HRES-14	HRES-15
Perforated Interval(s) (meters, bls)	293.1 – 439.0	206.9 – 466.3 533.4 – 596.7
Total Casing Depth (meters)	445.1	602.5

Materials installed in the annulus included 1/4-inch to 3/8-inch gravel pack, 3/8-inch bentonite chips, 8x12 silica sand, and cement-bentonite grout. All annular materials were installed using a tremie pipe. Annular bentonite seals at HRES-15 were placed above and below the lower perforated interval to ensure isolation of the aquifer zones. Gravel pack at HRES-15 was capped at the top and bottom of the interval with silica sand to minimize intrusion of bentonite from the seal into the gravel pack. Schematic diagrams of well construction are shown on **Figures 2 and 3**.

Surface completions consist of an extension of the 12-inch steel surface casing to approximately 1 meter above land surface. The casing extension was cemented in place and secured with a locking cap. Horizontal and vertical well coordinates for the top of surface casing and top of the well caps at HRES-14 and HRES-15 were surveyed by Civiltec Engineering, Inc. of Phoenix, Arizona, on June 2 and August 8, 2011, respectively. Survey data and computed land surface elevations are provided in **Table 5**.

TABLE 5. SUMMARY OF SURVEY RESULTS FOR HYDROLOGIC TEST WELLS HRES-14 AND HRES-15		
	HRES-14	HRES-15
	(meters)	(meters)
Easting	497632.963	497608.728
Northing	3687525.742	3685723.671
Elevation Top of 12-inch Surface Casing	1285.037	1315.498
Elevation Land Surface	1283.91	1314.61

Datum: UTM Zone 12 North (NAD27)-NGVD29

PUMP INSTALLATION AND INSTRUMENTATION

Dedicated pump assemblies were installed in hydrologic test wells HRES-14 and HRES-15 by Duncan Pump, of Phoenix, Arizona on June 7 and December 8, 2011, respectively. The wells are equipped with stainless steel Grundfos electric pumps and motors. The wells are equipped with 1-inch PVC sounder access tubes which extend from the wellhead to the top of the pump. The sounder access tubes are capped on the bottom and factory slotted in the lowermost 6.1 meters. The pump, motor, and column pipe are suspended from a steel and rubber sanitary well seal installed at the wellhead. Details for each well are described below.

Well HRES-14 was equipped with a Model 16S50-38 pump with a 5-horsepower, 460-volt, three-phase Model MS4000 electric motor (Product No. 79354509). The pump was installed on 1-1/4-inch galvanized steel API column pipe with galvanized steel couplings at a depth of 275.5 meters bls. A Level TROLL 500 pressure transducer datalogger (S/N 181373; 300 psi, non-vented), manufactured by In-Situ Inc., of Ft. Collins, Colorado is installed at HRES-14.

Well HRES-15 was equipped with a Model 25S75-39 pump with a 7.5-horsepower, 460-volt, three-phase Model MS4000 electric motor (Product No. 79355511). The pump was installed on 1-1/2-inch galvanized steel API column pipe with galvanized steel couplings at a depth of 225.6 meters bls. A Level TROLL 500 (S/N 194555; 100 psi, non-vented) is installed at HRES-15.

HYDRAULIC TESTING

Initial characterization of the ALT aquifer at well HRES-14 was accomplished by conducting airlift tests in the open borehole and in the cased well. Following installation of dedicated pumping equipment, a constant-rate pumping test was conducted. At well HRES-15, an open borehole and a cased well airlift test were conducted. A constant-rate pumping test will be conducted in early 2012. Drawdown data were analyzed using the Cooper-Jacob (1946) drawdown method and recovery data were analyzed using the Theis (1935) recovery method. Both methods were implemented in the computer-based analytical aquifer test software AQTESOLV® for Windows, version 4.50.004 (Glenn M. Duffield, HydroSOLVE, Inc., 2008). Operational details and results of testing are included below.

Airlift Tests

Short-term airlift tests were conducted at HRES-14 and HRES-15 during drilling operations and following well construction. Discharge volumes and airlift rates were calculated by periodic measurement of storage tank levels. Due to the discharge head configuration, groundwater levels could not be measured during airlift pumping; however, groundwater level was measured prior to each test and during the recovery period. During recovery, water level

was measured through the open airline (dual-wall drill pipe or AQ drill pipe) using an electric water level sounder.

HRES-14 Open Borehole Airlift Test During Drilling Operations

A 4-hour airlift test was conducted to investigate hydraulic parameters and water quality in the ALT aquifer prior to drilling below the Tal. The test interval extended from non-pumping water level to 399.3 meters bls. Depth to pre-pumping water level was 161.5 meters bls. Airlifting started at 21:34 on March 25, and stopped at 01:34 on March 26, 2011. The discharge rate was initially erratic but became more stable after the first 90 minutes of airlifting. For the first 90 minutes of the test, the discharge rate ranged between 2.4 and 6.5 L/s with an average of 4.0 L/s. For the remainder of the test (90 to 240 minutes) the discharge rate ranged between 2.5 and 3.4 L/s with an average of 3.0 L/s. Average discharge rate for the entire test was 3.6 L/s. A graph of recovery data and analysis are shown on **Figure 4**. Straight-line analysis using the Theis (1935) recovery method yields an estimated transmissivity of 17 m²/d. Operational details and test results are given in **Table 6**.

HRES-14 Cased Well Airlift Test

Following casing installation at well HRES-14, an approximately 4-hour airlift test was conducted to develop the well and to investigate hydraulic parameters and water quality in the ALT aquifer at this location. Screened interval is from 293.1 to 439.0 meters bls. Depth to pre-pumping water level was 152.9 meters bls. Airlifting started at 02:57 and stopped at 06:59, on April 2, 2011. The discharge rate steadily decreased from approximately 4.8 to 0.6 L/s; average rate was approximately 1.1 L/s. At the end of the recovery period, residual drawdown was approximately 9 meters. A graph of the recovery data is shown on **Figure 5**. The cased well airlift test did not yield data amenable to analysis using straight-line methods. Operational details are provided in **Table 6**.

HRES-15 Open Borehole Airlift Test During Drilling Operations

An approximately 3-hour airlift test was conducted to investigate hydraulic parameters and water quality in the ALT aquifer prior to drilling below the Tal. The test interval extended from non-pumping water level to 499.9 meters bls. Depth to pre-pumping water level was 195.9 meters bls. Airlifting started at 00:20 and stopped at 03:26, on June 2, 2011. The discharge rate was erratic due to surging and ranged from 1.0 to 24.5 L/s; average rate was 5.7 L/s. A very limited data set was collected during recovery due to technical difficulties; data are not amenable to analysis. Operational details are provided in **Table 6**.

HRES-15 Cased Well Airlift Test

Following casing installation at well HRES-15, airlift pumping was conducted to remove drilling fluid from the hole and develop the well. After this initial phase of development, water levels were allowed to stabilize, and an approximately 4-hour airlift test was conducted to further

develop the well and to investigate hydraulic parameters and water quality in the Tal, Tes, and Tev at this location. Screened intervals are from 206.9 to 466.3 meters bls in the Tal, and 533.4 and 596.7 meters bls in the Tes and Tev. Depth to pre-pumping water level was 195.8 meters bls. Airlifting began at 06:00 and stopped at 09:51, on June 16, 2011. The discharge rate ranged from 0.8 to 1.8 L/s; average rate was 1.2 L/s. A graph of the recovery data and analysis is shown on **Figure 6**. Straight-line analysis using the Theis (1935) recovery method yields an estimated transmissivity of 90 m²/d. Operational details and test results are summarized in **Table 6**.

TABLE 6. SUMMARY OF AIRLIFT TESTS AT HYDROLOGIC TEST WELLS HRES-14 AND HRES-15					
Well Identifier	Test Interval (meters, bls), Test Type, Test Date	Test Duration (minutes)	Pre-pumping Water Level (meters, bls)	Average Discharge Rate (L/s)	Transmissivity (m²/d)
HRES-14	161.5 – 399.3 open borehole 25-26 Mar 2011	240	161.5	3.6	17
HRES-14	293.1 – 439.0 cased well 02 Apr 2011	242	152.9	1.1	Not calculated
HRES-15	195.9 – 499.9 open borehole 02 Jun 2011	186	195.9	5.7	Not calculated
HRES-15	206.9 – 466.3 533.4 – 596.7 cased well 16 Jun 2011	231	195.8	1.2	90

HRES-14 Constant-rate Pumping Test

A 48-hour constant-rate pumping test was conducted in cased well HRES-14 during the period from July 13 through 15, 2011. Discharge assembly included a Blancett digital flow meter, a pressure gage, a gate valve to adjust flow rate, and a hose bib for obtaining water samples. Water pumped from HRES-14 was discharged to an un-named ephemeral wash in compliance with Arizona Department of Environmental Quality DeMinimis discharge regulations (area-wide discharge authorization AZDGP-60821).

During constant-rate testing, water levels were measured and recorded using a dedicated Level TROLL. Water levels were also measured periodically using an electric sounder. During testing, pumping rate and line pressure were measured as well as water quality parameters. Sand content of the water was measured using a 1-liter calibrated Imhoff cone. After pumping stopped, water level recovery was measured for a period equal to the pumping period.

Depth to pre-pumping water level was 162.6 meters bls. Pumping started at 13:15 on July 13, and stopped at 13:15 on July 15, 2011. The discharge rate ranged from 0.4 to 1.0 L/s; average pumping rate was 0.8 L/s. A graph of the data is shown on **Figure 7**. Toward the end of the pumping period the sample port was opened in order to collect a hydrochemistry sample which caused a spike in drawdown. Maximum drawdown at the well (disregarding the spike caused by sampling) was approximately 61 meters. Straight-line analysis of drawdown data using the Cooper-Jacob (1946) drawdown method yields an estimated transmissivity of 25 m²/d; analysis of recovery data using the Theis (1935) recovery method yields an estimated transmissivity of 70 m²/d. The slope of the recovery trend is very flat and it is possible that recovery was affected by local recharge of water from the pumping test. For this reason the transmissivity estimate yielded by analysis of the recovery data may be erroneously high; the transmissivity estimate yielded by analysis of drawdown data is likely the more reliable estimate. Estimated hydraulic conductivity based on transmissivity of 25 m²/d and saturated thickness of 145.9 meters (saturated perforated interval) is 2×10^{-4} cm/s. Operational details and test results are given in **Table 7**.

TABLE 7. SUMMARY OF CONSTANT-RATE TEST CONDUCTED IN HYDROLOGIC TEST WELL HRES-14	
WELL IDENTIFIER	HRES-14
Description of Hydrologic Testing Zone (meters bls)	Cased well (total depth 445.1 meters): perforated interval 293.1 to 439.0 meters bls
Test Type	Constant-rate
Geologic Units in Testing Zone	Tal
Test Duration (hours)	48
Pre-pumping Depth to Water (meters bls)	162.6
Average Discharge Rate (L/s)	0.8
Maximum Drawdown (meters)	61
Transmissivity from drawdown data (m²/d)	25
Saturated thickness (meters)	145.9 (perforated interval)
Hydraulic Conductivity (cm/s)	2×10^{-4}

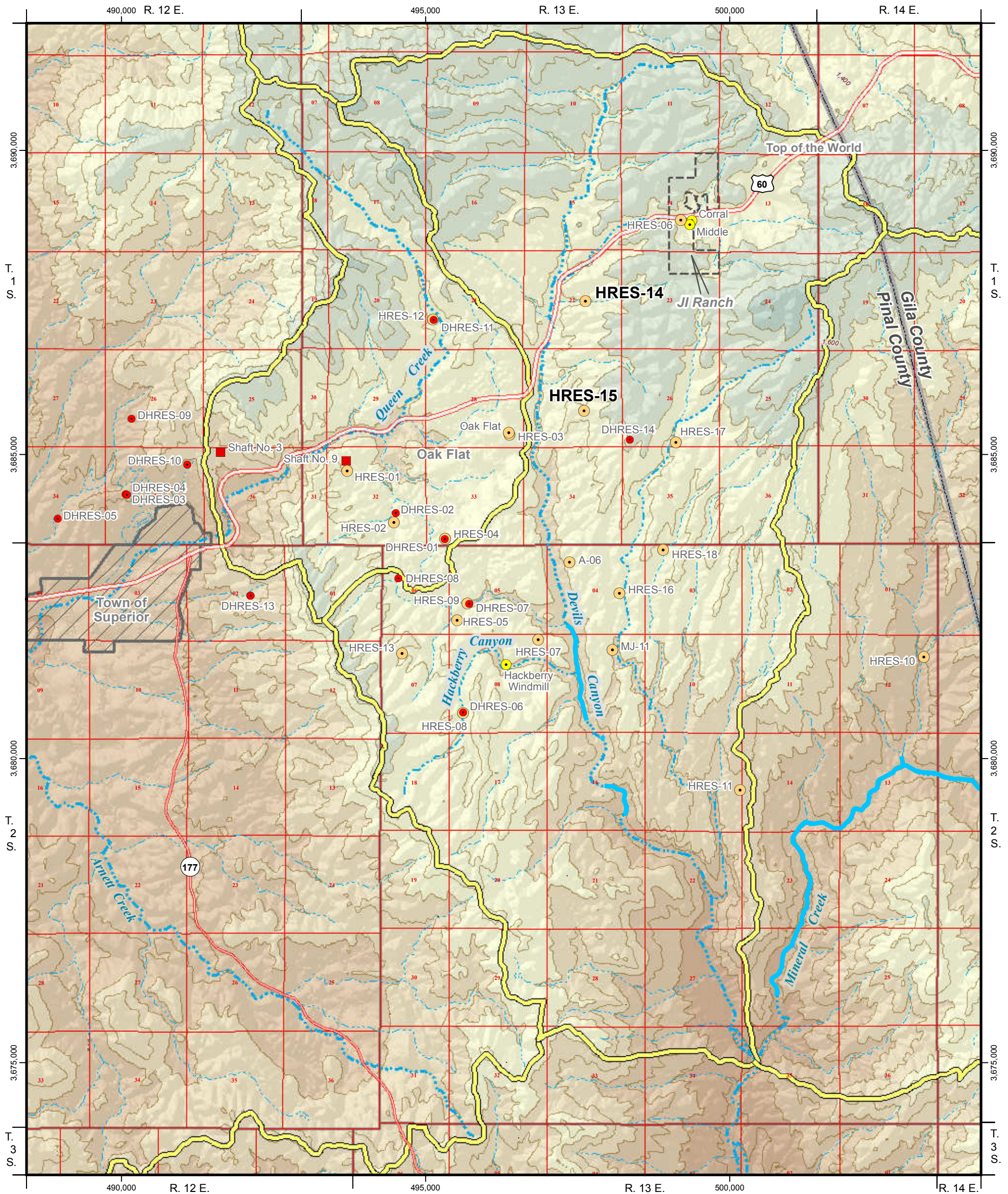
GROUNDWATER SAMPLING

Water quality parameters (temperature, pH, and specific conductance) were measured and recorded during testing using a Myron-L parameter meter that was calibrated prior to each test. Groundwater samples were collected near the end of each test. Sample identifiers and water quality parameters for samples collected during testing operations are given in **Table 8**. Data from groundwater samples collected toward the end of airlift tests are generally used as screening samples or to obtain an initial idea of water quality. Data considered to be most representative of the hydrochemical composition of formation water are those generated from samples collected at the end of pumping tests. Results of water sample analyses will be provided and discussed in a future report.

TABLE 8. WATER SAMPLES COLLECTED DURING TESTING OPERATIONS AT HYDROLOGIC TEST WELLS HRES-14 AND HRES-15						
Sample Identifier	Sample Description	Date	Time	Field Parameters		
				Temp (°C)	pH (s.u.)	Specific Conductance (µS/cm)
RESE-1003117	HRES-14 during drilling at 399.3 meters	26-Mar-11	01:00	24.0	7.93	234.9
RESE-1003118	HRES-14 cased airlift	02-Apr-11	06:45	23.4	8.31	417.9
RESE-1003126	HRES-15 during drilling at 499.9 meters	02-Jun-11	03:20	24.3	8.02	277.3
RESE-1003132	HRES-15 cased airlift	16-Jun-11	09:20	23.0	8.23	422.4
RESE-1003147	HRES-14 48-hour constant-rate test	15-Jul-11	12:15	26.5	7.15	280.6

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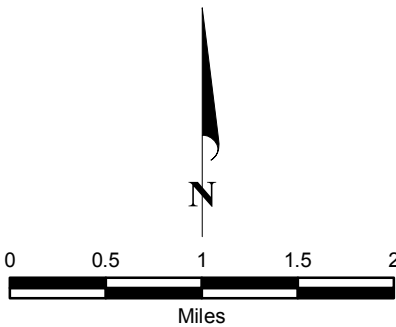


EXPLANATION

- 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)

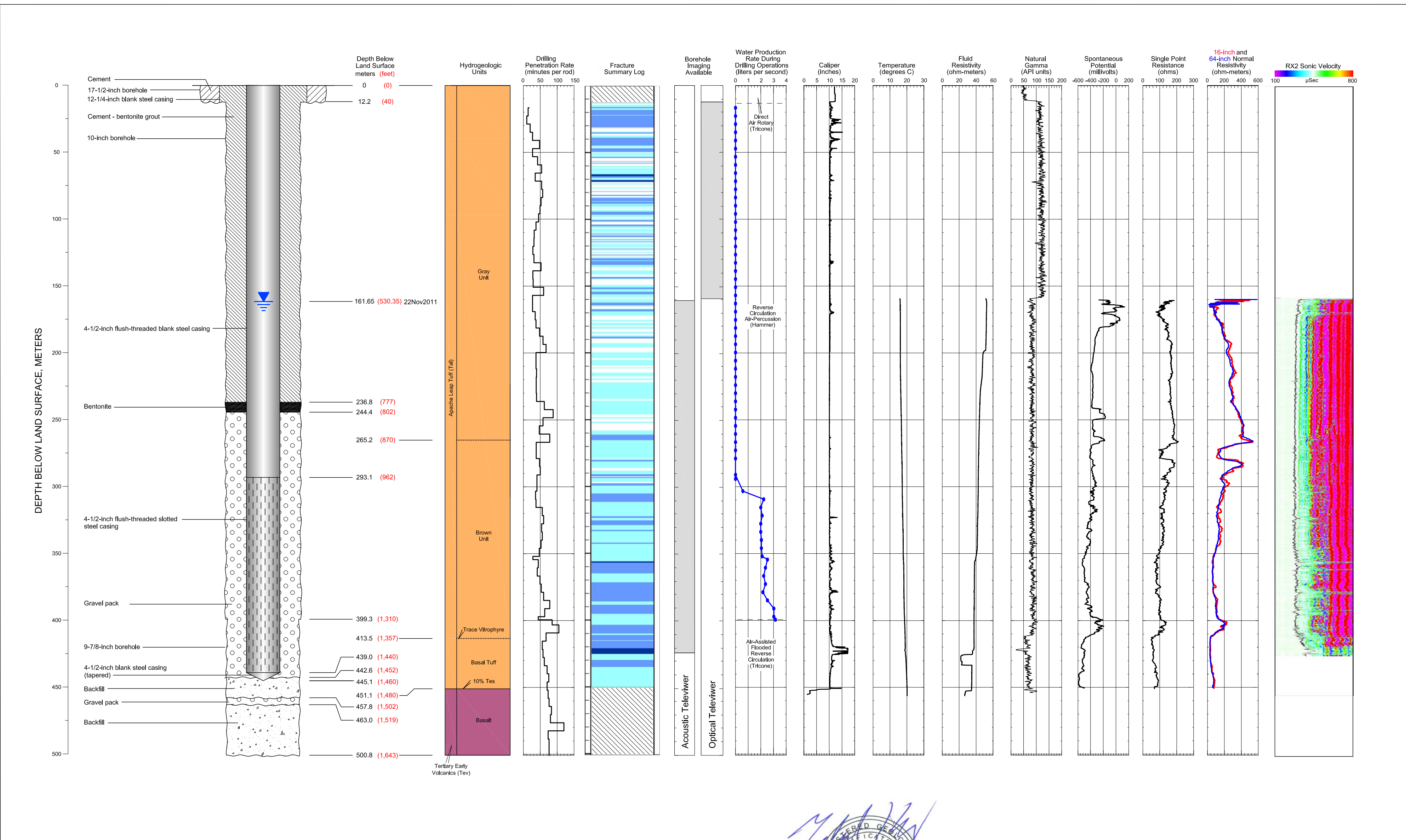
1,600 - 1,800
1,400 - 1,600
1,200 - 1,400
1,000 - 1,200
800 - 1,000
600 - 800



