APPENDIX A
FIELD EXPLORATION AND LABORATORY TESTS

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PURPOSE AND SCOPE

This appendix documents the environmental and geotechnical drilling, sampling, and testing methods as well as field observations that Hart Crowser made during the Remedial Investigation of the Van Stone Mine (Site). The mine is located in Stevens County in the upper Onion Creek watershed, about 23 miles northeast of Colville, Washington.

DRILLING AND CONE PENETROMETER PROCEDURES

A CME-850 track drill (subcontracted by Hart Crowser) was used to collect subsurface data and samples downgradient of and on the Upper and Lower Tailings Piles, and on the Pit Lake Dam (North Pit). The CME-850 is a convertible drill capable of using either hollow steam augers (HSA) or mud rotary drilling to advance borings. Downgradient of the tailings piles, borings were advanced using HSA; on the tailings piles and Pit Lake Dam, drilling was done with a tri-cone bit.

An electric cone (piezocone) penetrometer (CPT) was used to gather continuous subsurface profiles of conditions within the Upper and Lower Tailings piles. The system used is mounted on a truck that provides the necessary reaction for the applied loads.

The locations of monitoring wells, soil borings, and cone penetrometers were surveyed to establish elevations. Elevations are based on mean sea level. Horizontal coordinates were recorded using a Trimble GPS and referenced to latitude/longitude coordinates using the World Geodetic System 1984 datum (WGS 1984). The method controls the accuracy of the location and elevation of the explorations.

The following sections describe HSA, mud rotary, and CPT drilling/probing methods, and procedures for monitoring well installation and development.

Hollow-Stem Auger

Five HSA borings, designated MW-1 through MW-5 (RI Figure 4), were drilled and monitoring wells were installed from November 1–8, 2011. Boring depths ranged from 30 to 82 feet below the ground surface. Two of the borings were

located downgradient of the Upper Tailings Pile and three of the borings were located downgradient of the Lower Tailings Pile.

During drilling, one boring did not encounter groundwater. The boring was logged and abandoned by backfilling to the surface with bentonite chips. The abandoned boring is included in the boring log record as MW-2A. A new boring was drilled nearby, and monitoring well MW-2 was installed.

At each location, borings were advanced using an 8-inch-diameter HSA. A Hart Crowser engineering geologist observed the drilling and recorded Standard Penetration Test (SPT) blow counts and logged and collected split spoon samples (see mud rotary section for a description of those procedures). Samples were classified using the soil classification code presented on Figure A-1 - Key to Exploration Logs. The figure also provides a legend explaining the symbols and abbreviations used in the logs. Detailed boring logs and monitoring well installation details are presented on Figures A-2 through A-7.

Monitoring Well Installation

At each boring location, once the HSA reached a target water-bearing zone, drilling stopped. A well screen and well casing consisting of 2-inch-diameter, 0.020-inch machine-slotted screen and 2-inch-diameter Schedule 40 PVC pipe was assembled and lowered through the center of the hollow-stem auger to the target completion depth. When the screen was set at the target depth, a number 10/20 silica sand filter pack was placed in the annular space between the auger wall and screen from the bottom of the boring to approximately 2 feet above the top of the well screen. Bentonite chips were placed in the annular space from the top of the filter sand to within 1.0 to 1.5 feet of ground surface. During placement of filter pack sand and bentonite, the top of the casing was weighted down and the HSA was gradually retracted.

Each monitoring well was completed to grade with a concrete surface seal. For protection of the monitoring well, a locking stick-up steel monument was set in the concrete surface seal. The monitoring well construction details are illustrated on the boring logs, Figures A-2 through A-7.

The monitoring wells were installed in accordance with Washington State Department of Ecology regulations.

Monitoring Well Development

Each installed monitoring well was developed using a surge block and purging methods. The well development procedure was:

- Measure and record sediment thickness at the bottom of the well before and after well development;

- Remove sediment from the bottom of the well using a stainless steel bailer and submersible pump;

- Surge the well to remove fine material from the screen and filter pack and remove sediment at the bottom of the screen (If the well yield allowed it, a minimum of 10 casing volumes were purged.);

- Develop the well until water was visibly clear and turbidity readings stabilized;

- Clean the surge and purge equipment between monitoring wells to prevent cross-contamination of wells; and

- Record well development observations on a Well Development Data form.

Monitoring well development data is summarized in Table A-7.

Mud Rotary Borings

With depths ranging from 34 to 85 feet below the ground surface, five mud rotary borings, designated UT-HC-1, UT-HC-2, LT-HC-3, LT-HC-4, and PL-HC-5, were drilled from November 8–11, 2011. The borings were made with an approximately 2-3/4-inch-diameter, tri-cone bit. The drilling was continuously observed by a geotechnical engineer or engineering geologist from Hart Crowser. Detailed field logs were prepared for each boring. Six vibrating wire piezometers (VWPs) were installed in selected borings to measure groundwater pore pressure in the tailings piles and Pit Lake Dam. Using the Standard Penetration Test (SPT) and thin-walled Shelby tubes, we obtained samples at 2-1/2 to 5-foot-depth intervals.

The geotechnical boring logs are presented on Figures A-8 through A-12 at the end of this appendix.

Vibrating Wire Piezometers

To evaluate long-term fluctuation of groundwater levels in the tailings piles and Pit Lake Dam, six vibrating wire piezometers (VWPs) were installed by Hart Crowser in selected borings. VWP data loggers were installed by Hart Crowser on June 22, 2012, to monitor long-term groundwater levels in the tailings piles and Pit Lake Dam during the spring snowmelt, summer, and fall. The VWPs

were grouted in place using a grout mixture consisting of approximately 1 part Portland cement, 0.4 parts bentonite, and 6.6 parts water by weight. During field work, Hart Crowser field staff collected real-time readings from the VWPs to check current site conditions.

The VWPs convert water pressure to a frequency signal via a diaphragm and a tensioned steel wire. The piezometer is designed so that a change in pressure on the diaphragm causes a change in wire tension.

Calibration factors, which establish a relationship between pressure applied to the diaphragm and the frequency signal (Hertz) generated are used to convert recorded frequencies to pressure values in pounds per square inch.

The calibrations certificates for each VWP are presented on Figures A-13 through A-18.

Standard Penetration Test Procedures

The Standard Penetration Test (SPT) is an approximate measure of soil density and consistency. To be useful, the results must be used with engineering judgment in conjunction with other tests. The SPT (as described in ASTM D 1586) was used to obtain disturbed soil samples. This test uses a standard 2-inch outside diameter split-spoon sampler. Using a 140-pound autohammer, free-falling 30 inches, the sampler is driven into the soil for 18 inches. The number of blows required to drive the sampler the last 12 inches only is the Standard Penetration Resistance. This resistance, or blow count, measures the relative density of granular soil and the consistency of cohesive soil. The blow counts are plotted on the boring logs at their respective sample depths.

Soil samples were recovered from the split-barrel sampler, field classified, and placed in watertight jars. The samples were taken to Hart Crowser's laboratory for further testing.