HRES-14, HRES-15
WELL LOCATIONS

**MONTGOMERY
& ASSOCIATES**
Water Resource Consultants

2012
FIGURE 1



CADASTRAL: (D-1-13)22dba	ADWR NO: 55-912993
NORTHING: 3687525.742	EASTING: 497632.963
LAND SURFACE ELEVATION: 1283.91	
DATUM: NAD 27	
HORIZONTAL: UTM 12	
VERTICAL: NGVD 29 METERS	

Non-Pumping Water Level

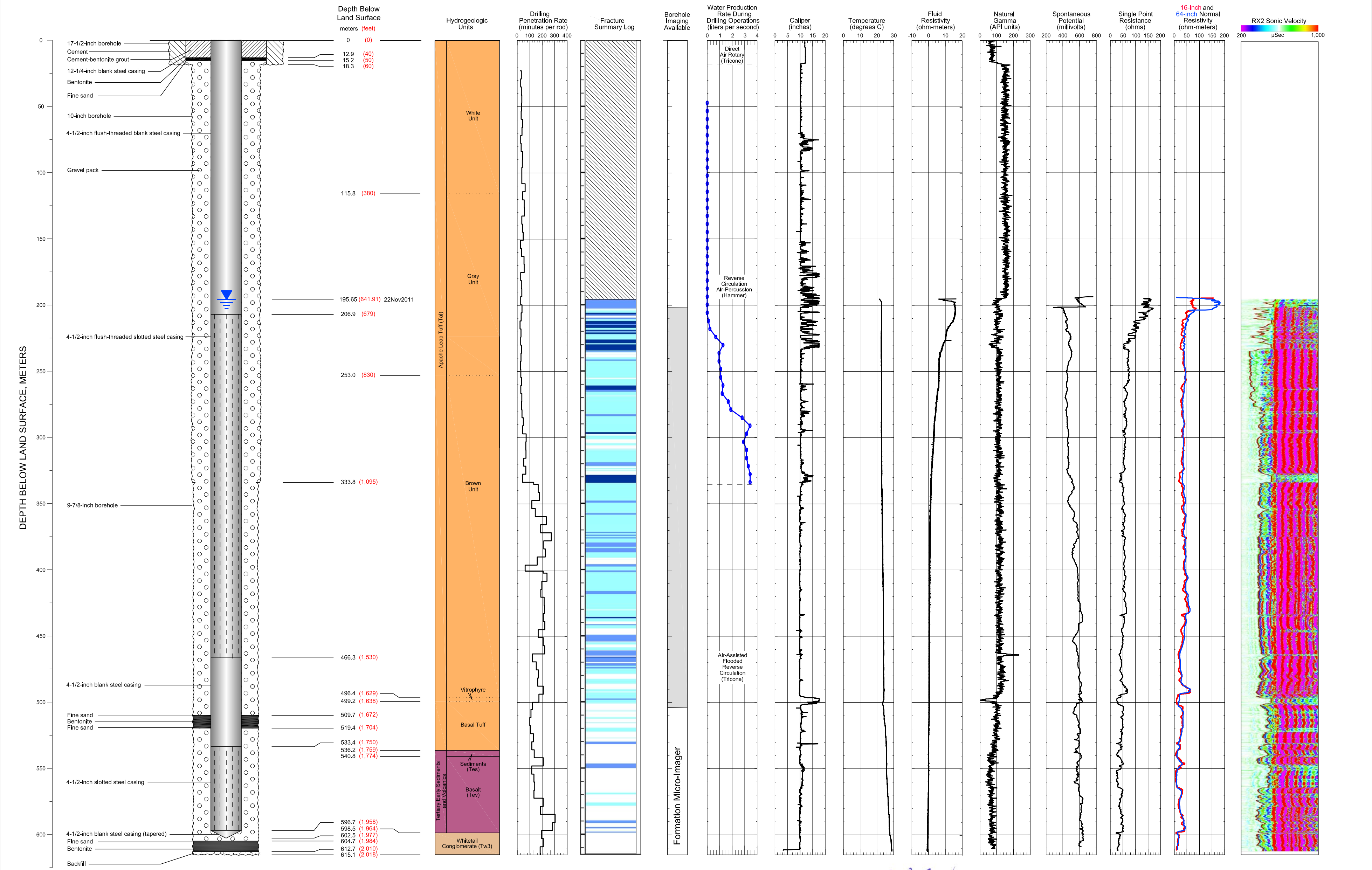
EXPLANATION

- No Data
- No Fracturing Evident
- Minor Fracturing
- Moderate Fracturing
- Major Fracturing


HRES-14
SCHEMATIC DIAGRAM OF
WELL CONSTRUCTION






Version: Jan. 5, 2012

FIGURE 2





CADASTRAL: (D-1-13)27dbc	ADWR NO: 55-913292
NORTHING: 3685723.671	EASTING: 497608.728
LAND SURFACE ELEVATION: 1314.61	
DATUM: NAD 27	
HORIZONTAL: UTM 12	
VERTICAL: NGVD 29 METERS	

 Non-pumping water level

EXPLANATION	
	No Data
	No Fracturing Evident
	Minor Fracturing
	Moderate Fracturing
	Major Fracturing





Water Resource Consultants

HRES-15

SCHEMATIC DIAGRAM OF WELL CONSTRUCTION

Version: Jan. 5, 2012

FIGURE 3

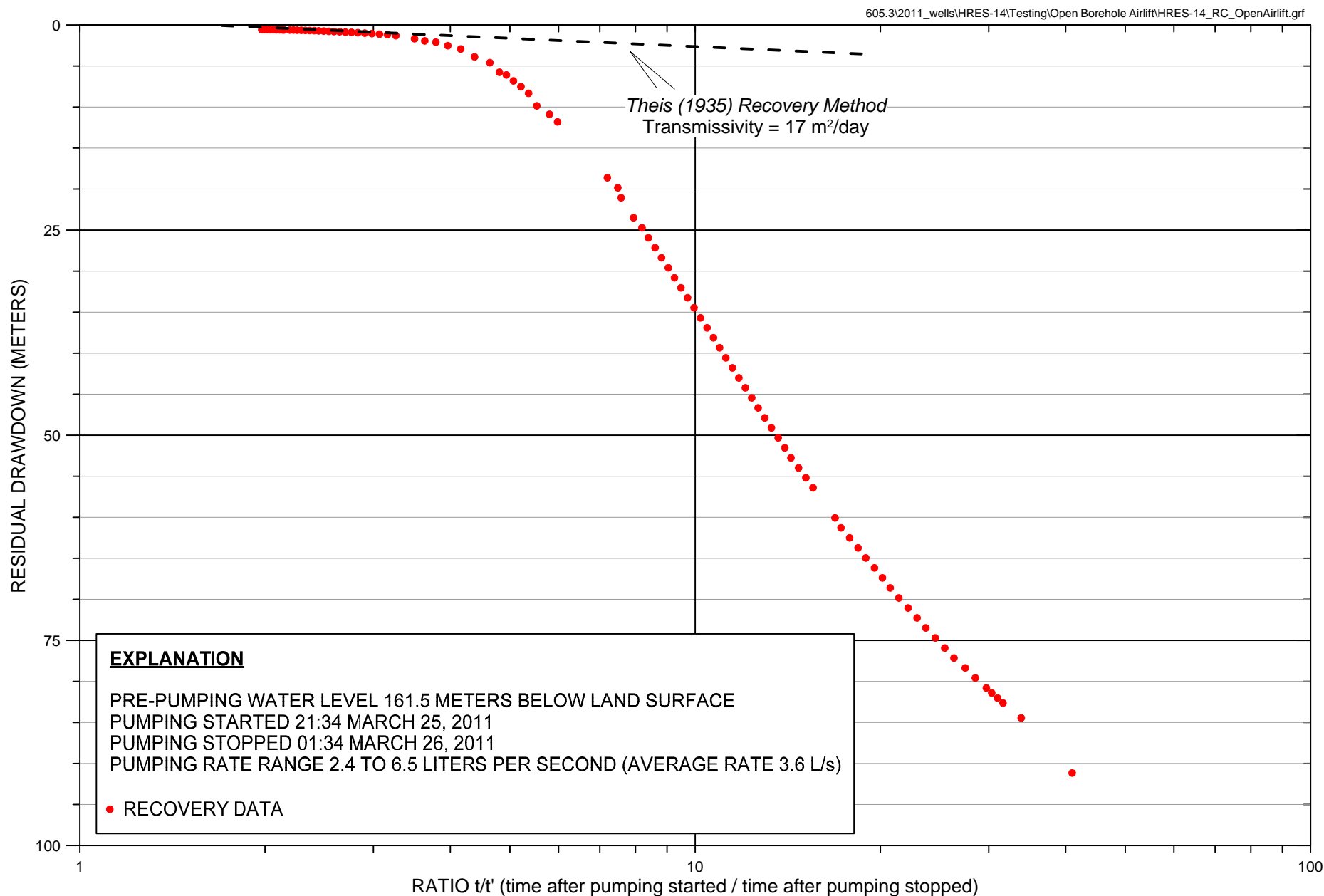
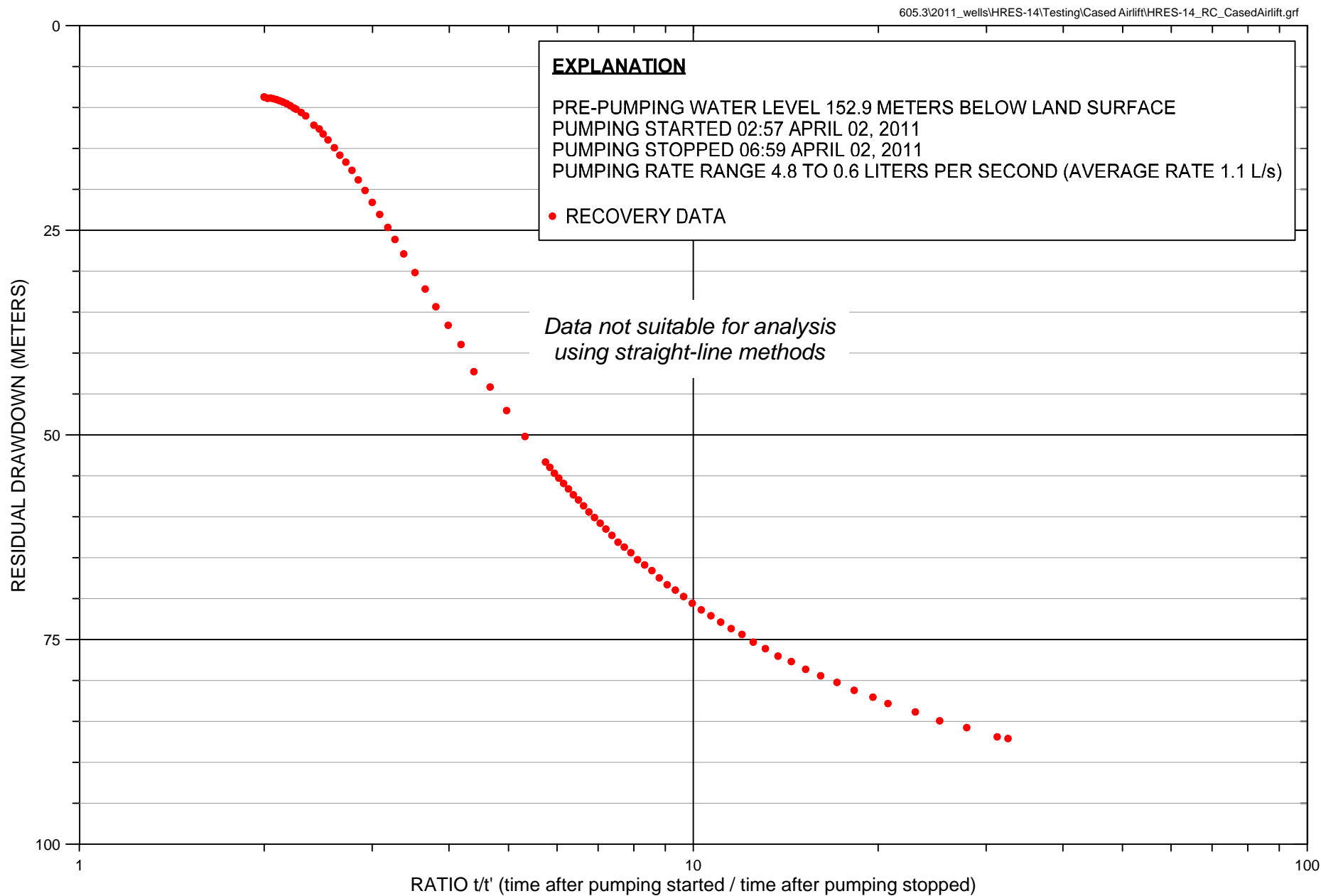
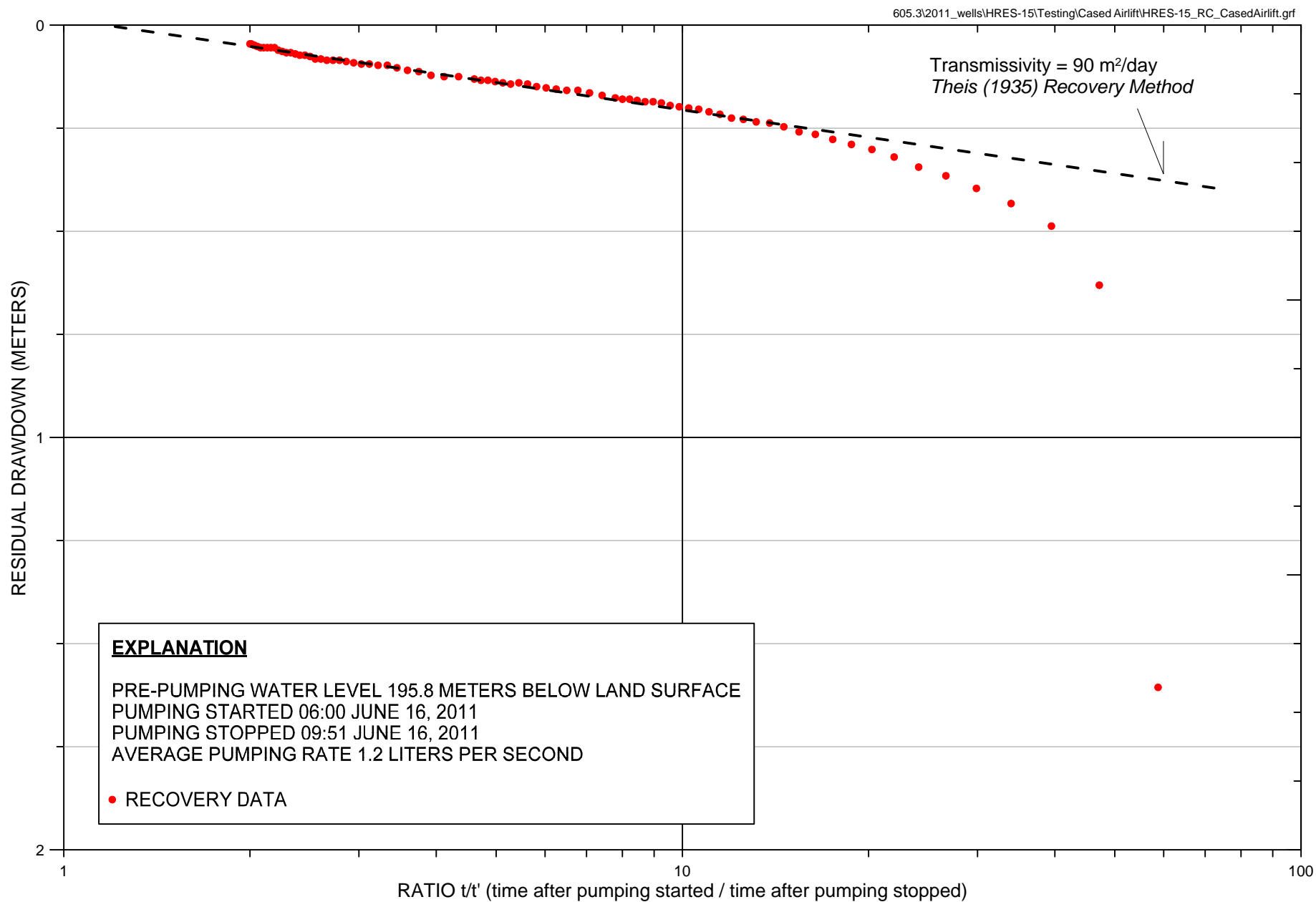


FIGURE 4. RECOVERY GRAPH FOR 4-HOUR OPEN BOREHOLE AIRLIFT TEST AT WELL HRES-14 (OPEN BOREHOLE DEPTH 399.4 METERS BLS), RESOLUTION PROJECT



**FIGURE 5. RECOVERY GRAPH FOR 4-HOUR AIRLIFT TEST AT CASSED WELL HRES-14
RESOLUTION PROJECT**



**FIGURE 6. RECOVERY GRAPH FOR 4-HOUR AIRLIFT TEST AT CASSED WELL HRES-15
 RESOLUTION PROJECT**

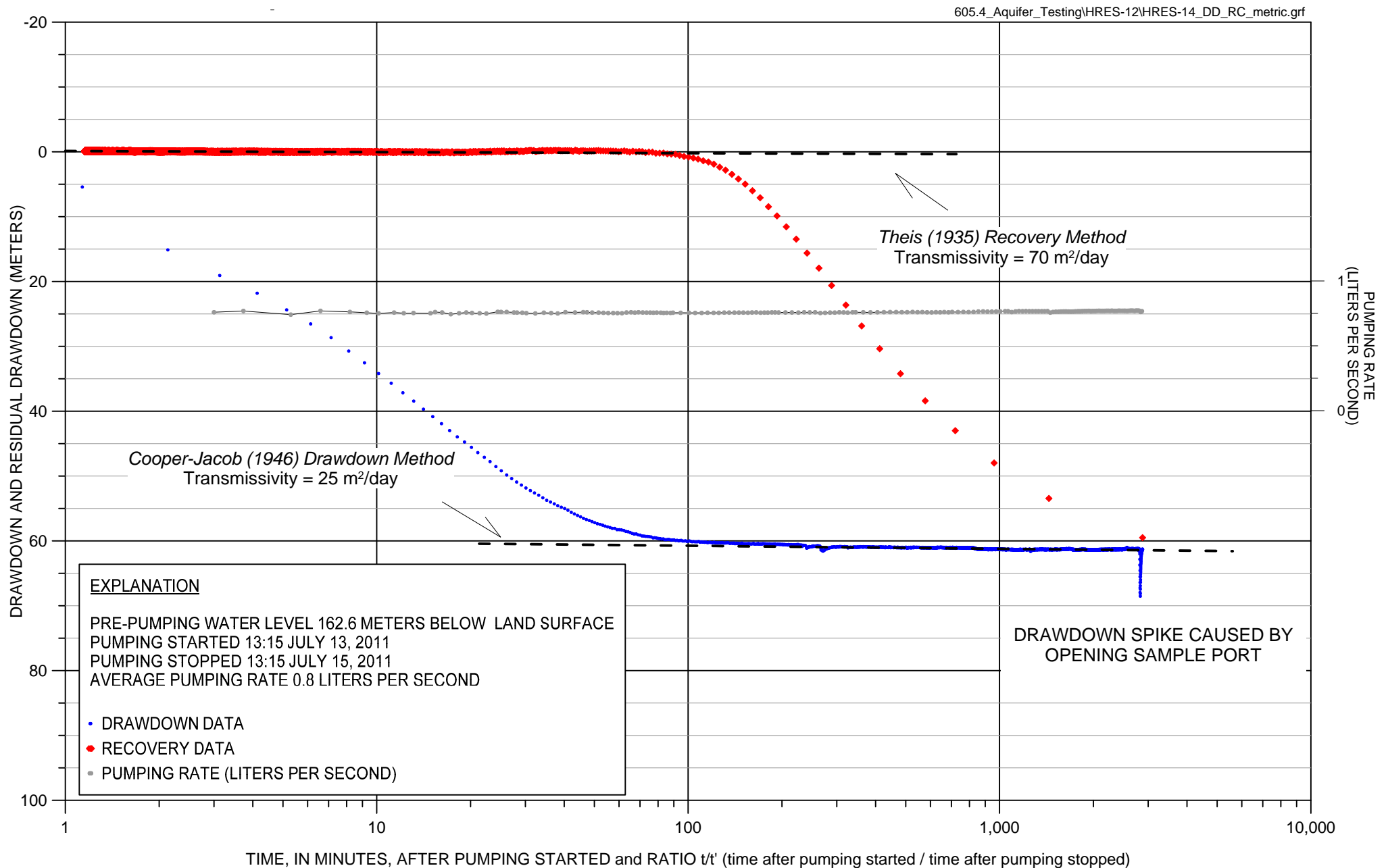


FIGURE 7. DRAWDOWN AND RECOVERY GRAPH FOR PUMPED WELL HRES-14 DURING 48-HOUR CONSTANT-RATE PUMPING TEST, RESOLUTION PROJECT

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

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
0 - 10	0.0 - 3.0	Gray Unit; reddish brown [2.5YR5/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 4 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 40% reddish-brown, aphanitic to cryptocrystalline groundmass; very trace lithic fragments; reaction to acid: none	weathered, some iron oxide (hematite) on biotite	DIRECT AIR ROTARY; Munsell Color Version: 2000 revised; subangular to subrounded chips up to 3.1 cm
10 - 20	3.0 - 6.1	Gray Unit; reddish brown [2.5YR5/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown, aphanitic to cryptocrystalline groundmass, trace pink groundmass; trace light gray pumice fragments; very trace lithic fragments; reaction to acid: none	weathered, trace brown clayey silt on chips, very trace iron oxide (hematite) on biotite	subangular to subrounded chips up to 3.4 cm
20 - 30	6.1 - 9.1	Gray Unit; reddish brown [2.5YR5/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass, trace pink groundmass; trace light gray pumice fragments; very trace lithic fragments of gray quartzite and red siltstone; reaction to acid: none	weathered, trace brown clayey silt on chips, trace iron oxide (hematite) on biotite	subangular to subrounded chips up to 2.4 cm
30 - 40	9.1 - 12.2	Gray Unit; reddish brown [2.5YR5/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass, trace orange groundmass; very trace light gray pumice fragments; very trace lithic fragments of gray quartzite and red siltstone; reaction to acid: none	trace iron oxide (hematite)	subangular to subrounded chips up to 1.2 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL HRES-14
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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
40 - 50	12.2 - 15.2	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 55% up to 2 mm sized phenocrysts of 60% anhedral, white feldspar, 35% translucent quartz, 5% euhedral, bronzy to black biotite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass, trace orange groundmass; trace light gray and gray pumice fragments; reaction to acid: none	trace iron oxide (hematite and very trace limonite), very trace quartz vein	DUAL-WALL REVERSE CIRCULATION AIR HAMMER; subangular to subrounded chips up to 1.3 cm
50 - 60	15.2 - 18.3	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass; trace light gray and brownish-gray pumice fragments; trace lithic fragments of gray quartzite and reddish-brown siltstone; reaction to acid: none	trace iron oxide (hematite) on biotite, very trace green silty clay	subangular to subrounded chips up to 1.0 cm
60 - 70	18.3 - 21.3	Gray Unit; weak red [10R5/3]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass; trace light gray and brownish-gray pumice fragments; very trace lithic fragments of gray sandy siltstone; reaction to acid: none	trace iron oxide (hematite and very trace limonite)	subangular to subrounded chips up to 2.4 cm
70 - 80	21.3 - 24.4	Gray Unit; weak red [10R5/3]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass; very trace light gray and brownish-gray pumice fragments; very trace lithic fragments of gray sandy siltstone; reaction to acid: none		subangular to subrounded chips up to 1.0 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL HRES-14

Resolution Copper Mining Pinal County, Arizona

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
80 - 90	24.4 - 27.4	Gray Unit; weak red [10R5/3]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass; very trace light gray and brownish-gray pumice fragments; very trace lithic fragments of gray sandy siltstone; reaction to acid: none		subangular to subrounded chips up to 1.1 cm
90 - 100	27.4 - 30.5	Gray Unit; weak red [10R5/3]; well lithified; crystal-rich, porphyritic tuff with 55% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass, very trace orange groundmass; trace lithic fragments of black basalt, tan siltstone and gray quartzite; very trace light gray and brownish-gray pumice fragments; reaction to acid: none	very trace iron oxide (hematite and limonite) on biotite, very trace quartz	subangular to subrounded chips up to 1.4 cm
100 - 110	30.5 - 33.5	Gray Unit; weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass, very trace orange groundmass; very trace light gray pumice fragments; very trace lithic fragments; reaction to acid: none	trace iron oxide (hematite and very trace limonite), trace manganese oxide, very trace nontronite	subangular to subrounded chips up to 0.8 cm
110 - 120	33.5 - 36.6	Gray Unit; weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown and whitish-pink, aphanitic to cryptocrystalline groundmass, very trace orange groundmass; trace lithic fragments of tan siltstone and brownish-gray sandstone; very trace light gray pumice fragments; reaction to acid: none	very trace iron oxide (hematite and limonite), very trace nontronite	subangular to subrounded chips up to 1.0 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL HRES-14
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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
120 - 130	36.6 - 39.6	Gray Unit; weak red [10R5/3]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 45% reddish-brown, aphanitic to cryptocrystalline groundmass, some whitish-pink groundmass; trace light gray pumice fragments; trace lithic fragments of reddish-brown silty sandstone; reaction to acid: none	trace iron oxide (hematite and very trace limonite), very trace manganese oxide, very trace nontronite	subangular to subrounded chips up to 1.4 cm
130 - 140	39.6 - 42.7	Gray Unit; weak red [10R5/3]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 45% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; trace light gray pumice fragments; trace lithic fragments of reddish-brown silty sandstone; reaction to acid: none	trace iron oxide (hematite and very trace limonite), very trace nontronite	subangular to subrounded chips up to 1.1 cm
140 - 150	42.7 - 45.7	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 45% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; trace gray pumice/fiamme fragments; very trace lithic fragments of gray siltstone; reaction to acid: none	trace iron oxide (hematite), very trace nontronite	subangular to subrounded chips up to 1.4 cm
150 - 160	45.7 - 48.8	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of 52% anhedral, white feldspar, 40% translucent quartz, 8% euhedral, bronzy to black biotite, very trace magnetite and 45% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace pumice fragments; very trace lithic fragments; reaction to acid: none	very trace iron oxide (hematite) on biotite, very trace nontronite	subangular to subrounded chips up to 1.0 cm; very trace black rubber

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL HRES-14
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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
160 - 170	48.8 - 51.8	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 45% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; trace gray pumice/fiamme fragments; trace lithic fragments of black basalt; reaction to acid: none	very trace iron oxide (hematite) and biotite, very trace quartz vein	subangular to subrounded chips up to 1.3 cm
170 - 180	51.8 - 54.9	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, trace magnetite and 45% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; trace gray fiamme; very trace lithic fragments of black basalt; reaction to acid: none		subangular to subrounded chips up to 1.7 cm
180 - 190	54.9 - 57.9	Gray Unit; red [10R5/6] and weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 45% reddish-brown, aphanitic to cryptocrystalline groundmass; very trace tuff with purplish-pink groundmass; reaction to acid: none		subangular to subrounded chips up to 1.2 cm
190 - 200	57.9 - 61.0	Gray Unit; red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 55% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 44% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; 1% gray pumice/fiamme; trace lithic fragments; reaction to acid: none		subangular to subrounded chips up to 1.2 cm; very trace black rubber
200 - 210	61.0 - 64.0	Gray Unit; red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; trace lithic fragments of black basalt and gray sandstone; reaction to acid: none	very trace iron oxide (hematite) on biotite	subangular to subrounded chips up to 1.4 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL HRES-14

Resolution Copper Mining Pinal County, Arizona

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
210 - 220	64.0 - 67.1	Gray Unit; red [10R5/6] and weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of 52% anhedral, white feldspar, 38% translucent quartz, 10% euhedral, black biotite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; trace gray fiamme; very trace lithic fragments; reaction to acid: none		subangular to subrounded chips up to 1.7 cm
220 - 230	67.1 - 70.1	Gray Unit; red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; very trace gray fiamme; reaction to acid: none	very trace iron oxide (limonite)	subangular to subrounded chips up to 1.6 cm
230 - 240	70.1 - 73.2	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite (less) and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; very trace gray fiamme; reaction to acid: none		subangular to subrounded chips up to 1.0 cm
240 - 250	73.2 - 76.2	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; very trace gray fiamme; reaction to acid: none	very trace iron oxide (limonite) on biotite	subangular to subrounded chips up to 1.0 cm; very trace black rubber
250 - 260	76.2 - 79.2	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; very trace lithic fragments of black sandstone; reaction to acid: none	very trace quartz	subangular to subrounded chips up to 1.0 cm

LITHOLOGIC DESCRIPTION OF DRILL CUTTINGS FROM HYDROGEOLOGIC TEST WELL HRES-14
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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
260 - 270	79.2 - 82.3	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; very trace lithic fragments; reaction to acid: none		subangular to subrounded chips up to 1.0 cm
270 - 280	82.3 - 85.3	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; very trace lithic fragments; reaction to acid: none	very trace iron oxide (limonite) on biotite, very trace quartz	subangular to subrounded chips up to 0.8 cm
280 - 290	85.3 - 88.4	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, aphanitic to cryptocrystalline groundmass very trace whitish-pink groundmass; very trace lithic fragments; reaction to acid: none	very trace quartz	subangular to subrounded chips up to 1.5 cm
290 - 300	88.4 - 91.4	Gray Unit; weak red [10R5/4] and red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace lithic fragments; reaction to acid: none	very trace iron oxide (limonite) on biotite	subangular to subrounded chips up to 0.9 cm

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APACHE LEAP TUFF - Gray Unit (Talg)				
300 - 310	91.4 - 94.5	Gray Unit; red [10R5/6] and weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace gray fiamme; reaction to acid: none		subangular to subrounded chips up to 1.6 cm
310 - 320	94.5 - 97.5	Gray Unit; red [10R5/6] and weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace gray fiamme; very trace lithic fragments; reaction to acid: none	very trace iron oxide (hematite) around biotite, very trace quartz, very trace weathered out biotite	subangular to subrounded chips up to 1.2 cm
320 - 330	97.5 - 100.6	Gray Unit; red [10R5/6] and weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace gray fiamme; very trace lithic fragments; reaction to acid: none	very trace quartz, very trace nontronite	subangular to subrounded chips up to 1.0 cm
330 - 340	100.6 - 103.6	Gray Unit; red [10R5/6] and weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 34% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; 1% gray fiamme; trace lithic fragments of tan sandstone; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.1 cm

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APACHE LEAP TUFF - Gray Unit (Talq)				
340 - 350	103.6 - 106.7	Gray Unit; red [10R5/6] and weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; trace gray fiamme; reaction to acid: none	trace iron oxide (hematite) around biotite	subangular to subrounded chips up to 1.1 cm
350 - 360	106.7 - 109.7	Gray Unit; weak red [10R5/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace gray pumice/fiamme; reaction to acid: none	very trace quartz	subangular to subrounded chips up to 0.9 cm
360 - 370	109.7 - 112.8	Gray Unit; weak red [10R4/2]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass; trace gray fiamme; reaction to acid: none	very trace iron oxide (hematite) around biotite	subangular to subrounded chips up to 1.2 cm; very trace black rubber
370 - 380	112.8 - 115.8	Gray Unit; weak red [10R4/2] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass; reaction to acid: none		subangular to subrounded chips up to 0.9 cm
380 - 390	115.8 - 118.9	Gray Unit; red [10R5/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass; very trace pumice/fiamme; very trace lithic fragments; reaction to acid: none	trace iron oxide (hematite)	subangular to subrounded chips up to 0.9 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
390 - 400	118.9 - 121.9	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass; very trace pumice/fiamme; very trace lithic fragments of gray quartzite; reaction to acid: none	trace iron oxide (hematite) around biotite	subangular to subrounded chips up to 1.3 cm
400 - 410	121.9 - 125.0	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite (more), very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass; very trace pumice/fiamme; very trace lithic fragments of gray quartzite; reaction to acid: none	very trace quartz	subangular to subrounded chips up to 1.3 cm
410 - 420	125.0 - 128.0	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite (some larger biotite up to 2 mm), very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; trace fiamme; reaction to acid: none		subangular to subrounded chips up to 1.2 cm
420 - 430	128.0 - 131.1	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; trace fiamme; trace lithic fragments of brown siltstone; reaction to acid: none	trace gypsum, very trace iron oxide (hematite), very trace weathered out biotite	subangular to subrounded chips up to 1.4 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
430 - 440	131.1 - 134.1	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; 97% crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; trace lithic fragments of brown siltstone; very trace fiamme; reaction to acid: none	3% white gypsum, very trace iron oxide (hematite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.1 cm
440 - 450	134.1 - 137.2	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; trace lithic fragments of brown siltstone; very trace fiamme; reaction to acid: none	trace gypsum, very trace weathered out biotite	subangular to subrounded chips up to 1.3 cm
450 - 460	137.2 - 140.2	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace fiamme; very trace lithic fragments of brown siltstone; reaction to acid: none	very trace gypsum, very trace weathered out biotite	subangular to subrounded chips up to 1.1 cm
460 - 470	140.2 - 143.3	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; very trace fiamme; very trace lithic fragments of brown siltstone; reaction to acid: none	very trace weathered out biotite	subangular to subrounded chips up to 1.2 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
470 - 480	143.3 - 146.3	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy biotite, very trace magnetite and 35% reddish-brown, aphanitic to cryptocrystalline groundmass, trace whitish-pink groundmass; reaction to acid: none		subangular to subrounded chips up to 1.0 cm
480 - 490	146.3 - 149.4	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 35% reddish-brown, cryptocrystalline groundmass; very trace pumice; very trace lithic fragments; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.2 cm
490 - 500	149.4 - 152.4	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 35% reddish-brown, cryptocrystalline groundmass; very trace pumice; reaction to acid: none	very trace iron oxide (hematite)	subangular to subrounded chips up to 1.2 cm
500 - 510	152.4 - 155.4	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite, very trace amphibole and 35% reddish-brown, cryptocrystalline groundmass; very trace pumice; reaction to acid: none	trace weathered out biotite	subangular to subrounded chips up to 1.0 cm
510 - 520	155.4 - 158.5	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite, very trace amphibole and 35% reddish-brown, cryptocrystalline groundmass, trace whitish-pink groundmass; very trace pumice; reaction to acid: none	trace weathered out biotite, very trace iron oxide (hematite) on biotite	subangular to subrounded chips up to 1.3 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Tal)				
520 - 530	158.5 - 161.5	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 35% reddish-brown, cryptocrystalline groundmass; trace fiamme; reaction to acid: none	very trace iron oxide (hematite), very trace quartz vein	subangular to subrounded chips up to 1.2 cm
530 - 540	161.5 - 164.6	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 63% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 33% reddish-brown, cryptocrystalline groundmass; 4% grayish-tan fiamme; reaction to acid: none	trace iron oxide (hematite and very trace limonite)	subangular to subrounded chips up to 1.2 cm
540 - 550	164.6 - 167.6	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 35% reddish-brown, cryptocrystalline groundmass; trace grayish-tan fiamme; reaction to acid: none		subangular to subrounded chips up to 1.2 cm
550 - 560	167.6 - 170.7	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of 50% anhedral, white feldspar, 47% translucent quartz, 3% euhedral, black biotite and 35% reddish-brown, cryptocrystalline groundmass; very trace grayish-tan fiamme; reaction to acid: none	very trace iron oxide (hematite) on biotite	subangular to subrounded chips up to 1.7 cm; very trace black rubber
560 - 570	170.7 - 173.7	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 35% reddish-brown, cryptocrystalline groundmass; very trace grayish-tan fiamme; very trace lithic fragments; reaction to acid: none		subangular to subrounded chips up to 1.5 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talq)				
570 - 580	173.7 - 176.8	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 35% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; reaction to acid: none	very trace iron oxide (hematite) on biotite	subangular to subrounded chips up to 1.3 cm
580 - 590	176.8 - 179.8	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 65% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 35% reddish-brown, cryptocrystalline groundmass; very trace pumice/fiamme fragments; reaction to acid: none to very weak	trace iron oxide (hematite) on biotite	subangular to subrounded chips up to 1.5 cm
590 - 600	179.8 - 182.9	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 1.5 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite (more), very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace pumice/fiamme fragments; reaction to acid: none		subangular to subrounded chips up to 1.2 cm
600 - 610	182.9 - 185.9	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; trace lithic fragments; very trace pumice/fiamme fragments; reaction to acid: none to very weak		subangular to subrounded chips up to 1.1 cm
610 - 620	185.9 - 189.0	Gray Unit; red [10R4/6] and weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace pumice/fiamme fragments; reaction to acid: none to very weak	very trace iron oxide (hematite) on biotite, very trace calcite chips up to 3 mm	subangular to subrounded chips up to 1.2 cm; very trace black rubber

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
620 - 630	189.0 - 192.0	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace pumice/fiamme fragments; very trace lithic fragments; reaction to acid: none to very weak	trace iron oxide (hematite) around biotite, very trace calcite chips up to 4 mm, very trace weathered out biotite	subangular to subrounded chips up to 1.2 cm
630 - 640	192.0 - 195.1	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass, very trace whitish-pink groundmass; very trace pumice/fiamme fragments; very trace lithic fragments; reaction to acid: none to very weak	trace white calcite chips up to 3 mm	subangular to subrounded chips up to 1.1 cm
640 - 650	195.1 - 198.1	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace pumice/fiamme fragments; reaction to acid: none to very weak	very trace iron oxide (limonite), very trace iron oxide (hematite) around biotite, very trace calcite chips up to 3 mm	subangular to subrounded chips up to 1.4 cm
650 - 660	198.1 - 201.2	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; reaction to acid: none to very weak	very trace iron oxide (hematite and limonite) around biotite	subangular to subrounded chips up to 1.4 cm; new bit
660 - 670	201.2 - 204.2	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; reaction to acid: none to very weak	very trace iron oxide (hematite), very trace calcite chips up to 2 mm	subangular to subrounded chips up to 0.9 cm

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APACHE LEAP TUFF - Gray Unit (Talq)				
670 - 680	204.2 - 207.3	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace fiamme; reaction to acid: none to very weak	very trace iron oxide (hematite) around biotite	subangular to subrounded chips up to 0.9 cm, mostly 0.4 cm
680 - 690	207.3 - 210.3	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; reaction to acid: none to very weak	very trace iron oxide (hematite) around biotite	subangular to subrounded chips up to 0.8 cm
690 - 700	210.3 - 213.4	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 3 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; very trace fiamme fragments; reaction to acid: none to very weak	very trace iron oxide (hematite and limonite) on biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.0 cm
700 - 710	213.4 - 216.4	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; very trace fiamme fragments; reaction to acid: none to very weak	trace iron oxide (hematite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.1 cm
710 - 720	216.4 - 219.5	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; very trace fiamme fragments; reaction to acid: none to very weak	trace iron oxide (hematite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.3 cm

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APACHE LEAP TUFF - Gray Unit (Talq)				
720 - 730	219.5 - 222.5	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; trace gray fiamme; reaction to acid: none to very weak	trace iron oxide (hematite) around biotite, very trace limonite, very trace calcite chips in unwashed sample	subangular to subrounded chips up to 1.6 cm
730 - 740	222.5 - 225.6	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; trace gray fiamme; reaction to acid: none to very weak	some iron oxide (hematite) around biotite, very trace quartz, very trace nontronite, very trace weathered out biotite	subangular to subrounded chips up to 1.3 cm
740 - 750	225.6 - 228.6	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; trace gray fiamme; trace lithic fragments; reaction to acid: none to very weak	trace iron oxide (hematite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.2 cm
750 - 760	228.6 - 231.6	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace pumice/fiamme; reaction to acid: none to very weak	trace iron oxide (hematite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.2 cm
760 - 770	231.6 - 234.7	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; very trace pumice/fiamme; reaction to acid: none to very weak	some iron oxide (hematite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.0 cm

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APACHE LEAP TUFF - Gray Unit (Talg)				
770 - 780	234.7 - 237.7	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; very trace fiamme; reaction to acid: none	some iron oxide (hematite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.2 cm
780 - 790	237.7 - 240.8	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; very trace fiamme; reaction to acid: none	minor iron oxide (hematite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.0 cm
790 - 800	240.8 - 243.8	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; very trace fiamme; reaction to acid: none to very weak	some iron oxide (hematite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.3 cm
800 - 810	243.8 - 246.9	Gray Unit; weak red [10R4/4] and red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; reaction to acid: none	some iron oxide (hematite) around biotite, very trace fluorescent yellow staining around feldspar, very trace weathered out biotite	subangular to subrounded chips up to 1.6 cm
810 - 820	246.9 - 249.9	Gray Unit; red [10R4/6] and weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; reaction to acid: none	minor iron oxide (hematite) around biotite, very trace quartz, very trace weathered out biotite	subangular to subrounded chips up to 1.0 cm