In the Event of Hard Driving

Occasionally, very dense materials preclude driving the total 18-inch sample. When this happens, the penetration resistance is entered on logs as follows:

Penetration less than 6 inches. The log indicates the total number of blows over the number of inches of penetration.

Penetration greater than 6 inches. The blow count noted on the log is the sum of the total number of blows completed after the first 6 inches of penetration.

This sum is expressed over the number of inches driven that exceed the first 6 inches. The number of blows needed to drive the first 6 inches is not reported. For example, a blow count series of 12 blows for 6 inches, 30 blows for 6 inches, and 50 (the maximum number of blows counted within a 6-inch increment for SPT) for 3 inches would be recorded as 80/9.

Standard Split-Spoon Sampler

A standard split-spoon sampler was used during exploration. This 2.5-inch inside diameter sampler was driven with a 140-pound hammer. The density/consistency of the soil is interpreted from the blow counts.

Shelby Tubes

To obtain a relatively undisturbed sample for classification and testing fine-grained soils, a 3-inch-diameter, thin-walled steel (Shelby) tube sampler was pushed hydraulically below the auger (as described in ASTM D 1587). The tubes were sealed in the field and taken to the laboratory for extrusion and classification.

Electric Cone (Piezocone) Penetrometer Probes

An electric cone (piezocone) penetrometer (CPT) was used to probe the tailings for this study. Completed by In-Situ Engineering, the probes, designated CPT-1 through CPT-11, were advanced to depths ranging from 15 to 90 feet below the ground surface on November 1 and 2, 2011. In-Situ Engineering used an electric piezocone (See Figure A-19). This figure also shows the classification method used to develop the soil behavior index represented on the individual logs for classification purposes. The piezocone is arranged to measure the following parameters, which are used for the soil classification:

- Tip resistance, Q_c in tsf (resistance to soil penetration developed at the cone tip);
- Friction resistance, F_s in tsf (resistance to soil penetration developed along the friction sleeve); and
- Pore water pressure behind the cone tip, U_{bt} in psi.

The electric piezocone penetrometer test procedure involves hydraulically pushing a series of cylindrical rods into the soil at a constant rate of 2 centimeters per second and monitoring soil and pore fluid response near the conical tip. The cylindrical rod at the bottom of the drill string houses the pressure transducer and load cells that, during probing, measure these parameters. To be useful, the results must be used with engineering judgment in

conjunction with other tests, preferably the SPT procedure, which allows soil sample collection for direct comparison. Tests were performed in general accordance with procedures outlined in ASTM D 3441, Standard Method for Deep, Quasi-Static, Cone and Friction-Cone Penetration Tests of Soil.

The cone tip has a surface area of about 10 square centimeters (cm^2) and an angle of 30 degrees from the axis. The friction sleeve has a surface area of about 150 cm^2. Before testing, a plastic filter element that has been saturated under vacuum in glycerin is placed behind the cone tip. This filter element transmits pore pressure to the transducer. Load cells measure end resistance on the tip and frictional resistance on the friction sleeve. As the cone penetrates the soil, measurements are continuously recorded on a portable computer at depth increments of about 5 centimeters.

The classification method used to develop an interpreted soil profile is based on normalized parameters provided by the piezocone, as no soil samples are collected.

The relationship between the cone tip resistance and friction ratio, which has been normalized for soil overburden stresses, can be established to predict soil behavior (Robertson et al. 1986). This relationship has been applied to the soil classification chart developed by Robertson (Figure A-19) according to the following equations:

$$q_t = q_c + u \times (1 - a)$$

$$R_f = (f_s / q_t) \times 100\%$$

Where:

q_t = Total corrected cone resistance (tsf or MPa)
R_f = Friction Ratio (%)
a = Net area ratio for cone (default to 0.80)
q_c = Measured cone tip resistance
f_s = Measured sleeve friction
u = Measured penetration pore pressure

Using the above equation and the classification chart presented on Figure A-19, we were able to develop the interpreted soil profiles provided on Figures A-20 through A-30. The classification chart used for this study was established based on observed soil behavior from many studies for different soil types.

Pore pressure dissipation tests were conducted at locations where excess pore water pressures were encountered during probing. Dissipation tests are performed by stopping the probe and measuring the variation of pore pressure with time. Plots of the pore pressure dissipation tests are presented on Figures A-31 through A-43

In situ measurements of shear wave velocity were obtained at four of the probe locations (CPT-1, CPT-4, CPT-8, and CPT-11). At these four locations a seismic adapter was added to the standard cone, and shear wave velocity data was collected in the same push that the CPT data was generated. At approximately 1 meter intervals a surface shear wave is generated, and the time for the shear wave to travel to geophone on the penetrometer is recorded. The results of the *in situ* shear wave measurements including delay times are presented on Figures A-44 through A-47.

GEOTECHNICAL LABORATORY TESTING

A laboratory-testing program was performed for this study to evaluate the basic index and geotechnical engineering properties of waste rock and tailings pile material on the Site. Both disturbed and relatively undisturbed samples were tested. The tests performed and the procedures followed are discussed below.

Soil Classification

Field Observation and Laboratory Analysis

Soil samples from the geotechnical explorations were visually classified in the field and then taken to our laboratory where the classifications were verified. Field and laboratory observations included density/consistency, moisture, and grain size and plasticity estimates. The classifications of selected samples were checked by laboratory tests such as grain size analysis. Classifications were made in general accordance with the Unified Soil Classification (USC) System, ASTM D 2487, as presented on Figure A-1.

Water Content Determination

Water content was determined for most samples recovered in general accordance with ASTM D 2216, as soon as possible following their arrival in our laboratory. Water content was not determined for very small samples or samples containing large gravel that would result in unrepresentative values. The results of these tests are plotted at the respective sample depth on the exploration logs (Figures A-8 through A-12). In addition, water contents are

routinely determined for samples subjected to other testing. These are also presented on the exploration logs.

Grain Size Analysis (GS)

Grain size distribution was analyzed on representative samples in general accordance with ASTM D 422. Wet sieve analysis was used to determine grain size distribution greater than the U.S. No. 200 mesh sieve. The size distribution for particles smaller than the No. 200 mesh sieve was determined by the hydrometer method for a selected number of samples. The results of the tests are presented as curves on Figures A-48 through A-51 plotting percent finer by weight versus grain size.

Triaxial Consolidated Undrained Compression Test

Triaxial consolidated undrained compression (TCU) and pore pressure tests were conducted to measure the effective strength of the soil at various stress levels. This test was performed in general accordance with ASTM 4767. A relatively undisturbed tailings sample was trimmed to about 6 inches, encased in a rubber membrane, and placed in the triaxial cell. The tailings pile samples were heterogeneous with visible layers of silty fine Sand and fine sandy Silt. All three test points for the Lower Tailings Pile were obtained from the same sample tube; however, the four Upper Tailings Pile test points were obtained from three different sample tubes.