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APACHE LEAP TUFF - Gray Unit (Talg)				
820 - 830	249.9 - 253.0	Gray Unit; red [10R4/6] and weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace fiamme; reaction to acid: none to very weak	trace iron oxide (hematite and limonite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.3 cm
830 - 840	253.0 - 256.0	Gray Unit; red [10R4/6]; well lithified; crystal-rich, porphyritic tuff with 60% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace fiamme; reaction to acid: none to very weak	trace iron oxide (hematite and limonite) around biotite, very trace weathered out biotite	subangular to subrounded chips up to 1.1 cm
840 - 850	256.0 - 259.1	Gray Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 45% reddish-brown, cryptocrystalline groundmass; reaction to acid: none to very weak	trace iron oxide (hematite and limonite) around biotite, very trace nontronite	subangular to subrounded chips up to 1.2 cm
850 - 860	259.1 - 262.1	Gray Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace fiamme; reaction to acid: none to very weak	trace iron oxide (hematite and limonite) around biotite, very trace nontronite	subangular to subrounded chips up to 1.5 cm
860 - 870	262.1 - 265.2	Gray Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass, very trace pinkish-orange groundmass; very trace fiamme; very trace lithic fragments; reaction to acid: none to very weak	very trace nontronite	subangular to subrounded chips up to 1.1 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
870 - 880	265.2 - 268.2	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 40% reddish-brown, cryptocrystalline groundmass, very trace pinkish-orange groundmass; trace lithic fragments; very trace fiamme; reaction to acid: none to very weak	some iron oxide (hematite and limonite) around biotite, very trace nontronite	subangular to subrounded chips up to 1.7 cm
880 - 890	268.2 - 271.3	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 40% reddish-brown, cryptocrystalline groundmass; trace gray fiamme; very trace lithic fragments; reaction to acid: none to very weak	some iron oxide (hematite) around biotite, very trace nontronite, very trace golden yellow mineral alteration	subangular to subrounded chips up to 1.5 cm
890 - 900	271.3 - 274.3	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace gray fiamme; very trace lithic fragments; reaction to acid: weak	trace calcite, trace iron oxide (hematite and very trace limonite) on biotite	subangular to subrounded chips up to 1.2 cm
900 - 910	274.3 - 277.4	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace gray fiamme; very trace lithic fragments; reaction to acid: none to weak	trace iron oxide (hematite and limonite), trace calcite	subangular to subrounded chips up to 1.6 cm
910 - 920	277.4 - 280.4	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace gray fiamme; very trace lithic fragments; reaction to acid: none to weak	trace iron oxide (hematite and limonite), trace calcite	subangular to subrounded chips up to 1.0 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
920 - 930	280.4 - 283.5	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 40% reddish-brown, cryptocrystalline groundmass; very trace gray fiamme; very trace lithic fragments; reaction to acid: none to very weak	trace iron oxide (hematite) around biotite, very trace calcite chips, one up to 0.9 cm	subangular to subrounded chips up to 1.5 cm
930 - 940	283.5 - 286.5	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace gray fiamme; very trace lithic fragments; reaction to acid: none to very weak	some iron oxide (hematite) around biotite, very trace quartz	subangular to subrounded chips up to 1.4 cm
940 - 950	286.5 - 289.6	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; reaction to acid: none to weak	some iron oxide (hematite) around biotite	subangular to subrounded chips up to 1.2 cm
950 - 960	289.6 - 292.6	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace magnetite and 40% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; very trace fiamme; reaction to acid: none to weak	trace iron oxide (hematite) around biotite, very trace selenite	subangular to subrounded chips up to 1.7 cm
960 - 970	292.6 - 295.7	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown, cryptocrystalline groundmass; trace gray fiamme; very trace lithic fragments; reaction to acid: none to moderate	very trace iron oxide (hematite) around biotite	subangular to subrounded chips up to 1.0 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
970 - 980	295.7 - 298.7	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown, cryptocrystalline groundmass; very trace lithic fragments; reaction to acid: none to very weak	very trace iron oxide (hematite) around biotite	subangular to subrounded chips up to 1.2 cm
980 - 990	298.7 - 301.8	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 55% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 45% reddish-brown, glassy to cryptocrystalline groundmass; very trace lithic fragments; very trace gray fiamme; reaction to acid: none	trace iron oxide (hematite and very trace limonite) around biotite, trace weathered out biotite	subangular to subrounded chips up to 1.1 cm
990 - 1,000	301.8 - 304.8	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 2 mm sized phenocrysts of 58% anhedral, white feldspar, 40% translucent quartz, 2% euhedral, bronzy to black biotite (less) and 50% reddish-brown, glassy to cryptocrystalline groundmass; very trace lithic fragments; very trace gray fiamme; reaction to acid: none	very trace iron oxide (hematite) on biotite, very trace fluorescent yellow staining	subangular to subrounded chips up to 1.2 cm
1,000 - 1,010	304.8 - 307.8	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 50% reddish-brown, glassy to cryptocrystalline groundmass; very trace lithic fragments; very trace gray fiamme; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.4 cm
1,010 - 1,020	307.8 - 310.9	Brown Unit; reddish brown [2.5YR4/4] and red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 50% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 50% reddish-brown, glassy to cryptocrystalline groundmass; trace lithic fragments; trace gray fiamme; reaction to acid: none	trace iron oxide (hematite) around biotite, trace iron oxide (limonite)	subangular to subrounded chips up to 0.9 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,020 - 1,030	310.9 - 313.9	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 50% reddish-brown, glassy to cryptocrystalline groundmass; trace lithic fragments; trace gray fiamme; reaction to acid: none to very weak	some iron oxide (hematite) around biotite, very trace iron oxide (limonite), very trace weathered out biotite	subangular to subrounded chips up to 0.8 cm
1,030 - 1,040	313.9 - 317.0	Brown Unit; red [2.5YR4/6] and reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite and 50% reddish-brown, glassy to cryptocrystalline groundmass; trace lithic fragments; trace gray fiamme; reaction to acid: none to weak	very trace iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.1 cm
1,040 - 1,050	317.0 - 320.0	Brown Unit; red [2.5YR4/6]; well lithified; 98% crystal-rich, porphyritic tuff with 50% up to 1 mm sized phenocrysts of 59% anhedral, white feldspar, 40% translucent quartz, 1% euhedral, bronzy to black biotite (less and smaller) and 50% orange-brown to reddish-brown, glassy to cryptocrystalline groundmass; 2% lithic fragments; trace gray fiamme; reaction to acid: none to weak	minor iron oxide (hematite and limonite) on chips, some iron oxide (hematite) around biotite	subangular to subrounded chips up to 1.0 cm; rough drilling, penetration rate increased
1,050 - 1,060	320.0 - 323.1	Brown Unit; red [2.5YR4/6]; well lithified; 98% crystal-rich, porphyritic tuff with 50% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite (less) and 50% orange-brown, glassy to cryptocrystalline groundmass; 2% lithic fragments; trace gray fiamme; reaction to acid: none to moderate	minor iron oxide (hematite and limonite), trace manganese oxide on fracture surfaces	subangular chips up to 1.4 cm; rough drilling
1,060 - 1,070	323.1 - 326.1	Brown Unit; red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 50% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite (less) and 50% orange-brown, glassy to cryptocrystalline groundmass; trace lithic fragments; trace gray fiamme; reaction to acid: none to very weak	some iron oxide (hematite and very trace limonite), trace fluorescent yellow staining	subangular chips up to 1.2 cm; rough drilling

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,070 - 1,080	326.1 - 329.2	Brown Unit; red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 50% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, bronzy to black biotite (less) and 50% orange-brown, glassy to cryptocrystalline groundmass; trace lithic fragments; very trace gray fiamme; reaction to acid: none	some iron oxide (hematite) around biotite, trace manganese oxide on fracture surfaces	subangular chips up to 1.7 cm; rough drilling
1,080 - 1,090	329.2 - 332.2	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 1.5 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 50% orange-brown, glassy to cryptocrystalline groundmass; trace gray fiamme; very trace lithic fragments; reaction to acid: none to very weak	some iron oxide (hematite and limonite), very trace manganese oxide on fracture surfaces, very trace calcite	subangular chips up to 1.2 cm; rough drilling
1,090 - 1,100	332.2 - 335.3	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 1.5 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 50% orange-brown, glassy to cryptocrystalline groundmass; very trace gray fiamme; very trace lithic fragments; reaction to acid: none	some iron oxide (hematite and very trace limonite)	subangular chips up to 1.4 cm
1,100 - 1,110	335.3 - 338.3	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 50% orange-brown, glassy to cryptocrystalline groundmass; very trace lithic fragments; reaction to acid: none	some iron oxide (hematite and trace limonite), very trace nontronite, very trace manganese oxide on fracture surfaces	subangular chips up to 1.3 cm
1,110 - 1,120	338.3 - 341.4	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 50% orange-brown, glassy to cryptocrystalline groundmass; very trace lithic fragments; reaction to acid: none to very weak	common iron oxide (hematite) around biotite	subangular to subrounded chips up to 1.4 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,120 - 1,130	341.4 - 344.4	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 50% orange-brown, glassy to cryptocrystalline groundmass; very trace lithic fragments; reaction to acid: none	some iron oxide (hematite), trace fluorescent yellow staining, very trace manganese oxide on fracture surfaces, very trace weathered out biotite	subangular to subrounded chips up to 1.8 cm
1,130 - 1,140	344.4 - 347.5	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 50% orange-brown, glassy to cryptocrystalline groundmass; very trace lithic fragments; reaction to acid: none	trace iron oxide (hematite and limonite), very trace manganese oxide	subangular to subrounded chips up to 1.1 cm
1,140 - 1,150	347.5 - 350.5	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 50% orange-brown, glassy to cryptocrystalline groundmass; reaction to acid: none	some iron oxide (hematite) around biotite, very trace limonite, very trace manganese oxide, very trace quartz	subangular to subrounded chips up to 1.2 cm
1,150 - 1,160	350.5 - 353.6	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 49% up to 1.5 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite (larger) and 49% orange-brown, glassy to cryptocrystalline groundmass; 2% lithic fragments of gray, brown and orange quartzite; trace fiamme; reaction to acid: none	trace iron oxide (hematite) around biotite, very trace manganese oxide, very trace selenite	subangular to subrounded chips up to 0.9 cm; very trace gray pipe dope
1,160 - 1,170	353.6 - 356.6	Brown Unit; red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 49% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite and 49% orange-brown, glassy to cryptocrystalline groundmass; 2% lithic fragments of gray, brown and orange quartzite; trace fiamme; reaction to acid: none	very trace iron oxide (hematite) around biotite, very trace quartz	subangular chips up to 1.1 cm; very trace black rubber; new bit
1,170 - 1,180	356.6 - 359.7	Brown Unit; red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 55% orange-brown, glassy to cryptocrystalline groundmass and 45% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; trace lithic fragments; reaction to acid: none to weak		subangular to subrounded chips up to 1.8 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,180 - 1,185	359.7 - 361.2	Brown Unit; red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 54% orange-brown, glassy to cryptocrystalline groundmass and 44% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 2% lithic fragments of gray quartzite and red siltstone; very trace fiamme; reaction to acid: none	very trace iron oxide (hematite)	subangular to subrounded chips up to 1.3 cm
1,190 - 1,200	362.7 - 365.8	Brown Unit; red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 54% orange-brown, glassy to cryptocrystalline groundmass and 44% up to 1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 2% lithic fragments of gray quartzite and red siltstone; very trace fiamme; reaction to acid: none to moderate		subangular to subrounded chips up to 0.9 cm
1,200 - 1,210	365.8 - 368.8	Brown Unit; red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 54% orange-brown, glassy to cryptocrystalline groundmass and 43% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 3% lithic fragments of gray quartzite and brown sandstone; very trace fiamme; reaction to acid: none to very weak	trace iron oxide staining (hematite), very trace manganese oxide, very trace calcite and calcite vein, very trace selenite	subangular to subrounded chips up to 1.0 cm
1,210 - 1,220	368.8 - 371.9	Brown Unit; red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 54% orange-brown to reddish-brown, glassy to cryptocrystalline groundmass and 43% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 3% lithic fragments of gray quartzite and brown sandstone; very trace fiamme; reaction to acid: none to weak	trace iron oxide staining (hematite and limonite), very trace calcite chips	subangular to subrounded chips up to 1.2 cm
1,220 - 1,230	371.9 - 374.9	Brown Unit; red [2.5YR4/6]; well lithified; crystal-rich, porphyritic tuff with 52% orange-brown to reddish-brown, glassy to cryptocrystalline groundmass and 41% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 7% lithic fragments of gray quartzite and red siltstone; trace fiamme; reaction to acid: none to moderate	3% white and translucent calcite chips up to 0.5 cm	subangular to subrounded chips up to 1.1 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,230 - 1,240	374.9 - 378.0	Brown Unit; reddish brown [2.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% brown, glassy to cryptocrystalline groundmass and 40% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace amphibole; 10% lithic fragments of gray quartzite and red siltstone; trace fiamme; reaction to acid: none to strong	minor iron oxide staining (hematite and very trace limonite), some white calcite chips and vein	subangular to subrounded chips up to 1.4 cm
1,240 - 1,250	378.0 - 381.0	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% brown, glassy to cryptocrystalline groundmass and 40% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 10% lithic fragments of gray quartzite and red siltstone; reaction to acid: none	common iron oxide staining (hematite and limonite), some on fracture surfaces, very trace manganese oxide	subangular to subrounded chips up to 3.0 cm
1,250 - 1,260	381.0 - 384.0	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 50% grayish-brown, glassy to cryptocrystalline groundmass and 40% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 10% lithic fragments of gray quartzite and red siltstone; trace fiamme; reaction to acid: none	minor iron oxide staining (hematite and limonite)	subangular to subrounded chips up to 1.3 cm
1,260 - 1,270	384.0 - 387.1	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 51% grayish-brown, glassy to cryptocrystalline groundmass and 41% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 8% lithic fragments of gray quartzite and red siltstone; trace fiamme; reaction to acid: none	minor iron oxide staining (hematite and limonite), very trace manganese oxide	subangular to subrounded chips up to 1.6 cm
1,270 - 1,280	387.1 - 390.1	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 51% grayish-brown, glassy to cryptocrystalline groundmass and 41% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace amphibole; 8% lithic fragments of gray quartzite and red siltstone; reaction to acid: none	minor iron oxide staining (hematite)	subangular to subrounded chips up to 1.0 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,280 - 1,290	390.1 - 393.2	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 51% grayish-brown, glassy to cryptocrystalline groundmass and 41% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 8% lithic fragments of gray quartzite and red siltstone; reaction to acid: none	some iron oxide staining (hematite), very trace quartz	subangular to subrounded chips up to 1.0 cm
1,290 - 1,300	393.2 - 396.2	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 51% grayish-brown, glassy to cryptocrystalline groundmass and 41% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 8% lithic fragments of gray, maroon, and orange quartzite and red siltstone; reaction to acid: none to very weak	trace iron oxide staining (hematite and very trace limonite), trace manganese oxide	subangular to subrounded chips up to 0.9 cm
1,300 - 1,310	396.2 - 399.3	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 51% grayish-brown, glassy to cryptocrystalline groundmass and 41% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 8% lithic fragments of gray, maroon, and orange quartzite and red siltstone; reaction to acid: none to very weak	some iron oxide staining (hematite and very trace limonite), very trace calcite vein	subangular to subrounded chips up to 0.7 cm
1,310 - 1,320	399.3 - 402.3	Brown Unit; brown [7.5YR4/3]; well lithified; 95% crystal-rich, porphyritic tuff with 53% grayish-brown, glassy to cryptocrystalline groundmass and 42% up to 2 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 5% rosy pink glassy tuff and lithic fragments of maroon well-lithified siltstone; reaction to acid: none	trace iron oxide staining (limonite)	AIR-ASSISTED FLOODED REVERSE CIRCULATION; flooded reverse, 9-7/8-inch tricone; angular to subangular chips up to 1.5 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,320 - 1,330	402.3 - 405.4	Brown Unit; brown [7.5YR4/3]; well lithified; 95% crystal-rich, porphyritic tuff with 55% grayish-brown, glassy to cryptocrystalline groundmass and 45% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, black biotite, very trace amphibole; 5% purple, rosy pink and tan glassy tuff, and lithic fragments of maroon well-lithified siltstone; reaction to acid: none	very trace iron oxide staining (hematite and limonite)	angular to subangular chips up to 0.9 cm
1,330 - 1,340	405.4 - 408.4	Brown Unit; brown [7.5YR4/3]; well lithified; 95% crystal-rich, porphyritic tuff with 55% grayish-brown, glassy to cryptocrystalline groundmass and 45% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 5% purple, rosy pink and tan glassy tuff, and lithic fragments of maroon well-lithified siltstone; reaction to acid: none	trace iron oxide staining (hematite and very trace limonite)	angular to subangular chips up to 1.3 cm
1,340 - 1,350	408.4 - 411.5	Brown Unit; brown [7.5YR4/3]; well lithified; 90% crystal-rich, porphyritic tuff with 55% grayish-brown, glassy to cryptocrystalline groundmass and 45% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 10% purple, rosy pink and tan glassy tuff, and lithic fragments of maroon well-lithified siltstone; trace tuff with gray groundmass; reaction to acid: none	very trace iron oxide staining (limonite)	angular to subangular chips up to 1.2 cm
1,350 - 1,360	411.5 - 414.5	Brown Unit; brown [7.5YR5/3]; well lithified; 91% crystal-rich, porphyritic tuff with 55% light gray, glassy to cryptocrystalline groundmass and 45% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 9% purple, rosy pink to white, and tan glassy tuff, and lithic fragments of maroon well-lithified siltstone; reaction to acid: none		subangular to subrounded chips up to 1.3 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Brown Unit (Talb)				
1,360 - 1,370	414.5 - 417.6	Brown Unit; brown [7.5YR5/3]; well lithified; 90% crystal-rich, porphyritic tuff with 55% light brown, glassy to cryptocrystalline groundmass and 45% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 10% gray, rosy pink and yellowish-white glassy tuff, and lithic fragments of reddish-brown siltstone; reaction to acid: none		subangular to subrounded chips up to 1.7 cm
1,370 - 1,380	417.6 - 420.6	Brown Unit; pinkish gray [7.5YR6/2]; well lithified; 91% crystal-rich, porphyritic tuff with 55% light brown, glassy to cryptocrystalline groundmass and 45% <1 mm sized phenocrysts of anhedral, white feldspar, translucent quartz, euhedral, and black biotite; 9% gray, rosy pink and yellowish-white glassy tuff, and lithic fragments of reddish-brown siltstone; reaction to acid: none		subangular to subrounded chips up to 0.9 cm; trace whitish-gray clayey sandy silt
1,380 - 1,390	420.6 - 423.7	Brown Unit; light gray [7.5YR5/1]; well lithified; 55% pink, gray and purple glassy tuff; 25% clear to milky quartz, 20% light gray tuff; trace lithic fragments of brown and red siltstone; reaction to acid: none	10% of overall sample is whitish-gray clayey sandy silt	subangular to subrounded chips up to 0.9 cm
APACHE LEAP TUFF - Basal Tuff (Talbt)				
1,390 - 1,400	423.7 - 426.7	Basal Tuff; pinkish gray [7.5YR6/2]; weakly lithified; 95% porphyritic tuff with 65% light gray, aphanitic groundmass and 35% up to 2 mm sized phenocrysts of feldspar, quartz, euhedral, and black biotite; 5% rosy pink glassy tuff, and lithic fragments of brown siltstone; reaction to acid: none		subangular to subrounded chips up to 1.6 cm
1,400 - 1,410	426.7 - 429.8	Basal Tuff; pinkish gray [7.5YR6/2]; weakly lithified; 95% porphyritic tuff with 65% light gray, aphanitic groundmass and 35% up to 2 mm sized phenocrysts of feldspar, quartz, euhedral, and black biotite; 5% brown and rosy pink quartzite, and lithic fragments of brown siltstone; reaction to acid: none to weak	trace gray clayey silt	subangular to subrounded chips up to 1.6 cm
1,410 - 1,420	429.8 - 432.8	Basal Tuff; pinkish gray [7.5YR6/2]; weakly lithified; 95% porphyritic tuff with 65% light gray, aphanitic groundmass and 35% up to 2 mm sized phenocrysts of feldspar, quartz, euhedral, and black biotite; 5% brown and rosy pink glassy tuff, and lithic fragments of brown siltstone; reaction to acid: none to weak	trace gray clayey silt	subangular to subrounded chips up to 0.9 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Basal Tuff (Talbt)				
1,420 - 1,430	432.8 - 435.9	Basal Tuff; pinkish gray [5YR6/2]; weakly lithified; 97% porphyritic tuff with 70% light gray, aphanitic groundmass and 30% up to 2 mm sized phenocrysts of feldspar, quartz, euhedral, and black biotite; 3% brown and tan glassy tuff, and lithic fragments of red siltstone; reaction to acid: none to weak	very trace iron oxide (hematite), very trace calcite chips	subangular chips up to 2.1 cm
1,430 - 1,440	435.9 - 438.9	Basal Tuff; pinkish gray [5YR6/2]; weakly lithified; porphyritic tuff with 70% light gray, aphanitic groundmass and 30% up to 2 mm sized phenocrysts of feldspar, quartz, euhedral, and black biotite; trace lithic fragments of reddish-brown siltstone; reaction to acid: none to weak		subangular to subrounded chips up to 1.6 cm
1,440 - 1,450	438.9 - 442.0	Basal Tuff; pinkish gray [5YR6/2]; weakly lithified; porphyritic tuff with 70% light gray, aphanitic groundmass and 30% <1 mm sized phenocrysts of feldspar, quartz, and bronzy to black biotite; trace lithic fragments of reddish-brown siltstone; reaction to acid: none to strong	very trace calcite chips up to 0.8 cm	subangular chips up to 1.8 cm
1,450 - 1,460	442.0 - 445.0	Basal Tuff; pinkish gray [5YR6/2]; weakly lithified; porphyritic tuff with 70% light gray, aphanitic groundmass and 30% <1 mm sized phenocrysts of feldspar, quartz, and black biotite; trace lithic fragments of reddish-brown siltstone; reaction to acid: none	trace iron oxide (limonite)	subangular to subrounded chips up to 1.3 cm
1,460 - 1,470	445.0 - 448.1	Basal Tuff; pinkish gray [5YR6/2]; weakly lithified; porphyritic tuff with 70% light gray, aphanitic groundmass and 30% <1 mm sized phenocrysts of feldspar, quartz, and black biotite; trace lithic fragments of reddish-brown siltstone; reaction to acid: none to weak	trace calcite chips up to 0.6 cm, very trace green staining	subangular to subrounded chips up to 1.5 cm
1,470 - 1,480	448.1 - 451.1	Basal Tuff; pinkish gray [5YR6/2]; weakly lithified; porphyritic tuff with 70% light gray, aphanitic groundmass and 30% <1 mm sized phenocrysts of feldspar, quartz, and black biotite; trace lithic fragments of reddish-brown siltstone; reaction to acid: none	very trace calcite	subangular to subrounded chips up to 1.4 cm; slightly contaminated with next sample