With the sample in the triaxial test cell, drainage lines from the sample were closed and back pressure was applied to saturate the sample. The tailings samples took longer than typical to saturate, possibly because of stratification or cementation of the samples. When saturation was complete, an all-around hydraulic pressure was applied. The sample was allowed to consolidate under the applied pressure with drainage occurring through slotted filter paper placed around the sample. When consolidation was complete, the sample was loaded to failure under undrained conditions by applying an increasing axial load at a constant strain rate. The strain rate is reported to two significant figures on the test results. Strain rates that are displayed as 0.00 have an actual value of 0.0007 inches per minute.

The magnitude of excess porewater pressure that developed during loading was recorded. An effective stress plot was then developed from the data to illustrate the variation in effective shear strength with varying consolidation (or overburden) pressures. The data are plotted as Mohr's circles using shear stress versus principal stress. The tangent to the Mohr's circles for a test series represents the effective angle of internal friction (φ'). The intercept along the

vertical axis is the apparent cohesion (c'). The test results are shown on Figures A-52 through A-53.

Proctor Test

A modified Proctor test was completed on a homogenized combination of several Shelby tube samples according to ASTM D 1557-02. Five sample layers were accumulated in a 4-inch-diameter mold and compacted with a 10-pound rammer dropping 18 inches. The compaction curve, shown on Figure A-54, shows the relationship between the sample's water content (%) and its dry density (pcf).

SOIL, SEDIMENT, GROUNDWATER, SURFACE WATER SAMPLING

Characterization of the Site included collecting samples from site media for chemical analyses. This section describes the types of samples collected and methods of sample collection, storage, and submittal to the analytical laboratory. The procedures were presented in the Sampling and Analysis Plan (SAP), which is Appendix B of the Final Work Plan for Remedial Investigation/Feasibility Study (Hart Crowser 2011).

Locations and descriptions of soil, sediment, surface water, groundwater, and background sampling locations are included in Tables A-1 through A-11. In the tables, media descriptions are grouped by Area of Interest (AOIs).

Composite Soil Sampling Procedures

Background Composite Soil Samples

Background soil sample locations were identified in the RI/FS Work Plan (Hart Crowser 2011) and are shown on Figure 2. Each background soil sample collected for chemical analysis was a composite sample consisting of five discrete soil subsamples. The procedure for composite sample collection was:

- Establish a center sub-sampling point at each background soil sample location;

- Measure out to a point 10 feet north from the center sub-sampling point and measure 10 feet to the east and west to establish two corner sub-sampling locations;

- Measure out to a point 10 feet south from the center sub-sampling point and measure 10 feet to the east and west to establish two corner sub-sampling locations;

- Collect approximately equal amounts of soil at each of the five subsample locations using a pre-cleaned stainless steel spoon, and place the soil in a pre-cleaned stainless steel bowl;

- Homogenize the soil in the stainless steel bowl, transfer the composited soil to a laboratory-supplied, 8-ounce glass sample jar, and seal and label the jars; and

- Store filled sample jars in a cooler with bagged ice and submit them to the analytical laboratory under chain of custody protocols.

Between each sampling location, sampling equipment was decontaminated using non-phosphate-based cleaner and deionized water.

Waste Rock Composite Samples

The general locations of composited waste rock samples were identified in the SAP and are shown on Figures 5, 6, and 7. Each composited sample consisted of 30 discrete subsamples. Before field work, 30 subsample locations were selected at each composite sample location, using aerial photographs to determine accessibility within the subsample collection area. If, during field work, a subsample location contained mostly large waste rock, the location was adjusted to obtain sufficient material to pass through a No. 10 mesh (2 mm) sieve.

The procedure for subsample collection and compositing was:

- Collect 30 discrete subsamples using a pre-cleaned stainless steel spoon and place each subsample in a labeled, clean plastic bag;

- Air dry the 30 subsamples and screen each subsample using a No. 10 mesh sieve;

- Combine approximately equal amounts from each subsample in a pre-cleaned stainless steel bowl and homogenize the sample, transfer the composited soil to a pre-cleaned, laboratory-supplied 8-ounce glass sample jar, and seal and label the jars;

- Store filled sample jars in coolers and submit them to the analytical laboratory under chain of custody protocols;

- Collect and archive sufficient subsample material to allow for XRF screening later, if needed; and

- Decontaminate sampling equipment between each waste rock sampling location using non-phosphate-based cleaner and deionized water, as described in the SAP.

Discrete Soil Sampling Procedures

Soil sampling locations are shown on Figures 5, 6, and 7. At each discrete soil sample location, the following procedure was used.

- Remove and set aside surface groundcover.

- Collect a soil sample from 0 to 3 inches deep using a pre-cleaned stainless steel spoon and place the sample in pre-cleaned, laboratory-supplied, 8-ounce glass sample jars. Remove organic material such as worms, rootlets, leaves, twigs, and debris from the jar.

- Collect soil for volatile analysis into 40ml VOA vials.

- Seal and label the jars and store them in a cooler with bagged ice before submitting them to the analytical laboratory under chain of custody protocols.

- Decontaminate equipment between each sampling location using non-phosphate-based cleaner and deionized water, as described in the SAP.

XRF Transect Sampling and Screening Procedures

A portable x-ray fluorescence (XRF) spectrometer was used to field screen soil for metal concentrations and to screen soil for metal concentrations following sample collection. Soil was screened for selected metals following EPA Method 6200, Field Portable XRF Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment. The instrument used a Delta XRF analyzer manufactured by Olympus Innov-X Systems. The XRF was factory calibrated and a calibration check was performed at the beginning of each field day. The instrument was used according to manufacturer's recommendations and procedures in the manufacturer's User's Guide. The instrument was operated by

an environmental scientist who was trained by a manufacturer's representative. The scientist also received Level I Radiation Safety Training.

Transect Screening

Eighteen sample collection transects, T1 through T18, were established outward from the toe of waste rock piles and the Upper and Lower Tailings Piles. (See Figures H-1, H-2, H-3 in Appendix H for map locations). Transects T16, T17, and T18 were used to fill data gaps and XRF screening was not used.

Transect lengths were established using the following procedure.

- A transect starting point was established at the toe of a pile and GPS coordinates were recorded and photographs taken.

- The starting point for the XRF screening location was measured out 500 feet from the toe of the pile. GPS coordinates were recorded and photographs taken.

- *In situ* soil at the 500-foot point was screened using the XRF. The forest duff layer was removed and the soil surface was cleared of rocks and gravel to present a uniform, fine-grained flat surface. To prevent damage, the XRF unit was protected by a thin plastic bag and measurements were taken through the bag. If *in situ* soil samples could not be screened, a soil sample was collected in a thin plastic bag, homogenized, and the XRF unit was uncovered to analyze the soil in the sample bag.

- If metals of concern (lead and zinc) were detected above the published natural background (see Appendix B) at the 500-foot point, another sampling point located 250 feet farther out from the toe of the pile and the XRF soil screening was repeated. This procedure was repeated until lead and zinc concentrations did not exceed natural background.

- The location where XRF screening indicated that lead and zinc were below natural background became the transect end point.

- The transect end point was considered the first discrete soil sample location. The distance from the transect end point to the transect starting point was divided into five equidistant segments to establish four more soil sample locations. A discrete soil sample was then collected from each of the five soil sample locations.

- With the exception of the soil sample collected at the transect end point (below background) the four other samples were taken to a sheltered staging area and the XRF was used to screen the soil samples. Following XRF screening, soil samples were selected for laboratory analysis. The remaining soil samples were archived.

In the event that additional information might be needed for the risk assessments, two additional soil samples were collected beyond the transect end point at 250 foot increments. These samples were archived.

Post Sample XRF Screening

Five-point composite samples from the mine site, Upper and Lower Tailings Piles, and soil samples collected along the pipeline were collected and screened. The XRF screening was used to help determine which soil samples would be submitted to the laboratory for analysis. XRF screening procedures described above were used to evaluate these samples.

The 30-point composite waste rock samples were returned to the Hart Crowser office in Seattle. The 30 subsamples were dried, sieved, and composited. The composite sample was analyzed by the XRF unit through a thin plastic bag.

XRF sample descriptions and measurements are presented in Appendix H.

Sediment Sampling Methods

The McNeil sediment sampler described in the SAP could not be used because of large-grained material in the stream beds (gravel to cobbles) and relatively narrow stream beds. Sediment samples were collected with a pre-cleaned stainless steel spoon from shallow, low-energy pools. Samples were collected slowly in order to capture the <2mm fraction of sediment at each location. Sediment was placed directly in pre-cleaned, laboratory supplied, 8-ounce glass sample jars. The jars were sealed and labeled. Filled sample jars were stored in a cooler with bagged ice and submitted to the laboratory under chain of custody protocols.

Equipment was decontaminated between each sampling location using non-phosphate-based cleaner and deionized water, as described in the SAP.

Water Sampling Methods

Groundwater data were obtained from seven residential wells and seven monitoring wells. The groundwater levels were used in the RI to assess

groundwater gradients and flow directions. Surface water samples were collected from Onion Creek and the Northeast and Southeast Tributaries. Groundwater and surface water sampling locations are shown on Figure 8 in the RI.

Groundwater Sampling

Seven residential wells were sampled to evaluate water quality in the upper portion of the Onion Creek watershed. Wellhead configurations limited the ability to measure water levels in wells RW-1 and RW-3. Depth to groundwater was measured using a water-level indicator. The water-level probe was decontaminated before use at each well. Groundwater samples, RW-1 through RW-7, were collected between November 5–11, 2012. A duplicate sample (RW-50) was collected from residential well RW-5.

Groundwater samples were collected from seven monitoring wells on the site, (W-1, W-2, DH-2, MW-2, MW-3, MW-4, and MW-5) between November 8-11, 2011, and between June 21–27, 2012. No duplicate samples were collected from the monitoring wells. Water level measurements were recorded before well development on November 7 and 9, 2011, before groundwater sampling from November 9–11, 2012, and between June 21–27, 2012. Well development parameters are summarized in Table A-8 and water level data are in Table A-9. Overall well construction and water level data are summarized in Table A-10.

Sampling Equipment

Equipment used for the collection of groundwater samples included:

- pH, temperature, specific conductivity, dissolved oxygen, turbidity, total dissolved solids, and oxidation-reduction potential meters;
- Water level indicator;
- Disposable bailer and peristaltic or submersible pump with disposable polyethylene tubing;
- Laboratory-supplied, pre-cleaned and preserved sample containers;
- Coolers with ice; and
- Hart Crowser Sample Custody Record and Groundwater Sampling Data forms.

Sampling Procedures

Upon arrival at a well field, personnel recorded well conditions and depth to water and sediment (where possible) using a water level indicator. Groundwater

samples were collected using low flow rates to minimize suspended solids in the water column. Purging and sampling was done using a disposable bailer and a peristaltic or submersible pump.

When using the peristaltic pump or submersible pump, clean sample tubing was used and disposed of after each use. During sampling, the tubing or pump intake was set at the approximate center of the screened interval. When sampling residential wells, the intake was set based on the conditions of the wellhead and information on the depth of the screened interval.

The field parameters of pH, temperature, specific conductivity, dissolved oxygen, turbidity, and oxygen redox potential meters were measured and recorded periodically during well purging. Once the field parameters remained stable between measurements, a groundwater sample was collected. The final stabilized readings measured just before sampling were recorded on a Groundwater Sampling Data form. The final stabilized readings are summarized in Table A-9.

Pre-cleaned and preserved sample bottles were filled directly from the polyethylene tubing at relatively low-flow rates. To prevent cross-contamination of the wells, sampling equipment was decontaminated between well locations using non-phosphate-based cleaner and deionized water.

Surface Water Sampling

Surface water samples were collected from Onion Creek and its tributaries. Samples collected for dissolved chemical analysis were field-filtered using a peristaltic pump with a disposable, in-line 0.45-micron filter cartridge and dedicated, disposable tubing. Samples were collected from the filter outlet directly into pre-cleaned and preserved sample containers obtained from the laboratory. A minimum of 25 mL of water was flushed through the sampling tubing and filter before samples were collected. All other unfiltered samples were collected directly from the peristaltic pump dedicated tubing or collected directly from the creek.

The field parameters of pH, temperature, specific conductivity, dissolved oxygen, turbidity, and oxygen redox potential were measured periodically when flushing the disposable tubing. Once the field parameters remained stable between measurements, the surface water sample was collected. The final stabilized readings measured just before sampling were recorded in field notebooks. The final stabilized readings are summarized in Table A-11.

SAMPLE HANDLING AND LABORATORY ANALYSIS

Soil, sediment, surface water, and groundwater samples collected during the sampling event were submitted to Test America of Tacoma, Washington, for chemical analysis. A summary of analytical tests and samples are presented in Table C-1 in Appendix C. Samples were packed on ice and placed in coolers following chain of custody protocols. Samples from the field were transferred to the analytical laboratory by overnight FedEx. Soil samples returned to Hart Crowser for drying, sieving, and compositing were transferred to the laboratory by courier.

One field duplicate sample for each set of background (BG), Onion Creek (OC), and residential well (RW) samples collected was submitted to the laboratory to assess combined field and laboratory variability. The background and Onion Creek samples were assigned the same exploration label with the number 2 at the end of the number. The residential well sample was assigned the same exploration label with one zero at the end of the number.

INVESTIGATION-DERIVED WASTE STORAGE AND DISPOSAL

Soil Cuttings

Soil cuttings generated on and near tailings piles were spread and left on the tailings pile in areas protected from erosion. Drill cuttings from monitoring wells were placed on the tailings piles so that wind or precipitation would not cause erosion or transport of the material.

Water

Development, groundwater sampling, and decontamination water was poured onto the ground.