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
TERTIARY EARLY VOLCANICS - Basalt (Tev)				
1,480 - 1,490	451.1 - 454.2	Basal Tuff and amygdaloidal basalt; reddish gray [5YR5/2]; weakly lithified; 35% porphyritic tuff with whitish-gray and tan groundmass; 30% dark gray to black amygdaloidal basalt; 20% weathered basalt; 10% brown silty tuffaceous sandstone; 5% lithic fragments of red siltstone and quartzite; reaction to acid: none to moderate	teal green amygdules with banding in basalt, trace translucent calcite	subangular chips up to 1.4 cm
1,490 - 1,500	454.2 - 457.2	Amygdaloidal basalt; very dark gray [N3] and reddish gray [5YR5/2]; well lithified; 97% very dark gray amygdaloidal basalt; reaction to acid: none	3% tan sandy clayey silt, teal green amygdules with banding, very trace white zeolite, very trace dark grayish green clayey silt	subangular chips up to 1.8 cm; 10% contamination of porphyritic tuff with whitish-gray groundmass and brown tuffaceous silty sandstone
1,500 - 1,510	457.2 - 460.2	Amygdaloidal basalt; very dark gray [N3] and light reddish brown [5YR6/3]; well lithified; black basalt; reaction to acid: none to very weak	some teal green unidentified mineral coating and veins, minor amygdules, very trace quartz chips, very trace serpentine	subangular chips up to 1.7 cm; 13% contamination of whitish-gray and pinkish-white tuff
1,510 - 1,520	460.2 - 463.3	Basalt; black [N2.5]; well lithified; black basalt; reaction to acid: none to very weak	minor teal green unidentified mineral coating, trace calcite	angular chips up to 1.0 cm; 1% contamination of pinkish-white tuff
1,520 - 1,530	463.3 - 466.3	Basalt; black [N2.5] and light reddish brown [5YR6/3]; well lithified; black basalt; reaction to acid: none	basalt has trace teal green unidentified mineral and white zeolite amygdules	angular to subangular chips up to 1.7 cm; 30% contamination of grayish-white and pinkish-white tuff
1,530 - 1,540	466.3 - 469.4	Basalt; very dark gray [N3]; well lithified; black basalt with trace vesicles; reaction to acid: none	trace teal green unidentified mineral and white zeolite amygdules	angular chips up to 1.3 cm; very trace dark gray silt; 9% contamination of white tuff
1,540 - 1,550	469.4 - 472.4	Basalt; light reddish brown [5YR6/3] and very dark gray [N3]; well lithified; black basalt with trace vesicles; reaction to acid: none to very weak	some basalt weathered reddish-brown, basalt has minor teal green coating	angular to subangular chips up to 1.2 cm; 50% contamination of white tuff, quartz and brown siltstone
1,550 - 1,560	472.4 - 475.5	Basalt; very dark gray [N3]; well lithified; black basalt; reaction to acid: none to strong	some iron oxide (hematite) on fracture surfaces and veins, trace teal green unidentified mineral coating, trace on fracture, very trace calcite chips, very trace bluish-white zeolite	angular chips up to 2.3 cm; 1% contamination of white tuff

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
TERTIARY EARLY VOLCANICS - Basalt (Tev)				
1,560 - 1,570	475.5 - 478.5	Basalt; very dark gray [N3]; well lithified; black basalt; reaction to acid: none	trace iron oxide (hematite) on fracture surfaces, very trace calcite	angular chips up to 2.1 cm; 20% contamination of white tuff
1,570 - 1,580	478.5 - 481.6	Basalt; very dark gray [N3] and light reddish brown [5YR6/3]; well lithified; black basalt; reaction to acid: none to strong	trace iron oxide (hematite) on fracture surfaces, very trace calcite	angular chips up to 2.1 cm; 10% contamination in unwashed sample; 1% contamination of white tuff
1,580 - 1,590	481.6 - 484.6	Basalt; very dark gray [N3] and light reddish brown [5YR6/3]; well lithified; black basalt; reaction to acid: none to strong	trace iron oxide (hematite and very trace limonite) on fracture surfaces, trace teal green unidentified mineral coating, very trace calcite vein	angular chips up to 1.2 cm; 30% contamination of white tuff
1,590 - 1,600	484.6 - 487.7	Basalt; very dark gray [N3] and dark reddish gray [2.5YR3/1]; well lithified; black and brownish-black basalt with minor vesicles; reaction to acid: none to strong	minor iron oxide staining (hematite and very trace limonite), very trace dendritic pattern to staining, trace teal green unidentified mineral and red hematite in vesicles, very trace calcite	angular chips up to 1.8 cm
1,600 - 1,610	487.7 - 490.7	Basalt; very dark gray [N3] and light reddish brown [5YR6/3]; well lithified; black basalt with trace vesicles; reaction to acid: none to weak	some white gypsum, trace white mineral vein and amygdules, trace teal green unidentified mineral amygdules, trace iron oxide (hematite), very trace calcite	angular to subangular chips up to 1.2 cm; 2% contamination of pinkish-white tuff
1,610 - 1,620	490.7 - 493.8	Basalt; very dark gray [N3] and light reddish brown [5YR6/3]; well lithified; black basalt; reaction to acid: none to very weak	some teal green unidentified mineral coating, trace serpentine, very trace calcite	angular chips up to 1.9 cm; trace contamination of pinkish-white tuff
1,620 - 1,630	493.8 - 496.8	Basalt; light reddish brown [5YR6/3] and very dark gray [N3]; well lithified; black basalt; reaction to acid: none to weak	trace iron oxide staining (hematite and very trace limonite), very trace calcite	angular chips up to 1.6 cm; 55% contamination of pinkish-white tuff
1,630 - 1,640	496.8 - 499.9	Basalt; very dark gray [N3] and light reddish brown [5YR6/3]; well lithified; black basalt; reaction to acid: none	trace teal green unidentified mineral	angular chips up to 2.1 cm; 40% contamination of pinkish-white tuff
1,640 - 1,643	499.9 - 500.8	Basalt; very dark gray [N3] and light reddish brown [5YR6/3]; well lithified; black and brownish-black basalt with trace vesicles; reaction to acid: none	trace teal green unidentified mineral amygdules, very trace bluish-white zeolite	angular to subangular chips up to 2.1 cm; 25% contamination of pinkish-white tuff

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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; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 60% pinkish-gray to white, aphanitic to microcrystalline groundmass; 36% phenocrysts of feldspar, quartz, bronzy biotite; 4% pumice; trace lithic fragments; reaction to acid: none to very weak	weathered, 10% overall sample is silt, trace iron oxide (hematite)	Munsell Color Version: 2000 revised; subangular chips up to 3.9 cm
10 - 20	3.0 - 6.1	White Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich tuff with 60% pinkish-white, aphanitic to microcrystalline groundmass; 38% phenocrysts of feldspar, quartz, bronzy biotite; 2% pumice; trace lithic fragments; reaction to acid: none to very weak	weathered, 15% overall sample is silt, trace iron oxide (hematite)	subangular chips up to 4.2 cm
20 - 30	6.1 - 9.1	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 60% pinkish-white, aphanitic to microcrystalline groundmass; 38% up to 3 mm sized phenocrysts of feldspar, quartz, bronzy biotite; 2% pumice; trace lithic fragments; reaction to acid: none to very weak	weathered, 20% overall sample is silt, trace iron oxide (hematite)	subangular chips up to 3.4 cm
30 - 40	9.1 - 12.2	White Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to crystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 2.5 cm; reaction to acid: none	weathered, 30% overall sample is silt, trace iron oxide (hematite), trace gypsum	subangular chips up to 2.9 cm
40 - 50	12.2 - 15.2	White Unit; light reddish brown [5YR6/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to crystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 2.5 cm; reaction to acid: none	weathered, 30% overall sample is silt, trace iron oxide (hematite)	subangular to subrounded chips up to 2.7 cm
50 - 60	15.2 - 18.3	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to crystalline groundmass; 34% up to 2 mm sized phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 2.5 cm; reaction to acid: none	weathered, 30% overall sample is silt, trace iron oxide (hematite)	mostly sand size cuttings

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
60 - 70	18.3 - 21.3	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite)	mostly sand size cuttings
70 - 80	21.3 - 24.4	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite), trace gypsum	mostly sand size cuttings
80 - 90	24.4 - 27.4	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite)	mostly sand size cuttings
90 - 100	27.4 - 30.5	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite)	mostly sand size cuttings
100 - 110	30.5 - 33.5	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite), trace gypsum	mostly sand size cuttings
110 - 120	33.5 - 36.6	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite), trace gypsum	mostly sand size cuttings
120 - 130	36.6 - 39.6	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	mostly sand size cuttings

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
130 - 140	39.6 - 42.7	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	mostly sand size cuttings
140 - 150	42.7 - 45.7	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite), very trace gypsum	subangular chips, mostly sand-sized
150 - 160	45.7 - 48.8	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite and limonite)	mostly sand sized cuttings; cutting size increasing up to 1.7 cm
160 - 170	48.8 - 51.8	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular chips, mostly sand-sized
170 - 180	51.8 - 54.9	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite), very trace gypsum	subangular chips, mostly sand-sized
180 - 190	54.9 - 57.9	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1.7 cm; reaction to acid: none	trace iron oxide (hematite)	subangular chips, mostly sand-sized
190 - 200	57.9 - 61.0	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1.7 cm with trace basalt; reaction to acid: none	trace iron oxide (hematite), very trace gypsum	subangular chips, mostly sand-sized

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
200 - 210	61.0 - 64.0	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1.7 cm with trace basalt; reaction to acid: none	trace iron oxide (hematite)	subangular chips, mostly sand-sized
210 - 220	64.0 - 67.1	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 65% pinkish-gray to white, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1.2 cm with trace basalt; reaction to acid: none	trace iron oxide (hematite), very trace gypsum	subangular chips up to 1.4 cm, mostly sand size cuttings
220 - 230	67.1 - 70.1	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 60% pinkish-gray to white, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 0.4 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	subangular chips up to 0.9 cm, mostly sand size cuttings
230 - 240	70.1 - 73.2	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 60% pinkish-gray to white, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 0.4 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	subangular chips up to 1.2 cm, mostly sand size cuttings
240 - 250	73.2 - 76.2	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 60% pinkish-gray to white, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1.5 cm; reaction to acid: none	trace iron oxide (hematite and very trace limonite), trace gypsum	subangular chips up to 2.0 cm, mostly sand size cuttings
250 - 260	76.2 - 79.2	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 60% pinkish-gray to white, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1.3 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 2.0 cm, mostly sand size cuttings

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
260 - 270	79.2 - 82.3	White Unit; dark reddish gray [5YR4/2]; well lithified; crystal-rich tuff with 60% pinkish-gray to white, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1.0 cm; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular chips up to 1.5 cm, mostly sand size cuttings
270 - 280	82.3 - 85.3	White Unit; dark reddish gray [5YR4/2]; well lithified; crystal-rich tuff with 60% pinkish-gray to white, aphanitic to microcrystalline groundmass; 39% up to 4 mm sized phenocrysts of feldspar, quartz, bronzy biotite; 1% pumice; trace lithic fragments up to 1.0 cm; reaction to acid: none	trace iron oxide (hematite and limonite)	subangular chips up to 1.7 cm, mostly sand size cuttings
280 - 290	85.3 - 88.4	White Unit; dark reddish gray [5YR4/2]; well lithified; crystal-rich tuff with 60% brownish-gray, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite and limonite), trace epidote	subangular chips up to 1.7 cm, mostly sand size cuttings
290 - 300	88.4 - 91.4	White Unit; dark reddish gray [5YR4/2]; well lithified; crystal-rich tuff with 60% brownish-gray, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.6 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 2.1 cm, mostly sand size cuttings
300 - 310	91.4 - 94.5	White Unit; reddish gray [5YR5/2]; well lithified; crystal-rich tuff with 60% brownish-gray, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 0.8 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 2.2 cm
310 - 320	94.5 - 97.5	White Unit; reddish gray [5YR5/2]; well lithified; crystal-rich tuff with 65% brownish-gray, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 2.9 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - White Unit (Talw)				
320 - 330	97.5 - 100.6	White Unit; reddish gray [5YR5/2]; well lithified; crystal-rich tuff with 65% pinkish-gray, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.6 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 2.3 cm
330 - 340	100.6 - 103.6	White Unit; reddish gray [5YR5/2]; well lithified; crystal-rich tuff with 70% pinkish-gray, aphanitic to microcrystalline groundmass; 29% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.2 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 1.9 cm
340 - 350	103.6 - 106.7	White Unit; reddish gray [5YR5/2]; well lithified; crystal-rich tuff with 70% pinkish-gray, aphanitic to microcrystalline groundmass; 29% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.2 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 1.6 cm
350 - 360	106.7 - 109.7	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.0 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 1.7 cm
360 - 370	109.7 - 112.8	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.0 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 2.1 cm
370 - 380	112.8 - 115.8	White Unit; reddish brown [5YR5/3]; well lithified; crystal-rich tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.1 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 1.9 cm
APACHE LEAP TUFF - Gray Unit (Talq)				
380 - 390	115.8 - 118.9	Gray Unit; dark reddish gray [5YR4/2]; well lithified; crystal-rich tuff with 60% pinkish-gray, aphanitic to microcrystalline groundmass; 39% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 0.8 cm with trace basalt; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 2.2 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talq)				
390 - 400	118.9 - 121.9	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 0.9 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 1.8 cm
400 - 410	121.9 - 125.0	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 0.9 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	subangular chips up to 2.3 cm
410 - 420	125.0 - 128.0	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 0.7 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	subangular chips up to 1.6 cm
420 - 430	128.0 - 131.1	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; trace lithic fragments up to 1.3 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 2.3 cm
430 - 440	131.1 - 134.1	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; trace lithic fragments up to 0.8 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 1.8 cm
440 - 450	134.1 - 137.2	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; trace lithic fragments up to 1.1 cm; reaction to acid: none	trace iron oxide (hematite and limonite), very trace gypsum	subangular chips up to 1.1 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talq)				
450 - 460	137.2 - 140.2	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; trace lithic fragments up to 0.7 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 1.5 cm
460 - 470	140.2 - 143.3	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; trace lithic fragments up to 1.0 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	subangular chips up to 1.0 cm
470 - 480	143.3 - 146.3	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; trace lithic fragments up to 0.6 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	subangular chips up to 1.2 cm
480 - 490	146.3 - 149.4	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; trace lithic fragments up to 0.5 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 1.3 cm
490 - 500	149.4 - 152.4	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; trace lithic fragments up to 0.3 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 0.9 cm
500 - 510	152.4 - 155.4	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 70% reddish-gray, aphanitic to microcrystalline groundmass; 29% up to 5 mm sized phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; trace lithic fragments up to 0.6 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	subangular chips up to 1.6 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
510 - 520	155.4 - 158.5	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 65% reddish-gray, aphanitic to microcrystalline groundmass; 34% up to 5 mm sized phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; very trace lithic fragments up to 0.3 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	subangular chips up to 2.0 cm
520 - 530	158.5 - 161.5	Gray Unit; reddish brown [2.5YR4/3]; well lithified; crystal-rich tuff with 65% reddish-gray, aphanitic to microcrystalline groundmass; 34% up to 5 mm sized phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; very trace lithic fragments up to 0.9 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum up to 0.7 cm	subangular chips up to 1.3 cm
530 - 540	161.5 - 164.6	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich tuff with 65% reddish-gray, aphanitic to microcrystalline groundmass; 34% up to 5 mm sized phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; very trace lithic fragments up to 0.8 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum up to 1.1 cm	subangular chips up to 1.8 cm
540 - 550	164.6 - 167.6	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich tuff with 75% reddish-gray, aphanitic to microcrystalline groundmass; 24% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; very trace lithic fragments up to 1.1 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	angular to subangular chips up to 4.3 cm
550 - 560	167.6 - 170.7	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich tuff with 65% reddish-gray, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, biotite, hornblende; 1% pumice; very trace lithic fragments up to 0.5 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	angular to subangular chips up to 3.0 cm
560 - 570	170.7 - 173.7	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich tuff with 74% reddish-gray, aphanitic to microcrystalline groundmass; 25% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 0.8 cm; reaction to acid: none	trace iron oxide (hematite), trace gypsum	subangular chips up to 2.1 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talg)				
570 - 580	173.7 - 176.8	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich tuff with 74% reddish-gray, aphanitic to microcrystalline groundmass; 25% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.2 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 1.1 cm
580 - 590	176.8 - 179.8	Gray Unit; NO SAMPLE		
590 - 600	179.8 - 182.9	Gray Unit; NO SAMPLE		
600 - 610	182.9 - 185.9	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich tuff with 65% reddish-gray, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.5 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 3.1 cm
610 - 620	185.9 - 189.0	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich tuff with 65% reddish-gray, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.5 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 3.1 cm
620 - 630	189.0 - 192.0	Gray Unit; dark reddish brown [2.5YR3/3]; well lithified; crystal-rich tuff with 65% reddish-gray, aphanitic to microcrystalline groundmass; 34% phenocrysts of feldspar, quartz, and biotite; 1% pumice; trace lithic fragments up to 1.5 cm; reaction to acid: none	trace iron oxide (hematite and limonite), trace gypsum	subangular chips up to 3.3 cm
630 - 640	192.0 - 195.1	Gray Unit; reddish brown [2.5YR4/3]; well lithified; 99% porphyritic tuff with 60% pinkish-red, cryptocrystalline groundmass; 38% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 2% light gray pumice; trace lithic fragments; trace magnetite; reaction to acid: none	1% pinkish-white gypsum, very trace iron oxide (hematite)	subangular chips up to 2.2 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Gray Unit (Talq)				
640 - 650	195.1 - 198.1	Gray Unit; reddish brown [2.5YR4/3]; well lithified; porphyritic tuff with 60% pinkish-red, cryptocrystalline groundmass; 39% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments; trace magnetite; reaction to acid: none	trace pinkish-white gypsum, very trace iron oxide (hematite and limonite)	subangular chips up to 3.1 cm
650 - 660	198.1 - 201.2	Gray Unit; reddish brown [2.5YR4/3]; well lithified; porphyritic tuff with 60% pinkish-red, cryptocrystalline groundmass; 39% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; very trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none	trace pinkish-white gypsum, very trace iron oxide (hematite and limonite)	subangular chips up to 2.9 cm
660 - 670	201.2 - 204.2	Gray Unit; reddish brown [2.5YR4/3]; well lithified; porphyritic tuff with 65% pinkish-red, cryptocrystalline groundmass; 35% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; very trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite), very trace pinkish-white gypsum	subangular chips up to 4.4 cm
670 - 680	204.2 - 207.3	Gray Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 35% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; very trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.9 cm
680 - 690	207.3 - 210.3	Gray Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass with 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.8 cm