Incidental Trash

Incidental trash generated during this investigation (including discarded nitrile gloves, aluminum foil, paper towels, and disposable equipment) was placed in plastic trash bags and disposed of as solid waste.

REFERENCES

ASTM D1586

ASTM D1587

ASTM D3441, Standard Method for Deep, Quasi-Static, cone & Friction Cone Penetration Tests of Soil.

Robertson ET Al, 1986

ASTM D2487

ASTM D2216

ASTM D422

ASTM D1557-02

HC 2011 Final Work Plan for Remedial Investigation/Feasibility Study of the Van Stone Mine

EPA 6200, Field Portable XRF.

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Table A-1 - Sample Location Coordinates

Areas of Interest	Sampling Media	Sample Name	Sample Type	Sample Date	Sample Coordinates[1]		Location-Notes
					Latitude	Longitude	
AOI-1	Soil	MS-1-COMP	COMP	11/04/11	48.7621634	-117.7612629	Comprised of 30 sub-samples.
AOI-1	Soil	MS-2-COMP	COMP	11/11/11	48.7650584	-117.7598871	Comprised of 30 sub-samples.
AOI-1	Soil	MS-3-COMP	COMP	11/10/11	48.7629780	-117.7574263	Comprised of 30 sub-samples.
AOI-1	Soil	MS-4-COMP	COMP	06/26/12	48.7587975	-117.7610151	Comprised of 30 sub-samples.
AOI-1	Soil	SWR-1-COMP	COMP	06/20/12	48.7589794	-117.7632366	Comprised of 30 sub-samples.
AOI-1	Soil	SWR-2-COMP	COMP	06/20/12	48.7580807	-117.7645072	Comprised of 30 sub-samples.
AOI-1	Soil	SWR-3-COMP	COMP	06/19/12	48.7570142	-117.7615766	Comprised of 30 sub-samples.
AOI-1	Soil	SWR-4-COMP	COMP	06/26/12	48.7575493	-117.7574284	Comprised of 30 sub-samples.
AOI-1	Soil	SWR-COMP	COMP	11/05/11	48.7558830	-117.7585640	Comprised of 30 sub-samples.
AOI-1	Soil	MS-01	DISC	06/20/12	48.7630857	-117.7615678	
AOI-1	Soil	MS-02	DISC	06/20/12	48.7632457	-117.7614799	
AOI-1	Soil	MS-03	DISC	06/20/12	48.7640339	-117.7613203	
AOI-1	Soil	MS-04	DISC	06/20/12	48.7642776	-117.7603882	
AOI-1	Soil	MS-05	DISC	06/20/12	48.7647292	-117.7608528	
AOI-1	Soil	MS-06	DISC	06/20/12	48.7660195	-117.7601117	
AOI-1	Soil	MS-07	DISC	06/20/12	48.7657653	-117.7602424	
AOI-1	Soil	MS-08	DISC	06/20/12	48.7657626	-117.7599818	
AOI-1	Soil	MS-09	DISC	06/20/12	48.7657763	-117.7596263	
AOI-1	Soil	MS-10	DISC	06/20/12	48.7656735	-117.7578101	
AOI-1	Soil	MS-11	DISC	06/21/12	48.7613406	-117.7646967	
AOI-1	Soil	MS-12	DISC	06/21/12	48.7618719	-117.7642278	
AOI-1	Soil	MS-13	DISC	06/21/12	48.7632494	-117.7641650	
AOI-1	Soil	MS-14	DISC	06/21/12	48.7638198	-117.7639126	
AOI-1	Soil	MS-15	DISC	06/21/12	48.7661513	-117.7626322	
AOI-1	Soil	MS-16	DISC	06/21/12	48.7664328	-117.7611981	
AOI-1	Soil	MS-17	DISC	06/20/12	48.7672376	-117.7589833	
AOI-1	Soil	MS-18	DISC	06/20/12	48.7665386	-117.7563548	
AOI-1	Soil	NP-1-SS	DISC	10/14/11	48.7627330	-117.7615670	
AOI-1	Soil	NP-3-SS	DISC	10/14/11	48.7658170	-117.7603500	
AOI-1	Soil	T11-SS-1200	DISC	11/02/11	48.7618801	-117.7669668	
AOI-1	Soil	T11-SS-300	DISC	11/02/11	48.7605656	-117.7636296	
AOI-1	Soil	T11-SS-900	DISC	11/02/11	48.7613775	-117.7659416	
AOI-1	Soil	T12-SS-150	DISC	11/08/11	48.7622976	-117.7644094	
AOI-1	Soil	T12-SS-450	DISC	11/08/11	48.7626748	-117.7655362	
AOI-1	Soil	T12-SS-750	DISC	11/02/11	48.7647670	-117.7699557	
AOI-1	Soil	T13-SS-150	DISC	10/31/11	48.7643362	-117.7631353	
AOI-1	Soil	T13-SS-300	DISC	10/31/11	48.7644764	-117.7637123	
AOI-1	Soil	T13-SS-500	DISC	10/31/11	48.7646911	-117.7645074	
AOI-1	Soil	T14-SS-300	DISC	11/07/11	48.7661128	-117.7618094	
AOI-1	Soil	T14-SS-500	DISC	11/07/11	48.7663521	-117.7624462	
AOI-1	Soil	T14-SS-750	DISC	11/07/11	48.7667731	-117.7632234	
AOI-1	Soil	T15-SS-1000	DISC	11/01/11	48.7590414	-117.7541459	
AOI-1	Soil	T15-SS-200	DISC	11/01/11	48.7599950	-117.7573680	
AOI-1	Soil	T15-SS-750	DISC	11/01/11	48.7594019	-117.7550672	
AOI-1	Soil	T16-SS-0	DISC	06/21/12	48.7640582	-117.7543566	
AOI-1	Soil	T16-SS-315	DISC	06/21/12	48.7648428	-117.7537981	
AOI-1	Soil	T16-SS-770	DISC	06/21/12	48.7658731	-117.7531209	
AOI-1	Soil	T17-SS-0	DISC	06/21/12	48.7566996	-117.7657905	
AOI-1	Soil	T17-SS-500	DISC	06/21/12	48.7574629	-117.7675937	
AOI-1	Soil	T18-SS-0	DISC	06/21/12	48.7592624	-117.7645032	
AOI-1	Soil	T18-SS-350	DISC	06/21/12	48.7599726	-117.7655458	
AOI-1	Soil	T15-SS-1020	DUP	11/01/11	48.7590414	-117.7541459	Field duplicate of T15-SS-1000
AOI-1	Surface Water	NP-SW-1	DISC	11/02/11	48.7601230	-117.7622540	
AOI-1	Surface Water	SP-SW-1	DISC	11/03/11	48.7573150	-117.7609680	
AOI-1	Surface Water	WP-SW-1	DISC	11/02/11	48.7600620	-117.7620450	

Table A-1 - Sample Location Coordinates

Areas of Interest	Sampling Media	Sample Name	Sample Type	Sample Date	Sample Coordinates[1]		Location-Notes
					Latitude	Longitude	
AOI-2	Groundwater	MW-04	DISC	11/11/11	48.7624270	-117.7760820	
AOI-2	Groundwater	MW-05	DISC	11/11/11	48.7610070	-117.7774920	
AOI-2	Soil	T10-SS-150	DISC	11/06/11	48.7608497	-117.7752255	
AOI-2	Soil	T10-SS-500	DISC	11/06/11	48.7604021	-117.7739385	
AOI-2	Soil	T10-SS-750	DISC	11/06/11	48.7600584	-117.7730447	
AOI-2	Soil	T6-SS-100	DISC	11/06/11	48.7603002	-117.7777215	
AOI-2	Soil	T6-SS-300	DISC	11/06/11	48.7602978	-117.7786085	
AOI-2	Soil	T6-SS-500	DISC	11/06/11	48.7601419	-117.7794734	
AOI-2	Soil	T7-SS-100	DISC	11/07/11	48.7623272	-117.7764305	
AOI-2	Soil	T7-SS-300	DISC	11/07/11	48.7624624	-117.7772623	
AOI-2	Soil	T7-SS-500	DISC	11/07/11	48.7622998	-117.7781110	
AOI-2	Soil	T8-SS-100	DISC	11/05/11	48.7637468	-117.7740673	
AOI-2	Soil	T8-SS-300	DISC	11/05/11	48.7642537	-117.7743545	
AOI-2	Soil	T8-SS-500	DISC	11/05/11	48.7647664	-117.7747061	
AOI-2	Soil	T9-SS-100	DISC	11/05/11	48.7622706	-117.7741996	
AOI-2	Soil	T9-SS-300	DISC	11/05/11	48.7619996	-117.7734783	
AOI-2	Soil	T9-SS-500	DISC	11/05/11	48.7617407	-117.7727662	
AOI-2	Soil	UT-01	DISC	06/24/12	48.7595989	-117.7770486	
AOI-2	Soil	UT-02	DISC	06/24/12	48.7597328	-117.7767171	
AOI-2	Soil	UT-03	DISC	06/24/12	48.7598044	-117.7760310	
AOI-2	Soil	UT-04	DISC	06/24/12	48.7638885	-117.7721312	
AOI-2	Soil	UT-05	DISC	06/24/12	48.7637534	-117.7727573	
AOI-2	Soil	UT-06	DISC	06/24/12	48.7636119	-117.7733500	
AOI-2	Soil	UT-07	DISC	06/26/12	48.7607796	-117.7779331	
AOI-2	Soil	UT-09	DISC	06/26/12	48.7606172	-117.7788025	
AOI-2	Soil	UT-10	DISC	06/26/12	48.7604309	-117.7794540	
AOI-2	Soil	UT-11	DISC	06/26/12	48.7604664	-117.7795927	
AOI-2	Soil	UT-12	DISC	06/27/12	48.7613846	-117.7776694	
AOI-2	Soil	UT-13	DISC	06/27/12	48.7614510	-117.7778540	
AOI-2	Soil	UT-14	DISC	06/27/12	48.7616641	-117.7777221	
AOI-2	Soil	UT-15	DISC	06/27/12	48.7619216	-117.7784776	
AOI-2	Soil	UT-16	DISC	06/27/12	48.7622095	-117.7779736	
AOI-2	Soil	UT-17	DISC	06/27/12	48.7622728	-117.7765061	
AOI-2	Soil	UT-2-SS	DISC	10/14/11	48.7613330	-117.7768670	
AOI-2	Soil	UT-3-SS	DISC	10/14/11	48.7625170	-117.7746830	
AOI-2	Soil	UT-160	DUP	06/27/12	48.7622095	-117.7779736	Field duplicate of UT-16
AOI-2	Soil	UT-20	DUP	06/24/12	48.7597328	-117.7767171	Field duplicate of UT-2
AOI-2	Surface Water	UT-SW-1	DISC	11/09/11	48.7606540	-117.777806	
AOI-2	Surface Water	UT-SW-2	DISC	06/26/12	48.7604664	-117.7795927	
AOI-2	Surface Water	UT-SW-3	DISC	06/26/12	48.7606140	-117.7797883	
AOI-3	Groundwater	DH-02	DISC	11/08/11	48.7775470	-117.8025070	
AOI-3	Groundwater	MW-02	DISC	11/09/11	48.7752710	-117.8024820	
AOI-3	Groundwater	MW-03	DISC	11/10/11	48.7771150	-117.7963290	
AOI-3	Groundwater	W-01	DISC	11/10/11	48.7785180	-117.8016500	
AOI-3	Groundwater	W-02	DISC	11/09/11	48.7741490	-117.8015350	
AOI-3	Soil	LT-01	DISC	06/23/12	48.7787898	-117.7954093	
AOI-3	Soil	LT-02	DISC	06/23/12	48.7791287	-117.7956033	
AOI-3	Soil	LT-03	DISC	06/23/12	48.7789139	-117.7966106	
AOI-3	Soil	LT-04	DISC	06/23/12	48.7789869	-117.7966631	
AOI-3	Soil	LT-05	DISC	06/23/12	48.7791641	-117.7963549	
AOI-3	Soil	LT-06	DISC	06/23/12	48.7792991	-117.7981191	
AOI-3	Soil	LT-07	DISC	06/23/12	48.7792098	-117.7980536	
AOI-3	Soil	LT-08	DISC	06/23/12	48.7790804	-117.7980230	
AOI-3	Soil	LT-09	DISC	06/23/12	48.7791625	-117.7985283	
AOI-3	Soil	LT-10	DISC	06/23/12	48.7791949	-117.7990457	