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APACHE LEAP TUFF - Gray Unit (Talg)				
690 - 700	210.3 - 213.4	Gray Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.8 cm
700 - 710	213.4 - 216.4	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 35% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none		subangular chips up to 3.1 cm
710 - 720	216.4 - 219.5	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 60% pink and tan-brown, cryptocrystalline groundmass; 38% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; 1% lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.7 cm
720 - 730	219.5 - 222.5	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 60% pink and tan-brown, cryptocrystalline groundmass; 39% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of dark brown siltstone; trace light gray pumice; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 2.1 cm
730 - 740	222.5 - 225.6	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 60% pink and tan-brown, cryptocrystalline groundmass; 39% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 2.4 cm

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APACHE LEAP TUFF - Gray Unit (Talq)				
740 - 750	225.6 - 228.6	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 60% pink and tan-brown, cryptocrystalline groundmass, and 40% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.6 cm
750 - 760	228.6 - 231.6	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 60% pink and tan-brown, cryptocrystalline groundmass; 38% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 2% light gray pumice; trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none	very trace white gypsum	subangular chips up to 4.1 cm
760 - 770	231.6 - 234.7	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.6 cm
770 - 780	234.7 - 237.7	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 33% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 2% light gray pumice; trace lithic fragments of dark brown siltstone; trace magnetite; reaction to acid: none		subangular chips up to 2.0 cm
780 - 790	237.7 - 240.8	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 33% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 2% light gray pumice; trace lithic fragments of brown siltstone and dark gray quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 3.9 cm

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APACHE LEAP TUFF - Gray Unit (Talq)				
790 - 800	240.8 - 243.8	Gray Unit; reddish brown [2.5YR4/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown siltstone and dark gray quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.2 cm
800 - 810	243.8 - 246.9	Gray Unit; reddish brown [5YR4/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown siltstone and dark gray quartzite; trace magnetite; reaction to acid: none	very trace pinkish-white gypsum	subangular chips up to 2.8 cm
810 - 820	246.9 - 249.9	Gray Unit; reddish brown [5YR4/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 35% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of brown siltstone and dark gray quartzite; trace magnetite; reaction to acid: none		subangular chips up to 1.4 cm
820 - 830	249.9 - 253.0	Gray Unit; reddish brown [5YR4/4]; well lithified; porphyritic tuff with 65% pink and tan-brown, cryptocrystalline groundmass; 35% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of brown siltstone and dark gray quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.6 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
830 - 840	253.0 - 256.0	Brown Unit; reddish brown [5YR4/4]; well lithified; porphyritic tuff with 65% pink and brown, cryptocrystalline groundmass; 35% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of brown siltstone and dark gray quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.4 cm
840 - 850	256.0 - 259.1	Brown Unit; dusky red [10R3/2]; well lithified; porphyritic tuff with 65% pink and brown, cryptocrystalline groundmass; 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of brown siltstone; trace light gray pumice; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 2.2 cm
850 - 860	259.1 - 262.1	Brown Unit; dusky red [10R3/2]; well lithified; porphyritic tuff with 63% pink and brown, cryptocrystalline groundmass, 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite, and 2% dark red groundmass; 1% lithic fragments of brown siltstone; trace light gray pumice; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.9 cm
860 - 870	262.1 - 265.2	Brown Unit; dusky red [10R3/2]; well lithified; porphyritic tuff with 63% pink and brown, cryptocrystalline groundmass, 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite, and 2% dark red groundmass; trace light gray pumice; trace lithic fragments of brown siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.7 cm
870 - 880	265.2 - 268.2	Brown Unit; dusky red [10R3/2]; well lithified; porphyritic tuff with 65% pink and brown, cryptocrystalline groundmass; 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite), very trace white gypsum	subangular chips up to 1.5 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
880 - 890	268.2 - 271.3	Brown Unit; dusky red [10R3/2]; well lithified; porphyritic tuff with 65% pink and brown, cryptocrystalline groundmass; 33% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 2% light gray pumice; trace lithic fragments of brown siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.7 cm
890 - 900	271.3 - 274.3	Brown Unit; dusky red [10R3/2]; well lithified; porphyritic tuff with 65% pink and brown, cryptocrystalline groundmass; 33% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 2% light gray pumice; trace lithic fragments of brown siltstone; trace magnetite; reaction to acid: none		subangular chips up to 2.3 cm
900 - 910	274.3 - 277.4	Brown Unit; dusky red [10R3/2]; well lithified; porphyritic tuff with 65% pink and brown, cryptocrystalline groundmass; 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.7 cm
910 - 920	277.4 - 280.4	Brown Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 65% pink and brown, cryptocrystalline groundmass; 34% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.4 cm
920 - 930	280.4 - 283.5	Brown Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 70% pink and brown, cryptocrystalline groundmass; 29% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.2 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
930 - 940	283.5 - 286.5	Brown Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 70% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.5 cm
940 - 950	286.5 - 289.6	Brown Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 70% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none	trace iron oxide (hematite) (hematite and very trace limonite)	subangular chips up to 0.7 cm
950 - 960	289.6 - 292.6	Brown Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 70% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none	trace iron oxide (hematite) (hematite and very trace limonite)	subangular chips up to 1.3 cm
960 - 970	292.6 - 295.7	Brown Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 69% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of brown, tan, and gray siltstone; trace light gray pumice; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.0 cm
970 - 980	295.7 - 298.7	Brown Unit; dark reddish brown [2.5YR3/4]; well lithified; porphyritic tuff with 67% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 2% light gray pumice; 1% lithic fragments of brown, tan, and gray siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.1 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
980 - 990	298.7 - 301.8	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 68% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; 1% lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.5 cm
990 - 1,000	301.8 - 304.8	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 69% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none	trace iron oxide (hematite) (hematite and very trace limonite)	subangular chips up to 1.9 cm
1,000 - 1,010	304.8 - 307.8	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 69% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none to moderate	trace iron oxide (hematite) (hematite and very trace limonite), very trace calcite	subangular chips up to 1.6 cm
1,010 - 1,020	307.8 - 310.9	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 70% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.3 cm
1,020 - 1,030	310.9 - 313.9	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 70% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of brown and tan siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.4 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,030 - 1,040	313.9 - 317.0	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 69% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of brown and gray siltstone; trace light gray pumice; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.5 cm
1,040 - 1,050	317.0 - 320.0	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 68% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite, and trace pink groundmass; 1% light gray pumice; 1% lithic fragments of brown and gray siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.2 cm
1,050 - 1,060	320.0 - 323.1	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 68% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite, and trace pink groundmass; 1% light gray pumice; 1% lithic fragments of brownish-yellow siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.0 cm
1,060 - 1,070	323.1 - 326.1	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 69% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite, and trace pink groundmass; 1% light gray pumice; trace lithic fragments of brownish-yellow siltstone; trace magnetite; reaction to acid: none		subangular chips up to 1.1 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,070 - 1,080	326.1 - 329.2	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 69% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite, and trace pink groundmass; trace light gray pumice; 1% lithic fragments of brown, gray, and red siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 0.9 cm
1,080 - 1,090	329.2 - 332.2	Brown Unit; dark reddish brown [5YR3/3]; well lithified; porphyritic tuff with 69% pink and brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite, and trace pink groundmass; trace light gray pumice; trace lithic fragments of brown and red siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.2 cm
1,090 - 1,100	332.2 - 335.3	Brown Unit; NO SAMPLE		
1,100 - 1,110	335.3 - 338.3	Brown Unit; NO SAMPLE		
1,110 - 1,120	338.3 - 341.4	Brown Unit; NO SAMPLE		
1,120 - 1,130	341.4 - 344.4	Brown Unit; NO SAMPLE		
1,130 - 1,140	344.4 - 347.5	Brown Unit; NO SAMPLE		
1,140 - 1,150	347.5 - 350.5	Brown Unit; NO SAMPLE		
1,150 - 1,160	350.5 - 353.6	Brown Unit; NO SAMPLE		
1,160 - 1,170	353.6 - 356.6	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 29% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown and red siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.2 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,170 - 1,180	356.6 - 359.7	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 29% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown and red siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.5 cm
1,180 - 1,185	359.7 - 361.2	Brown Unit; NO SAMPLE		
1,190 - 1,200	362.7 - 365.8	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 29% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown and red siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.7 cm
1,200 - 1,210	365.8 - 368.8	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 29% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown and red siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.4 cm
1,210 - 1,220	368.8 - 371.9	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 29% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace lithic fragments of brown and red siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.3 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,220 - 1,230	371.9 - 374.9	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 29% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% light gray pumice; trace magnetite; very trace lithic fragments of gray siltstone; reaction to acid: none	very trace iron oxide (hematite), very trace white gypsum	subangular chips up to 1.7 cm
1,230 - 1,240	374.9 - 378.0	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of gray siltstone and black quartzite; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.5 cm
1,240 - 1,250	378.0 - 381.0	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of gray siltstone; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.2 cm
1,250 - 1,260	381.0 - 384.0	Brown Unit; dark reddish brown [5YR3/2]; well lithified; 99% crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace light gray pumice; trace lithic fragments of gray siltstone; trace magnetite; reaction to acid: none to strong	1% calcite on fracture surfaces, very trace iron oxide (hematite)	subangular chips up to 1.8 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,260 - 1,270	384.0 - 387.1	Brown Unit; dark reddish brown [5YR3/2]; well lithified; 99% crystal-rich, porphyritic tuff with 69% reddish-brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of gray siltstone; trace light gray pumice; trace magnetite; reaction to acid: none to strong	1% calcite on fracture surfaces, very trace iron oxide (hematite)	subangular chips up to 1.3 cm
1,270 - 1,280	387.1 - 390.1	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 69% reddish-brown, cryptocrystalline groundmass; 30% 1-2 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of gray siltstone; trace light gray pumice; trace magnetite; reaction to acid: none to moderate	trace calcite on fracture surfaces, very trace iron oxide (hematite), trace brown clay balls	subangular chips up to 2.1 cm
1,280 - 1,290	390.1 - 393.2	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 69% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of gray siltstone; trace light gray pumice; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 2.2 cm
1,290 - 1,300	393.2 - 396.2	Brown Unit; dark reddish brown [5YR3/2]; well lithified; crystal-rich, porphyritic tuff with 68% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 2% lithic fragments of dark gray and black quartzite; trace light gray pumice; trace magnetite; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 1.7 cm
1,300 - 1,310	396.2 - 399.3	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray quartzite; trace light gray pumice; trace magnetite; reaction to acid: none	trace iron oxide (hematite)	subangular chips up to 0.8 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,310 - 1,320	399.3 - 402.3	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray quartzite; trace light gray pumice; trace magnetite; reaction to acid: none to moderate	trace iron oxide (hematite), trace white calcite	subangular chips up to 0.8 cm
1,320 - 1,330	402.3 - 405.4	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 69% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of gray quartzite and reddish-brown siltstone; trace light gray pumice; trace magnetite; reaction to acid: none to moderate	trace iron oxide (hematite), very trace white calcite	subangular chips up to 0.7 cm
1,330 - 1,340	405.4 - 408.4	Brown Unit; dark reddish brown [5YR3/4]; well lithified; 99% crystal-rich, porphyritic tuff with 69% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of gray quartzite and reddish-brown siltstone; trace light gray pumice; trace magnetite; reaction to acid: none to strong	1% white calcite, trace iron oxide (hematite)	subangular chips up to 1.2 cm
1,340 - 1,350	408.4 - 411.5	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray quartzite and reddish-brown siltstone; trace light gray pumice; trace magnetite; reaction to acid: none to moderate	trace iron oxide (hematite), very trace white calcite	subangular chips up to 1.6 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,350 - 1,360	411.5 - 414.5	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray and brown quartzite; very trace light gray pumice; trace magnetite; reaction to acid: none to moderate	trace white calcite, very trace iron oxide (hematite)	subangular chips up to 1.1 cm
1,360 - 1,370	414.5 - 417.6	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray and brown quartzite and black siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none	very trace iron oxide (hematite)	subangular chips up to 2.8 cm
1,370 - 1,380	417.6 - 420.6	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray and brown quartzite and black siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to moderate	trace white calcite, very trace iron oxide (hematite and limonite)	subangular chips up to 1.8 cm
1,380 - 1,390	420.6 - 423.7	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace magnetite; very trace lithic fragments of gray and brown quartzite and black siltstone; reaction to acid: none to moderate	trace white calcite, very trace iron oxide (hematite and limonite)	subangular chips up to 0.9 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,390 - 1,400	423.7 - 426.7	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray and brown quartzite and black siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to moderate	trace white calcite, very trace iron oxide (hematite and limonite)	subangular chips up to 1.7 cm
1,400 - 1,410	426.7 - 429.8	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray and brown quartzite and tan-yellow siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to moderate	trace white calcite, very trace iron oxide (hematite and limonite)	subangular chips up to 1.4 cm
1,410 - 1,420	429.8 - 432.8	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray and brown quartzite; trace magnetite; very trace light gray pumice; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 2.4 cm
1,420 - 1,430	432.8 - 435.9	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray and brown quartzite and reddish-orange siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none	very trace iron oxide (hematite and limonite)	subangular chips up to 1.6 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,430 - 1,440	435.9 - 438.9	Brown Unit; dark reddish brown [5YR3/4]; well lithified; crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray quartzite and reddish-orange siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to moderate	trace calcite on fracture surfaces, very trace iron oxide (hematite and limonite)	subangular chips up to 3.2 cm
1,440 - 1,450	438.9 - 442.0	Brown Unit; dark reddish brown [5YR4/4]; well lithified; 99% crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray and brown quartzite and reddish-orange siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to strong	1% calcite on fracture surfaces, trace iron oxide (hematite)	subangular chips up to 3.1 cm
1,450 - 1,460	442.0 - 445.0	Brown Unit; dark reddish brown [5YR4/4]; well lithified; 99% crystal-rich, porphyritic tuff with 70% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; trace lithic fragments of gray and brown quartzite and reddish-orange siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to moderate	1% calcite on fracture surfaces, trace iron oxide (hematite)	subangular chips up to 2.5 cm
1,460 - 1,470	445.0 - 448.1	Brown Unit; dark reddish brown [5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 69% reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of gray and brown quartzite and reddish-orange siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to moderate	trace iron oxide (hematite), trace calcite on fracture surfaces	subangular chips up to 1.6 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,470 - 1,480	448.1 - 451.1	Brown Unit; dark reddish brown [5YR4/4]; well lithified; 99% crystal-rich, porphyritic tuff with 69% reddish-brown and dark red, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of gray and brown quartzite and reddish-orange siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to strong	1% calcite on fracture surfaces, trace iron oxide (hematite)	subangular chips up to 0.9 cm
1,480 - 1,490	451.1 - 454.2	Brown Unit; weak red [10R4/4]; well lithified; 99% crystal-rich, porphyritic tuff with 69% dark reddish-brown, cryptocrystalline groundmass; 30% 1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 1% lithic fragments of gray and brown quartzite and reddish-orange siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to strong	1% calcite on fracture surfaces, trace iron oxide (hematite)	subangular chips up to 1.3 cm
1,490 - 1,500	454.2 - 457.2	Brown Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 68% dark reddish-brown, cryptocrystalline groundmass; 30% <1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 2% lithic fragments of gray, brown, and yellow quartzite; trace magnetite; very trace light gray pumice; reaction to acid: none to moderate	trace iron oxide (hematite), trace calcite	subangular chips up to 1.6 cm; trace tool marks
1,500 - 1,510	457.2 - 460.2	Brown Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 67% dark reddish-brown, cryptocrystalline groundmass; 30% <1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 3% lithic fragments of gray, brown, and yellow quartzite; trace magnetite; very trace light gray pumice; reaction to acid: none to weak	trace iron oxide (hematite), very trace calcite	subangular chips up to 1.5 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,510 - 1,520	460.2 - 463.3	Brown Unit; weak red [10R4/4]; well lithified; crystal-rich, porphyritic tuff with 68% dark reddish-brown, cryptocrystalline groundmass; 30% <1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 3% lithic fragments of gray, brown, and tan quartzite; trace magnetite; very trace light gray pumice; reaction to acid: none to weak	trace iron oxide (hematite), very trace calcite	subangular chips up to 1.4 cm
1,520 - 1,530	463.3 - 466.3	Brown Unit; reddish brown [5YR4/3]; well lithified; crystal-rich, porphyritic tuff with 68% brown, cryptocrystalline groundmass; 30% <1 mm sized phenocrysts of milky white, anhedral plagioclase, translucent quartz, black and bronzy, euhedral biotite; 3% lithic fragments of gray, brown, and tan quartzite and pink siltstone; trace magnetite; very trace light gray pumice; reaction to acid: none to weak	trace iron oxide (hematite), very trace calcite	subangular chips up to 1.6 cm
1,530 - 1,540	466.3 - 469.4	Brown Unit; brown [7.5YR5/4]; well lithified; crystal-rich, porphyritic tuff with 55% orangish-brown, cryptocrystalline groundmass, and 40% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 3% lithic fragments of quartzite, basalt, and siltstone; 2% pumice; reaction to acid: weak	trace iron oxide (hematite), trace calcite, very trace drusy quartz on fracture surface	subangular chips up to 1.6 cm
1,540 - 1,550	469.4 - 472.4	Brown Unit; brown [7.5YR4/4]; well lithified; 99% crystal-rich, porphyritic tuff with 55% orangish-brown, cryptocrystalline groundmass; 39% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 4% lithic fragments of quartzite, basalt, and siltstone; 2% pumice; reaction to acid: moderate	1% calcite, trace iron oxide (hematite), very trace manganese oxide	subangular chips up to 1.6 cm
1,550 - 1,560	472.4 - 475.5	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 55% orangish-brown, cryptocrystalline groundmass; 39% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 4% lithic fragments of quartzite, basalt, and siltstone; 2% pumice; reaction to acid: weak	trace iron oxide (hematite), trace calcite, very trace manganese oxide	subangular chips up to 1.6 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,560 - 1,570	475.5 - 478.5	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 55% orangish-brown, cryptocrystalline groundmass, and 40% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 3% lithic fragments of quartzite, basalt, and siltstone; 2% pumice; reaction to acid: weak	trace iron oxide (hematite), trace calcite, very trace manganese oxide	subangular chips up to 1.6 cm
1,570 - 1,580	478.5 - 481.6	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 55% orangish-brown, cryptocrystalline groundmass, and 40% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 3% lithic fragments of quartzite, basalt, and siltstone; 2% pumice; reaction to acid: weak	trace iron oxide (hematite), trace calcite, very trace manganese oxide	subangular chips up to 1.6 cm
1,580 - 1,590	481.6 - 484.6	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% orangish-brown, cryptocrystalline to glassy groundmass; 36% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 3% lithic fragments of quartzite, basalt, and siltstone; 1% pumice; reaction to acid: weak	trace iron oxide (hematite and limonite), trace calcite, very trace manganese oxide, very trace gypsum	subangular chips up to 1.6 cm
1,590 - 1,600	484.6 - 487.7	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% orangish-brown, cryptocrystalline to glassy groundmass; 36% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 3% lithic fragments of quartzite, basalt, and siltstone; 1% pumice; reaction to acid: weak	trace iron oxide (hematite), trace calcite, very trace manganese oxide, trace translucent zeolite	subangular chips up to 1.6 cm
1,600 - 1,610	487.7 - 490.7	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 60% orangish-brown, cryptocrystalline to glassy groundmass; 36% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 3% lithic fragments of quartzite, basalt, and siltstone; 1% pumice; reaction to acid: weak	trace iron oxide (hematite), trace calcite, very trace manganese oxide	subangular chips up to 1.6 cm