Table A-1 - Sample Location Coordinates

Areas of Interest	Sampling Media	Sample Name	Sample Type	Sample Date	Sample Coordinates[1]		Location-Notes
					Latitude	Longitude	
AOI-3	Soil	LT-11	DISC	06/23/12	48.7788120	-117.8015761	
AOI-3	Soil	LT-12	DISC	06/26/12	48.7788052	-117.8012663	
AOI-3	Soil	LT-13	DISC	06/26/12	48.7790423	-117.8010847	
AOI-3	Soil	LT-14	DISC	06/26/12	48.7789924	-117.8015070	
AOI-3	Soil	LT-15	DISC	06/26/12	48.7789030	-117.8017636	
AOI-3	Soil	LT-16	DISC	06/21/12	48.7761779	-117.8033607	
AOI-3	Soil	LT-17	DISC	06/21/12	48.7757017	-117.8045634	
AOI-3	Soil	LT-18	DISC	06/21/12	48.7742915	-117.7988708	
AOI-3	Soil	LT-19	DISC	06/21/12	48.7743641	-117.8004563	
AOI-3	Soil	LT-1-SS	DISC	10/14/11	48.7768345	-117.7999234	
AOI-3	Soil	LT-20	DISC	06/22/12	48.7783216	-117.7952196	
AOI-3	Soil	LT-21	DISC	06/22/12	48.7785583	-117.7931689	
AOI-3	Soil	LT-22	DISC	06/22/12	48.7779976	-117.8043524	
AOI-3	Soil	LT-23	DISC	06/22/12	48.7779272	-117.8063729	
AOI-3	Soil	LT-2-SS	DISC	10/14/11	48.7780170	-117.8008500	
AOI-3	Soil	LT-DP-01	DISC	11/08/11	48.7782014	-117.8028473	
AOI-3	Soil	-OC ROAD-CULVE	DISC	11/09/11	48.7780370	-117.8056170	
AOI-3	Soil	T1-SS-100	DISC	11/04/11	48.7773238	-117.7962691	
AOI-3	Soil	T1-SS-300	DISC	11/04/11	48.7769702	-117.7956590	
AOI-3	Soil	T1-SS-500	DISC	11/04/11	48.7765984	-117.7950122	
AOI-3	Soil	T2-SS-100	DISC	11/04/11	48.7762004	-117.7978635	
AOI-3	Soil	T2-SS-300	DISC	11/04/11	48.7758138	-117.7972965	
AOI-3	Soil	T2-SS-500	DISC	11/04/11	48.7753833	-117.7967652	
AOI-3	Soil	T3-SS-100	DISC	11/03/11	48.7754150	-117.8020274	
AOI-3	Soil	T3-SS-300	DISC	11/03/11	48.7748631	-117.8019686	
AOI-3	Soil	T3-SS-500	DISC	11/03/11	48.7743237	-117.8018618	
AOI-3	Soil	T4-SS-100	DISC	11/03/11	48.7771889	-117.8031793	
AOI-3	Soil	T4-SS-300	DISC	11/03/11	48.7772552	-117.8040092	
AOI-3	Soil	T4-SS-500	DISC	11/03/11	48.7772331	-117.8048218	
AOI-3	Soil	T5-SS-100	DISC	11/04/11	48.7787462	-117.8019362	
AOI-3	Soil	T5-SS-300	DISC	11/04/11	48.7791876	-117.8024605	
AOI-3	Soil	T5-SS-500	DISC	11/04/11	48.7796388	-117.8029570	
AOI-3	Soil	LT-180	DUP	06/21/12	48.7742915	-117.7988708	Field duplicate of LT-18
AOI-3	Soil	LT-190	DUP	06/21/12	48.7743641	-117.8004563	Field duplicate of LT-19
AOI-3	Soil	LT-90	DUP	06/23/12	48.7791625	-117.7985283	Field duplicate of LT-9
AOI-3	Soil	T3-SS-320	DUP	11/03/11	48.7748631	-117.8019686	Field duplicate of T3-SS-300
AOI-3	Soil	T4-SS-120	DUP	11/03/11	48.7771889	-117.8031793	Field duplicate of T4-SS-120
AOI-4	Soil	DR-01	DISC	06/25/12	48.7852161	-117.8100735	
AOI-4	Soil	DR-02	DISC	06/25/12	48.7823626	-117.8078813	
AOI-4	Soil	DR-03	DISC	06/25/12	48.7800612	-117.8065006	
AOI-4	Soil	DR-04	DISC	06/25/12	48.7767686	-117.8045946	
AOI-4	Soil	DR-05	DISC	06/25/12	48.7738006	-117.8032251	
AOI-4	Soil	DR-06	DISC	06/25/12	48.7739446	-117.7987404	
AOI-4	Soil	DR-07	DISC	06/25/12	48.7711153	-117.7964917	
AOI-4	Soil	DR-08	DISC	06/25/12	48.7682173	-117.7953903	
AOI-4	Soil	DR-09	DISC	06/25/12	48.7664716	-117.7904695	
AOI-4	Soil	DR-10	DISC	06/25/12	48.7652310	-117.7863154	
AOI-4	Soil	DR-11	DISC	06/25/12	48.7630592	-117.7813101	
AOI-4	Soil	DR-12	DISC	06/25/12	48.7648842	-117.7761929	
AOI-4	Soil	DR-13	DISC	06/25/12	48.7669535	-117.7702461	
AOI-4	Soil	DR-14	DISC	06/25/12	48.7682560	-117.7652378	
AOI-4	Soil	DR-15	DISC	06/25/12	48.7679831	-117.7591893	
AOI-4	Soil	PL-01	DISC	06/25/12	48.7653572	-117.7643558	
AOI-4	Soil	PL-02	DISC	06/25/12	48.7652476	-117.7656602	
AOI-4	Soil	PL-03	DISC	06/25/12	48.7609478	-117.7623288	