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APACHE LEAP TUFF - Brown Unit (Talb)				
1,610 - 1,620	490.7 - 493.8	Brown Unit; brown [7.5YR4/4]; well lithified; crystal-rich, porphyritic tuff with 65% orangish-brown, cryptocrystalline to glassy groundmass; 30% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 4% lithic fragments of quartzite, basalt, and siltstone; 1% pumice; reaction to acid: very weak to weak	trace iron oxide (hematite), trace calcite veinlet, very trace manganese oxide	subangular chips up to 1.6 cm
1,620 - 1,630	493.8 - 496.8	Brown Unit; brown [7.5YR4/3]; well lithified; 95% crystal-rich, porphyritic tuff with 65% orangish-brown, cryptocrystalline to glassy groundmass, 30% phenocrysts of translucent quartz, feldspar, and black, euhedral biotite; 4% lithic fragments of quartzite, basalt, and siltstone; 1% pumice; 5% tuff with dark grayish-brown glassy groundmass; reaction to acid: very weak	trace iron oxide (hematite), very trace calcite, very trace manganese oxide, very trace gypsum	subangular chips up to 1.6 cm
APACHE LEAP TUFF - Vitrophyre (Talv)				
1,630 - 1,640	496.8 - 499.9	Vitrophyre and Basal Tuff; reddish brown [5YR5/3] and black [N2.5]; weakly to well lithified; 60% pinkish-brown tuff with 65% aphanitic groundmass, 30% phenocrysts of quartz, feldspar, biotite, 5% lithic fragments; 40% black vitrophyre with 75% glassy groundmass, 20% phenocrysts of quartz and biotite, 5% lithic fragments; reaction to acid: very weak	trace iron oxide (hematite), very trace gypsum	subangular to subrounded chips up to 2.5 cm
APACHE LEAP TUFF - Basal Tuff (Talbt)				
1,640 - 1,650	499.9 - 502.9	Basal Tuff; reddish brown [5YR5/3]; weakly to moderately lithified; pinkish-brown tuff with 45% aphanitic groundmass; 45% phenocrysts of quartz, plagioclase, and biotite; 10% lithic fragments of pink, white, and orange, fine to medium-grained quartzite; trace magnetite; reaction to acid: very weak	trace iron oxide (hematite), trace pinkish-white clay	subangular to subrounded chips up to 1.3 cm
1,650 - 1,660	502.9 - 506.0	Basal Tuff; reddish brown [5YR5/3]; weakly to moderately lithified; 99% pinkish-brown tuff with 44% aphanitic groundmass; 44% phenocrysts of quartz, plagioclase, and biotite; 12% lithic fragments of pink, yellow, gray, and orange, fine to medium-grained quartzite; trace magnetite; trace brown, welded tuff; reaction to acid: very weak	1% white and pink vein quartz, trace iron oxide (hematite), trace pinkish-white clay	subangular to subrounded chips up to 2.1 cm

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
APACHE LEAP TUFF - Basal Tuff (Talbt)				
1,660 - 1,670	506.0 - 509.0	Basal Tuff; brown [7.5YR4/3]; weakly to moderately lithified; brownish-tan, porphyritic tuff with 57% aphanitic groundmass; 37% phenocrysts of quartz, plagioclase, and biotite; 6% lithic fragments of gray, black, and red fine to medium-grained quartzite; trace brown chert; trace magnetite; reaction to acid: none to very weak	trace iron oxide (hematite), trace white and yellow vein quartz	subangular chips up to 1.9 cm
1,670 - 1,680	509.0 - 512.1	Basal Tuff; light brown [7.5YR6/3]; weakly to moderately lithified; light tan and pink, porphyritic tuff with 52% aphanitic groundmass; 33% phenocrysts of quartz, plagioclase, and biotite; 15% lithic fragments of gray, brown, yellow, and red fine to medium-grained quartzite; trace magnetite; reaction to acid: none to very weak	trace iron oxide (hematite), trace white and yellow vein quartz	subangular chips up to 1.3 cm
1,680 - 1,690	512.1 - 515.1	Basal Tuff; light brown [7.5YR6/3]; weakly to moderately lithified; light tan and pink porphyritic tuff with 57% aphanitic groundmass; 38% phenocrysts of quartz, plagioclase, and biotite; 5% lithic fragments of gray, brown, yellow, black, and red, fine to medium-grained quartzite; trace magnetite; trace pink tuff; very trace reddish-brown siltstone; reaction to acid: none to very weak	trace iron oxide (hematite), trace white and yellow vein quartz	subangular chips up to 1.1 cm
1,690 - 1,700	515.1 - 518.2	Basal Tuff; light brown [7.5YR6/3]; weakly to moderately lithified; light tan and pink porphyritic tuff with 57% aphanitic groundmass; 38% phenocrysts of quartz, plagioclase, and biotite; 5% lithic fragments of gray, brown, yellow, black, and red fine to medium-grained quartzite and reddish-orange chert; trace magnetite; trace pink tuff; very trace reddish-brown siltstone; reaction to acid: none to very weak	trace iron oxide (hematite), trace white and yellow vein quartz	subangular chips up to 1.3 cm

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APACHE LEAP TUFF - Basal Tuff (Talbt)				
1,700 - 1,710	518.2 - 521.2	Basal Tuff; light brown [7.5YR6/3]; weakly to moderately lithified; light tan and pink, porphyritic tuff with 58% aphanitic groundmass; 39% phenocrysts of quartz, plagioclase, and biotite; 3% lithic fragments of gray, brown, yellow, black, and red fine to medium-grained quartzite and reddish-orange chert; trace magnetite; trace reddish-orange tuff; very trace pink tuff; very trace reddish-brown siltstone; reaction to acid: none to very weak	trace iron oxide (hematite), very trace tan clay, trace white and yellow vein quartz	subangular chips up to 1.7 cm
1,710 - 1,720	521.2 - 524.3	Basal Tuff; light brown [7.5YR6/3] and red [10R4/6]; weakly to moderately lithified; 70% light tan and pink, and 30% red porphyritic tuff with 65% aphanitic groundmass; 25% phenocrysts of quartz, plagioclase, and biotite; 10% lithic fragments of gray, brown, yellow, black, and red, fine to medium-grained quartzite and reddish-orange chert; trace magnetite; trace reddish-orange tuff; very trace pink tuff; very trace reddish-brown siltstone; reaction to acid: none to very weak	some iron oxide (hematite and limonite), very trace tan clay, trace white and yellow vein quartz	subangular chips up to 0.9 cm
1,720 - 1,730	524.3 - 527.3	Basal Tuff; light brown [7.5YR6/3]; moderately to well lithified; light tan and pink, porphyritic tuff with 63% aphanitic groundmass; 34% phenocrysts of quartz, plagioclase, and biotite; 3% lithic fragments of gray, brown, yellow, and red, fine to medium-grained quartzite; trace magnetite; reaction to acid: none to very weak	trace iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.1 cm
1,730 - 1,740	527.3 - 530.4	Basal Tuff; light brown [7.5YR6/3]; moderately to well lithified; light tan and pink, porphyritic tuff with 64% aphanitic groundmass; 35% phenocrysts of quartz, plagioclase, and biotite; 1% lithic fragments of gray, brown, yellow, and red, fine to medium-grained quartzite; trace magnetite; reaction to acid: none to very weak	trace iron oxide (hematite and limonite), trace light yellow vein quartz, very trace orange-tan clay	subangular to subrounded chips up to 0.8 cm

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APACHE LEAP TUFF - Basal Tuff (Talbt)				
1,740 - 1,750	530.4 - 533.4	Basal Tuff; light brown [7.5YR6/3]; moderately to well lithified; light brown, porphyritic tuff with 67% aphanitic groundmass; 28% phenocrysts of quartz, plagioclase, and biotite; 5% lithic fragments of gray, brown, yellow, and red, fine to medium-grained quartzite; trace magnetite; trace pink tuff; reaction to acid: none to very weak	trace iron oxide (hematite and limonite), trace light yellow vein quartz, very trace orange-tan clay	subangular to subrounded chips up to 1.4 cm
TERTIARY EARLY SEDIMENTS (Tes)				
1,750 - 1,760	533.4 - 536.4	Conglomerate; dusky red [10R3/4]; moderately to well lithified; sandy tuffaceous conglomerate; 55% reddish-brown, fine-grained quartzite; 30% brownish-black, poorly sorted sandstone; 5% red siltstone; 5% brown clay balls; 5% light brown porphyritic tuff with 70% aphanitic groundmass, 30% phenocrysts of quartz, plagioclase, and biotite; trace white vein quartz; trace magnetite; overall sample is 32% fines, 55% sand, 13% gravel; reaction to acid: moderate	some iron oxide (hematite), trace white clay	subangular to subrounded chips up to 1.7 cm
1,760 - 1,770	536.4 - 539.5	Conglomerate; dusky red [10R3/4] and very dark gray [5YR3/1]; moderately to well lithified; sandy conglomerate; cut chips are 65% brown, green, and black, poorly sorted quartzite; 25% reddish-brown, fine-grained quartzite; 5% red siltstone; 3% black and brown vesicular basalt; 2% brown clay balls; trace light brown tuff; trace white vein quartz; trace magnetite; overall samples is 20% fines, 70% sand, 10% gravel; reaction to acid: moderate	some iron oxide (hematite)	subangular to subrounded chips up to 1.4 cm
TERTIARY EARLY VOLCANICS (Tev)				
1,770 - 1,780	539.5 - 542.5	Basalt; very dark gray [N3]; well lithified; 60% black to dark gray basalt with common magnetite; trace pink and brown, fine-grained quartzite; reaction to acid: weak	40% gray silty clay, trace teal unidentified mineral amygdules	subangular to subrounded chips up to 1.2 cm; trace contamination of light brown tuff
1,780 - 1,790	542.5 - 545.6	Basalt; very dark gray [N3]; well lithified; 89% black to dark gray basalt with common magnetite; trace tan and brown, fine-grained quartzite; reaction to acid: weak	11% gray silty clay, trace teal unidentified mineral amygdules	subangular to subrounded chips up to 1.0 cm; 10% contamination of light brown tuff
1,790 - 1,800	545.6 - 548.6	Basalt; very dark gray [N3]; well lithified; 90% black to dark gray basalt with common magnetite; 8% brown siltstone; reaction to acid: none to very weak	2% gray silty clay, trace teal unidentified mineral amygdules	subangular to subrounded chips up to 1.3 cm; trace contamination of light brown tuff

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
TERTIARY EARLY VOLCANICS (Tev)				
1,800 - 1,810	548.6 - 551.7	Siltstone; reddish brown [5YR4/4] and very dark gray [N3]; well lithified; 88% brown siltstone; 10% black to dark gray basalt with common magnetite; reaction to acid: none to very weak	2% gray silty clay, trace teal unidentified mineral amygdules	subangular to subrounded chips up to 1.5 cm
1,810 - 1,820	551.7 - 554.7	Basalt; very dark gray [N3]; well lithified; 90% black to dark gray basalt with common magnetite; 8% brown siltstone; reaction to acid: none to very weak	2% gray silty clay, trace teal unidentified mineral amygdules	subangular to subrounded chips up to 0.9 cm
1,820 - 1,830	554.7 - 557.8	Basalt; very dark gray [N3]; well lithified; 98% black to dark gray basalt with common magnetite; 1% brown siltstone; reaction to acid: none to very weak	2% gray silty clay, trace green vein quartz, trace teal unidentified mineral amygdules	subangular to subrounded chips up to 0.9 cm; 2% contamination of pink tuff
1,830 - 1,840	557.8 - 560.8	Basalt; very dark gray [N3]; well lithified; 97% black to dark gray basalt with common magnetite; trace brown siltstone; reaction to acid: none to very weak	2% white, green, and yellow vein quartz, 1% gray silty clay, trace teal unidentified mineral amygdules	subangular to subrounded chips up to 0.7 cm; 1% contamination of pink tuff
1,840 - 1,850	560.8 - 563.9	Basalt; very dark gray [N3]; well lithified; 67% teal and black to dark gray basalt with common magnetite; reaction to acid: none to very weak	33% dark gray sandy clay, trace yellow vein quartz, trace teal unidentified mineral amygdules	subangular to subrounded chips up to 0.5 cm; 40% contamination of pink tuff
1,850 - 1,860	563.9 - 566.9	Basalt; very dark gray [N3]; well lithified; 89% black to dark gray basalt with common magnetite; 3% teal and black to dark gray basalt with common magnetite; reaction to acid: none	8% dark gray sandy clay, trace yellow vein quartz, trace teal unidentified mineral amygdules	subangular to subrounded chips up to 0.8 cm; 10% contamination of pink dacite tuff
1,860 - 1,870	566.9 - 570.0	Basalt; black [N2.5]; well lithified; 98% black to dark gray basalt with common magnetite; 1% teal and black to dark gray basalt; 1% brown siltstone; reaction to acid: none	some iron oxide (hematite and limonite), trace yellow vein quartz	subangular to subrounded chips up to 1.2 cm; 5% contamination of pink dacite tuff
1,870 - 1,880	570.0 - 573.0	Basalt; black [N2.5]; well lithified; black to dark gray basalt with common magnetite; trace brown siltstone; reaction to acid: none	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.5 cm; very trace contamination of pink dacite tuff
1,880 - 1,890	573.0 - 576.1	Basalt; black [N2.5]; well lithified; black to dark gray basalt with common magnetite; trace brown siltstone; reaction to acid: none	trace iron oxide (hematite and limonite), very trace white vein quartz	subangular to subrounded chips up to 1.3 cm; 5% contamination of milky pink dacite tuff

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TERTIARY EARLY VOLCANICS (Tev)				
1,890 - 1,900	576.1 - 579.1	Basalt; black [N2.5]; well lithified; black to dark gray basalt with common magnetite; trace brown siltstone; reaction to acid: none	some iron oxide (hematite and limonite), very trace white vein quartz	subangular to subrounded chips up to 1.7 cm; 2% contamination of milky pink dacite tuff
1,900 - 1,910	579.1 - 582.2	Basalt; black [N2.5]; well lithified; black to dark gray basalt with common magnetite; trace brown siltstone; reaction to acid: none	some iron oxide (hematite and limonite), very trace white vein quartz	subangular to subrounded chips up to 1.3 cm; 2% contamination of milky pink dacite tuff
1,910 - 1,920	582.2 - 585.2	Basalt; black [N2.5]; well lithified; black to dark gray basalt with common magnetite; reaction to acid: none	some iron oxide (hematite and limonite), very trace whitish-green vein quartz	subangular to subrounded chips up to 0.9 cm; 10% contamination of milky pink dacite tuff
1,920 - 1,930	585.2 - 588.3	Basalt; black [N2.5]; well lithified; 99% black to dark gray basalt with common magnetite; reaction to acid: none	some iron oxide (hematite and limonite), 1% white chalk, very trace whitish-green vein quartz	subangular to subrounded chips up to 1.1 cm; 10% contamination of milky pink dacite tuff
1,930 - 1,940	588.3 - 591.3	Basalt; black [N2.5]; well lithified; black to dark gray basalt with common magnetite; reaction to acid: none	some iron oxide (hematite and limonite), trace white vein quartz	subangular to subrounded chips up to 1.4 cm; 15% contamination of milky pink dacite tuff
1,940 - 1,950	591.3 - 594.4	Basalt; black [N2.5]; well lithified; black to dark gray basalt with common magnetite; reaction to acid: none	some iron oxide (hematite and limonite), trace white vein quartz, very trace epidote	subangular to subrounded chips up to 2.1 cm; 10% contamination of milky pink dacite tuff, brown tuff, and orange quartzite
1,950 - 1,960	594.4 - 597.4	Basalt; black [N2.5]; well lithified; black to dark gray basalt with common magnetite; reaction to acid: none	some iron oxide (hematite and limonite), very trace white vein quartz	subangular to subrounded chips up to 2.2 cm; 3% contamination of milky pink dacite tuff and very trace brown and orange quartzite
1,960 - 1,970	597.4 - 600.5	Basalt; black [N2.5]; well lithified; black to dark gray basalt with common magnetite; reaction to acid: none	some iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.3 cm; 25% contamination of milky pink dacite tuff, red, brown and orange quartzite

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DEPTH INTERVAL (feet)	DEPTH INTERVAL (meters)	GENERAL DESCRIPTION	SECONDARY FEATURES	COMMENTS
WHITETAIL CONGLOMERATE - Conglomerate Unit (Tw3)				
1,970 - 1,980	600.5 - 603.5	Basalt and Conglomerate Unit no. 3; brown [7.5YR5/4]; weakly to well lithified; 70% conglomerate, 30% black basalt; cut chips of conglomerate are 90% clasts of tan and brown, fine-grained quartzite, orange chert, trace diabase; 10% matrix chips of red and brown, calcareous siltstone; reaction to acid: moderate	some iron oxide (hematite and limonite), trace orange and white vein quartz	subangular to subrounded chips up to 1.7 cm; 50% contamination of milky pink dacite tuff (Talbt), 8% black sandstone (Tes)
1,980 - 1,990	603.5 - 606.6	Conglomerate Unit no. 3; brown [7.5YR5/4]; weakly to moderately lithified; conglomerate; cut chips are 87% clasts of 88% gray and tan, fine-grained quartzite, 5% black basalt, and 5% orange-white quartz; 13% matrix chips of brown, calcareous siltstone; overall sample is 64% brown silt, 32% sand, 4% gravel; reaction to acid: moderate	trace iron oxide (hematite and limonite)	subangular to subrounded chips up to 1.3 cm; 60% contamination of milky pink dacite tuff (Talbt), 2% blackish-brown sandstone (Tes)
1,990 - 2,000	606.6 - 609.6	Conglomerate Unit no. 3; brown [7.5YR5/4]; weakly to moderately lithified; conglomerate; cut chips are 90% clasts of brown, red, and tan fine-grained quartzite, black basalt, and trace orange-white quartz; 10% matrix chips of brown and red, calcareous siltstone; overall sample is 8% brown silt, 80% sand, 12% gravel; reaction to acid: moderate	some iron oxide (hematite), trace calcite	subangular to subrounded chips up to 1.0 cm; 20% contamination of milky pink dacite tuff (Talbt), 1% black and brown sandstone (Tes)
2,000 - 2,010	609.6 - 612.6	Conglomerate Unit no. 3; weak red [2.5YR4/2]; weakly to moderately lithified; conglomerate; cut chips are 94% clasts of 63% gray, brown, and tan, fine-grained quartzite, 24% black and gray medium-grained quartzite, 13% gray limestone; 6% matrix chips of reddish-brown calcareous siltstone; overall sample is 63% brown silt, 33% sand, 4% gravel; reaction to acid: moderate to strong	some iron oxide (hematite), trace calcite	subangular to subrounded chips up to 1.4 cm; 15% contamination of milky pink dacite tuff (Talbt)
2,010 - 2,018	612.6 - 615.1	Conglomerate Unit no. 3; weak red [2.5YR4/2]; weakly to moderately lithified; conglomerate; cut chips are 94% clasts of 63% gray, brown, and tan fine-grained quartzite, 24% black and gray medium-grained quartzite, 13% gray limestone, and trace orange chert; 6% matrix chips of reddish-brown calcareous siltstone, trace purple siltstone; overall sample is 36% brown silt, 60% sand, 4% gravel; reaction to acid: moderate to strong	some iron oxide (hematite), trace calcite	subangular to subrounded chips up to 1.7 cm; 15% contamination of milky pink dacite tuff (Talbt)

APPENDIX B-1. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL HRES-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
17-Mar	HRES-14	J.Kent	0.00	0.00	0.00	0.00	Crew safely and successfully mobilized the drill rig, and all equipment on skids to HRES-14. Smaller equipment will be mobilized tomorrow (drill rods, generator, etc.). Anticipate site set up to be complete on March 21st.	Mobilization	N/A	N/A
18-Mar	HRES-14	D. Stalling	0.00	0.00	0.00	0.00	Mobilization and site set up continues. Crews are making equipment connections and transporting drilling accessories to site. Anticipate completing final inspection on Sunday the 20th.	Mobilization	N/A	N/A
19-Mar	HRES-14	D. Stalling	0.00	0.00	0.00	0.00	Mobilization and site set up has been completed. Final electrical and site inspections are scheduled for 1400hrs by Peek's Performance. RCM site inspection completed this morning with only minor issues that were immediately addressed. Drilling to start later this afternoon.	17-1/4" Starter Tri-Cone bit	N/A	N/A
20-Mar	HRES-14	E. Jung	12.19	40.00	12.19	40.00	Drilled 12.19m and installed 12.5m of 12-3/4" surface casing. On standby for 8hr cement cure. Set up to drill RC. Resumed drilling at 1500hrs. Currently drilling.	10" Hammer RC Air w/ water injection.	N/A	Apache Leap Tuff (Tal)
21-Mar	HRES-14	A.Jergenson	135.64	445.00	123.44	405.00	Drilling, making great progress. Surveys taken at 30.48m 0.25° Inc., 60.96m 0.5° Inc., and 91.44m 1.0° Inc. Plan is to drill down to 198.12m prior to tripping out for new hammer. Currently drilling 30min/rod.	10" Hammer RC Air w/ water injection.		Apache Leap Tuff, Brown Unit (Talb)
22-Mar	HRES-14	D. Stalling	217.93	715.00	82.30	270.00	Crew tripped for bit changed and commenced drilling by 0845hrs. Surveys taken at 121.9m Inc .75°, 152.4m Inc 1° and 182.9m Inc 1.5°. Currently drilling 30 minutes per rod.	10" Hammer RC Air w/ water injection.	N/A	Apache Leap Tuff, Brown Unit (Talb)
23-Mar	HRES-14	D. Stalling	315.47	1035.00	97.54	320.00	Drilling, making good progress. Took surveys at 213.4m Inc 1.75°, 243.8m Inc 2.5°, 274.3m Inc 3°. Hit water production zone beginning at 303.3m. See hydro data for current production. Penetration rate has increased to 1hr/rod. Bit trip anticipated late tonight.	10" Hammer RC Air w/ water injection.	Water production zone reached at 303.3 producing 9.2gpm followed by 35.3gpm at 309.4m. Production holding ~32gpm.	Apache Leap Tuff, Brown Unit (Talb)

APPENDIX B-1. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL HRES-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
24-Mar	HRES-14	D. Stalling	352.04	1155.00	36.58	120.00	Crews completed bit trip and commenced drilling 1100hrs. Current static water level measured 162.9m. Surveys taken at 304.8m Inc 3.5° and 335.28m Inc 4°. Crew is currently diagnosing problem with compressor after a loss of air pressure occurred. Anticipate drilling to commence shortly.	10" Hammer RC Air w/ water injection.	Average water production of 33.5gpm.	Apache Leap Tuff, Brown Unit (Talb)
25-Mar	HRES-14	D. Stalling	399.29	1310.00	47.24	155.00	Drilled down to 399m and flooded out the bit. Current plan is to conduct air lift test, and then crew will switch over to drill 9-7/8" tri-cone flooded reverse. Air lift test will be conducted later this afternoon.	Airlift Test	Water production reached 50+gpm at 352.0m.	Apache Leap Tuff, Brown Unit (Talb)
26-Mar	HRES-14	D. Stalling	399.29	1310.00	0.00	0.00	Conducted air lift test successfully for a total of eight hours including recovery. Water parameters during test stabilized quickly. Static water level also stabilized quickly during the recovery. Crew will be tripping in BHA to drill flooded reverse early afternoon. Anticipate drilling to commence later tonight.	Airlift Test	Initial pumping rate of 80gpm which gradually decreased to 46gpm towards the end of the test. Static water level before the test recorded 161.5m with a final level of 161.9m. Initial parameters: pH = 7.05, EC = 225.0 uS, T = 18.5 deg C, ORP = 161 mV. Stabilized parameters: pH = 7.91, EC = 234.9 uS, T = 24.1 deg C, ORP = 26 mV	Apache Leap Tuff, Brown Unit (Talb)
27-Mar	HRES-14	E. Jung	439.83	1443.00	40.54	133.00	Tripped in with 9-7/8" tricone at 0045hrs. Hole was tight from 268.21m. Reamed down to 399.29m. Currently drilling.	9-7/8" Tricone Flooded Reverse	N/A	Apache Leap Tuff (Tal) Possible basal unit - under review: Welded tuff with white groundmass, 10% white-gray, clayey sandy silt from 420.62-423.67m.

APPENDIX B-1. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL HRES-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-Mar	HRES-14	A.Jergenson	500.79	1643.00	60.96	200.00	Drilled down to 500m, pulled back due to formation problems higher up in the hole ~420m. There is evidence that the hole is starting to unravel due to contamination of the chips from the Basal Tuff (423-451m). Crew's spent 45mins cleaning up the hole after a connection was made, pulled back above the bad zone. Decision has been made to call the hole. Anticipate running geophysics later this evening.	9-7/8" Tricone Flooded Reverse	N/A	Apache Leap Tuff Basal Unit (Talbt) 417-451m. Contact with the Tertiary Early Volcanics (Tev) at 451m. Currently drilling in Tev.
29-Mar	HRES-14	D. Stalling	500.79	1643.00	0.00	0.00	Successfully completed running geophysical logging by Southwest Exploration from 1945hrs to 0440hrs. Crews will be tripping casing and prepare to gravel pack later tonight. Currently tripping casing.	4-1/2" HWT blank and perforated casing.	N/A	Apache Leap Tuff Basal Unit (Talbt) 417-451m. Contact with the Tertiary Early Volcanics (Tev) at 451m. Currently drilling in Tev.
30-Mar	HRES-14	D. Stalling	500.79	1643.00	0.00	0.00	Crews set up and began gravel packing but is experiencing problems with tremmie pipe plugging from angular gravel. Tagged gravel pack at 457.8m bls as of noon. Crew is currently tripping in remaining 61m of BQ rods after clearing a plugged section to continue gravel packing.	4-1/2" HWT blank and perforated casing.	N/A	Apache Leap Tuff Basal Unit (Talbt) 417-451m. Contact with the Tertiary Early Volcanics (Tev) at 451m. Currently drilling in Tev.
31-Mar	HRES-14	D. Stalling	500.79	1643.00	0.00	0.00	Currently gravel packing. Crews have slowed gravel and water flow rate to prevent plugging and have made good progress. Gravel packing will run through the night.	4-1/2" HWT blank and perforated casing.	N/A	Apache Leap Tuff Basal Unit (Talbt) 417-451m. Contact with the Tertiary Early Volcanics (Tev) at 451m. Currently drilling in Tev.
1-Apr	HRES-14	D. Stalling	500.79	1643.00	0.00	0.00	Completed gravel packing at 1300hrs. Currently setting up to run the airlift test. Anticipate starting airlift test tomorrow morning.	4-1/2" HWT blank and perforated casing.	N/A	Tev

APPENDIX B-1. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL HRES-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
2-Apr	HRES-14	D. Stalling	500.79	1643.00	0.00	0.00	Air lift and recovery tests completed at 1100hrs. See hydro data for parameter details. Crew tripped out AQ then will modify the top seal to tag gravel pack. Anticipate well completion by tomorrow morning. Currently setting up to cement to surface following bentonite seal on top of gravel pack.	4-1/2" HWT blank and perforated casing.	Water production was calculated to ~10gpm by the end of test. Initial parameters: pH = 8.06, EC = 576.7 uS, T = 18.7° C, ORP = 42. Final parameters after a 4hr test: pH = 8.31, EC = 417.9 uS, T = 23.4° C, ORP = 46. Water level recovered quickly from 240.0m to 161.6m.	Tev
3-Apr	HRES-14	E. Jung	500.79	1643.00	0.00	0.00	Mixed and pumped cement to surface. Tagged cement 6 hrs later at 33.53m. Mixed and pumped cement to surface. Began breakdown of site. Crew is on mobilization schedule. Wellhead will be secured by resting the head on a steel plate. Once rig is mobilized off, the monument will be installed.	Mobilization	N/A	N/A
4-Apr	HRES-14	A.Jergenson	500.79	1643.00	0.00	0.00	Cement subsided 3.66m overnight. Cemented to surface. Currently, breaking down site and mobilizing equipment to the DHRES-14 site.	Mobilization	N/A	N/A

APPENDIX B-2. DAILY DRILLING REPORT SUMMARY FOR HYDROLOGIC TEST WELL HRES-15

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
21-May	HRES-15	D. Stalling	0.00	0.00	0.00	0.00	Rig was successfully mobilized by 0900hrs. Crews will continue with equipment setup in anticipation of final site inspections by RCM and Peek's by tomorrow. Crew will be mobilizing the remaining baker tank and doghouse later this afternoon. Anticipate final site completion by tomorrow morning.	Mobilization	N/A	N/A
22-May	HRES-15	E. Jung	0.00	0.00	0.00	0.00	Site set-up was complete at 0930hrs. Inspections were conducted from 1000-1200hrs. Corrected minor issues and began drilling for surface casing at ~1300hrs. Anticipate surface casing to be set late tonight.	17-1/4" Starter Tri-Cone bit	N/A	N/A
23-May	HRES-15	E. Jung	18.29	60.00	18.29	60.00	Drilled to 18.29m. Installed and cemented 18.29m of 12-3/4" surface casing by 0330hrs. Installed diverter head. Assembled BHA to drill 10" hammer, RC air. Resumed drilling at 1400hrs.	10" Hammer RC Air w/ water injection.	N/A	Apache Leap Tuff (Tal)
24-May	HRES-15	E. Jung	150.88	495.00	132.59	435.00	Drilling with a penetration rate of 25-30min per rod. Took surveys at 30.48m Inc 0.0°, 60.96m Inc 0.0°, 91.44m Inc 0.25°, and 121.91m Inc 0.75°.	10" Hammer RC Air w/ water injection.	N/A	Apache Leap Tuff (Tal)
25-May	HRES-15	E. Jung	193.55	635.00	42.67	140.00	Drilling with a penetration rate of ~30min/rod. Lost circulation at 178.3m. Regained partial returns by 190m. Currently drilling - working to clean hole before each connection.	10" Hammer RC Air w/ water injection.	Lost all returns in fracture zone at 178.3m. Regained partial returns by 190m.	Apache Leap Tuff (Tal)
26-May	HRES-15	E. Jung	291.08	955.00	97.54	320.00	Drilling with ~40min/rod penetration rate. Took surveys at 182.87m Inc 1.5°, 213.35m Inc 2.0°, and 243.83m Inc 1.25°. Cleaning hole for ~20min before breaking connections. Currently drilling.	10" Hammer RC Air w/ water injection.	Encountered water at 217.92m (1-10gpm). Currently producing ~55gpm. Drilling with full returns.	Apache Leap Tuff (Tal)
27-May	HRES-15	D. Stalling	333.76	1095.00	42.67	140.00	Decision was made to trip out and switch over to drilling flooded reverse with a 9-7/8" tri cone due to current water production amount. Currently reaming hole while tripping in BHA. Anticipate drilling to commence later this afternoon.	9-7/8" Tricone Flooded Reverse	Producing ~55gpm at current depth.	Apache Leap Tuff (Tal)

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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-May	HRES-15	D. Stalling	312.42	1025.00	32.00	105.00	Crew reamed hole while tripping in down to ~283m. In the attempt to reach bottom, the rigid BHA caught a ledge or slight dogleg which caused the bit to track off previous hole. Crew drilled with full returns and took survey at 298.7 Inc 1.25°. Currently drilling with a penetration rate of 2hrs/rod with no borehole stability issues noticed.	9-7/8" Tricone Flooded Reverse		Apache Leap Tuff (Tal)
29-May	HRES-15	E. Jung	356.62	1170.00	44.20	145.00	It is believed that the hole twinned off the original at approximately 280-283m, or 53.76-50.76m from the bottom. New hole is designated HRES-15A. Currently drilling with a 2-1/2hr/rod penetration rate. Took surveys at 304.79m Inc 1.75°, and 335.26m Inc 2.0°.	9-7/8" Tricone Flooded Reverse	Water level was previously recorded at 195.89m below land surface, during switch from hammer to tricone bit.	Apache Leap Tuff (Tal) Brown Unit, with 1% calcite from 332.22 - 341.36m, and minor clay balls from 338.310 - 341.36m.
30-May	HRES-15	E. Jung	406.30	1333.00	49.68	163.00	Currently drilling with a penetration rate of 2-1/2 to 3hr per rod. Took survey at 365.74m Inc 2.0°.	9-7/8" Tricone Flooded Reverse	N/A	Apache Leap Tuff (Tal) with 1% calcite from 402.32 - 405.36m.
31-May	HRES-15	E. Jung	451.10	1480.00	44.81	147.00	Hit contact with vitrophyre unit at 0700hrs. Currently tripping out bit to conduct air-lift test - expected to begin ~2200hrs.	9-7/8" Tricone Flooded Reverse	N/A	Apache Leap Tuff (Tal) Brown Unit contact with vitrophyre at 448m.
1-Jun	HRES-15	D. Stalling	499.87	1640.00	48.77	160.00	While tripping out it was discovered that there was a miscount in the number of drill rods in the hole, and that the hole was deeper than the crews had thought. When they previously thought they were kicked off higher in the hole drilling new, they were in fact at/near the bottom, continuing to drill on the same/original hole. While tripping in to conduct air lift test, the rods hit a bridge at 257.6m. Crew was forced to trip out and clean hole with the tricone assembly. Currently drilling out bridge and reaming hole to prepare for air lift test. Anticipate air lift to commence late tonight.	9-7/8" Tricone Flooded Reverse	N/A	Apache Leap Tuff (Tal) Brown Unit contact with vitrophyre at 448m.

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2-Jun	HRES-15	D. Stalling	499.87	1640.00	0.00	0.00	Conducted air lift test successfully for a total of six hours including recovery. Water parameters during test stabilized quickly. Static water level also stabilized quickly during the recovery to 196.0m. Currently tripping in to resume drilling.	9-7/8" Tricone Flooded Reverse	Air lift test conducted from 0020hrs to 0328hrs. Water production held at 80gpm for 3hrs. Final parameters: T=24.3°C; EC=277.4µS; pH=8.02; ORP=-4mV	Apache Leap Tuff (Tal) Brown Unit contact with vitrophyre at 448m.
3-Jun	HRES-15	D. Stalling	544.98	1788.00	45.11	148.00	Commenced drilling at 2030hrs. Drilling with a penetration rate of 1-2.5 hours per rod. Anticipate running geophysics tomorrow to log the lower portion of hole. Currently drilling.	9-7/8" Tricone Flooded Reverse	N/A	Vitrophyre contact with basal tuff at 499.87m. Basal tuff contact with Tes at 533.4m. Tes contact with Basalt of Tev at 545.6m to current depth.
4-Jun	HRES-15	D. Stalling	592.23	1943.00	47.24	155.00	Drilling with a penetration rate of 3.5hrs/rod. Surveys taken at 548.6m Inc 1.75° and 579.1m Inc 2.5°. Anticipate reaching the contact with Whitetail conglomerate by tonight. Currently 88hrs on bit and drilling.	9-7/8" Tricone Flooded Reverse	N/A	Basalt (Tev)
5-Jun	HRES-15	E. Jung	615.09	2018.00	22.86	75.00	Reached TD of 615.09m at ~2300hrs in Whitetail Conglomerate. Cleaned hole and tripped out for geophysics. Logging crew on site ~1345hrs. Currently logging hole.	9-7/8" Open Hole	Last water level recorded was 197.49m bls.	Early Volcanics (Tev) contact with Whitetail Conglomerate (Tw) at 601.95m.
6-Jun	HRES-15	E. Jung	615.09	2018.00	0.00	0.00	Logging crew encountered a bridge at 182.87m. Drill crew tripped in, worked through bridge at 182.87m, and encountered a bridge at 528.8m. Had difficulty with lack of submergence/circulation, and tripped out to move lift tube in string. Tripped in - encountered a bridge at 502.9m and worked through. Circulated and reamed through fill from 502.9m to 507.47m where the bit plugged. Plan is to collect geophysical logs to this point before completing well. Currently tripping out.	9-7/8" Tricone Flooded Reverse	Full returns - fill material.	Apache Leap Tuff (Tal) fill material.
7-Jun	HRES-15	E. Jung	615.09	2018.00	0.00	0.00	Logging crew made a second attempt and became stuck in the hole at 182.87m while running logs. Fishing contractor was contacted, and is due to arrive ~2300hrs tonight to retrieve tool from hole. Crew is on standby.	9-7/8" Open Hole	N/A	N/A

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8-Jun	HRES-15	E. Jung	615.09	2018.00	0.00	0.00	Fishing contractor arrived on site at midnight and latched onto stuck tool with overshot at 0600hrs - with no problems. Tools were out of the hole by 0815hrs. Crew will ream and condition hole to original TD of 615.09m, utilizing bentonite and polymers to stabilize borehole. Currently tripping in.	9-7/8" Tricone Flooded Reverse - Mud	N/A	N/A
9-Jun	HRES-15	E. Jung	615.09	2018.00	0.00	0.00	Tripped in slowly while conditioning the hole with mud. Reamed through bridge and fill at 504.42m. Currently reaming and conditioning at 527.89m.	9-7/8" Tricone Flooded Reverse - Mud	N/A	Apache Leap Tuff (Tal) fill material.
10-Jun	HRES-15	J.Kent	615.09	2018.00	0.00	0.00	Completed conditioning the hole and tripped out in preparation for geophysics. Southwest arrived on site for geophysical logging at 0830hrs. Successfully completed the combo tool with no hole issues. Currently running the second tool. Anticipate completing geophysics this afternoon.	9-7/8" Open Hole	N/A	Whitetail Conglomerate (Tw) at 601.95m.
11-Jun	HRES-15	J.Kent	615.09	2018.00	0.00	0.00	Safely and successfully completed geophysical logging at 1500hrs. Hauled well completion materials from West/East plant laydown yards to site. Set up and tripped NRQ pipe down to TD with no issues. Currently cleaning ends of 4.5" HWT casing to ensure proper torque requirements are achieved. Anticipate tripping in casing late this afternoon.	9-7/8" Open Hole	N/A	Whitetail Conglomerate (Tw) at 601.95m.
12-Jun	HRES-15	E. Jung	615.09	2018.00	0.00	0.00	Installed 4-1/2" blank and slotted casing as per casing schedule. Currently installing gravel pack at ~457m.	4-1/2" Blank and Slotted Casing.	N/A	Whitetail Conglomerate (Tw) at 601.95m.
13-Jun	HRES-15	E. Jung	615.09	2018.00	0.00	0.00	Continue to install gravel pack at the rate of 1 cubic yard per hour. Currently at ~285m bls. Anticipate well development to commence mid-morning tomorrow.	4-1/2" Blank and Slotted Casing.	N/A	Whitetail Conglomerate (Tw) at 601.95m.
14-Jun	HRES-15	E. Jung	615.09	2018.00	0.00	0.00	Completed annular installations by 1400hrs. Anticipate air-lift pumping to commence mid-afternoon.	4-1/2" Blank and Slotted Casing.	N/A	Whitetail Conglomerate (Tw) at 601.95m.

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15-Jun	HRES-15	E. Jung	615.09	2018.00	0.00	0.00	Attempt to unload the hole at 550m was unsuccessful. Tripped up to 365m - still unsuccessful at ~5gpm. Tripped out air line. Tripped in 101 pipe to 550m, and AQ to 365m (reverse). Began air-lift at 1245hrs with initial rate of ~25gpm. Currently conducting air-lift development.	4-1/2" Blank and Slotted Casing.	Static water level was last measured at 197.2m bls.	N/A
16-Jun	HRES-15	A.Jergenson	615.09	2018.00	0.00	0.00	Completed two additional air-lift developments that began at 0157hrs. Crew is currently monitoring the recovery, from last test, and will be done by ~1300hrs. Crews are setting up to begin tripping out the AQ and 101 pipe, as well as finish the annulus well construction.	4-1/2" Blank and Slotted Casing.	Static water level prior to the development was 195.81m bls. With the 101 pipe down to 426m and airline(AQ) set at 335m. Discharge averaged ~20gpm for both tests. First measurement after air-lift measured 198.21m (after 1st test) and then 197.42m (after 2nd test).	N/A
17-Jun	HRES-15	D. Stalling	615.09	2018.00	0.00	0.00	Crews completed the construction of the well collar. Site is currently undergoing teardown and cleanup to begin demobilizing to the next site. Anticipate the rig to be mobilized tomorrow morning with assistance.	4-1/2" Blank and Slotted Casing.	N/A	N/A
18-Jun	HRES-15	D. Stalling	615.09	2018.00	0.00	0.00	Mobilized rig successfully to next site. Crews will continue to breakdown and move auxiliary equipment throughout the day. Anticipate complete site set-up by tomorrow night. Final inspections are scheduled for Monday morning.	Mobilization	N/A	N/A