Table A-1 - Sample Location Coordinates

Areas of Interest	Sampling Media	Sample Name	Sample Type	Sample Date	Sample Coordinates[1]		Location-Notes
					Latitude	Longitude	
AOI-4	Soil	PL-04	DISC	06/25/12	48.7605587	-117.7651272	
AOI-4	Soil	PL-05	DISC	06/25/12	48.7613526	-117.7688203	
AOI-4	Soil	PL-06	DISC	06/26/12	48.7653947	-117.7717079	
AOI-4	Soil	PL-07	DISC	06/26/12	48.7655937	-117.7687186	
AOI-4	Soil	PL-08	DISC	06/25/12	48.7603818	-117.7733583	
AOI-4	Soil	PL-09	DISC	06/25/12	48.7630739	-117.7726548	
AOI-4	Soil	PL-10	DISC	06/26/12	48.7644818	-117.7820004	
AOI-4	Soil	PL-11	DISC	06/26/12	48.7662018	-117.7876086	
AOI-4	Soil	PL-12	DISC	06/27/12	48.7659038	-117.7890442	
AOI-4	Soil	PL-13	DISC	06/27/12	48.7669886	-117.7889163	
AOI-4	Soil	PL-14	DISC	06/27/12	48.7716659	-117.7933345	
AOI-4	Soil	PL-15	DISC	06/27/12	48.7740834	-117.7923470	
AOI-4	Soil	TAILINGS BOX	DISC	11/06/11	48.765416	-117.76396	
AOI-4	Soil	UT-LT-2000'	DISC	11/10/11	48.766364	-117.787599	
AOI-4	Soil	UT-LT-4000'	DISC	11/10/11	48.76380614	-117.7813929	
AOI-5	Groundwater	RW-01	DISC	11/05/11	NA	NA	
AOI-5	Groundwater	RW-02	DISC	11/06/11	NA	NA	
AOI-5	Groundwater	RW-03	DISC	11/06/11	NA	NA	
AOI-5	Groundwater	RW-04	DISC	11/09/11	NA	NA	
AOI-5	Groundwater	RW-05	DISC	11/10/11	NA	NA	
AOI-5	Groundwater	RW-06	DISC	11/11/11	NA	NA	
AOI-5	Groundwater	RW-07	DISC	11/11/11	NA	NA	
AOI-5	Groundwater	RW-50	DUP	11/10/11	NA	NA	Field duplicate of RW-5
AOI-5	Sediment	BG-12-SD	DISC	10/07/11	48.7659000	-117.7966830	Located on Onion Creek
AOI-5	Sediment	NT-SD-01	DISC	06/22/12	48.7793123	-117.7996300	
AOI-5	Sediment	OC-10-SD	DISC	10/12/11	48.7673000	-117.7639000	
AOI-5	Sediment	OC-11-SD	DISC	10/12/11	48.7603000	-117.7623170	
AOI-5	Sediment	OC-12-SD	DISC	10/11/11	48.7673330	-117.7556670	
AOI-5	Sediment	OC-13-SD	DISC	10/09/11	48.7839000	-117.8133670	
AOI-5	Sediment	OC-14-SD	DISC	10/12/11	48.7585500	-117.7612000	
AOI-5	Sediment	OC-15-SD	DISC	10/14/11	48.7654000	-117.7694000	
AOI-5	Sediment	OC-16-SD	DISC	10/14/11	48.7657670	-117.7686330	
AOI-5	Sediment	OC-17-SD	DISC	10/14/11	48.7634170	-117.7913500	
AOI-5	Sediment	OC-18-SD	DISC	10/14/11	48.7617670	-117.7851670	
AOI-5	Sediment	OC-19-SD	DISC	10/14/11	48.7775830	-117.7775830	
AOI-5	Sediment	OC-1-SD	DISC	10/09/11	48.7801170	-117.8075670	
AOI-5	Sediment	OC-2-SD	DISC	10/09/11	48.7795500	-117.8058000	
AOI-5	Sediment	OC-3-SD	DISC	10/12/11	48.7790170	-117.7948330	
AOI-5	Sediment	OC-4-SD	DISC	10/13/11	48.7744500	-117.8050000	
AOI-5	Sediment	OC-5-SD	DISC	10/13/11	48.7678670	-117.8012500	
AOI-5	Sediment	OC-6-SD	DISC	10/13/11	48.7661830	-117.7982000	
AOI-5	Sediment	OC-7-SD	DISC	10/14/11	48.7615170	-117.7812330	
AOI-5	Sediment	OC-8-SD	DISC	10/13/11	48.7620330	-117.7784330	
AOI-5	Sediment	OC-9-SD	DISC	10/12/11	48.7643500	-117.7687500	
AOI-5	Sediment	OC-13-SD2	DUP	10/09/11	48.7839000	-117.8133670	Field duplicate of OC-13-SD
AOI-5	Soil	BG-12-SS	COMP	10/07/11	48.7659000	-117.7966830	
AOI-5	Surface Water	BG-12-SW	DISC	10/07/11	48.7659000	-117.7966830	Located on Onion Creek
AOI-5	Surface Water	OC-10-SW	DISC	10/12/11	48.7673000	-117.7639000	
AOI-5	Surface Water	OC-11-SW	DISC	10/12/11	48.7603000	-117.7623170	
AOI-5	Surface Water	OC-12-SW	DISC	10/11/11	48.7673330	-117.7556670	
AOI-5	Surface Water	OC-13-SW	DISC	10/09/11	48.7839000	-117.8133670	
AOI-5	Surface Water	OC-14-SW	DISC	10/12/11	48.7585500	-117.7612000	
AOI-5	Surface Water	OC-15-SW	DISC	10/14/11	48.7654000	-117.7694000	
AOI-5	Surface Water	OC-16-SW	DISC	10/14/11	48.7657670	-117.7686330	
AOI-5	Surface Water	OC-17-SW	DISC	10/14/11	48.7634170	-117.7913500	

Table A-1 - Sample Location Coordinates

Areas of Interest	Sampling Media	Sample Name	Sample Type	Sample Date	Sample Coordinates[1]		Location-Notes
					Latitude	Longitude	
AOI-5	Surface Water	OC-18-SW	DISC	10/14/11	48.7617670	-117.7851670	
AOI-5	Surface Water	OC-19-SW	DISC	10/14/11	48.7775830	-117.7775830	
AOI-5	Surface Water	OC-1-SW	DISC	10/09/11	48.7801170	-117.8075670	
AOI-5	Surface Water	OC-2-SW	DISC	10/09/11	48.7795500	-117.8058000	
AOI-5	Surface Water	OC-3-SW	DISC	10/12/11	48.7790170	-117.7948330	
AOI-5	Surface Water	OC-4-SW	DISC	10/13/11	48.7744500	-117.8050000	
AOI-5	Surface Water	OC-5-SW	DISC	10/13/11	48.7678670	-117.8012500	
AOI-5	Surface Water	OC-6-SW	DISC	10/13/11	48.7661830	-117.7982000	
AOI-5	Surface Water	OC-7-SW	DISC	10/14/11	48.7615170	-117.7812330	
AOI-5	Surface Water	OC-8-SW	DISC	10/13/11	48.7620330	-117.7784330	
AOI-5	Surface Water	OC-9-SW	DISC	10/12/11	48.7643500	-117.7687500	
AOI-5	Surface Water	OC-13-SW2	DUP	10/09/11	48.7839000	-117.8133670	Field duplicate of OC-13-SW
Background	Sediment	BG-10-SD	DISC	10/05/11	48.7554170	-117.7734500	
Background	Sediment	BG-11-SD	DISC	10/08/11	48.7592670	-117.7446000	
Background	Sediment	BG-13-SD	DISC	10/05/11	48.7592000	-117.8028170	
Background	Sediment	BG-14-SD	DISC	10/06/11	48.7648830	-117.8019330	
Background	Sediment	BG-15-SD	DISC	10/07/11	48.7483000	-117.7820670	
Background	Sediment	BG-1-SD	DISC	10/06/11	48.7810170	-117.7916170	
Background	Sediment	BG-2-SD	DISC	10/04/11	48.7810830	-117.7833500	
Background	Sediment	BG-3-SD	DISC	10/06/11	48.7810000	-117.7625170	
Background	Sediment	BG-4-SD	DISC	10/06/11	48.7851670	-117.7549830	
Background	Sediment	BG-5-SD	DISC	10/05/11	48.7617830	-117.7336500	
Background	Sediment	BG-6-SD	DISC	10/04/11	48.7547500	-117.7428830	
Background	Sediment	BG-7-SD	DISC	10/04/11	48.7469170	-117.7500170	
Background	Sediment	BG-8-SD	DISC	10/03/11	48.7659000	-117.7514830	
Background	Sediment	BG-9-SD	DISC	10/07/11	48.7455500	-117.7922170	
Background	Sediment	BG-9-SD2	DUP	10/07/11	48.7455500	-117.7922170	Field duplicate of BG-9-SD
Background	Soil	BG-10-SS	COMP	10/05/11	48.7554170	-117.7734500	5-point composite sample.
Background	Soil	BG-11-SS	COMP	10/08/11	48.7592670	-117.7446000	5-point composite sample.
Background	Soil	BG-13-SS	COMP	10/05/11	48.7592000	-117.8028170	5-point composite sample.
Background	Soil	BG-14-SS	COMP	10/06/11	48.7648830	-117.8019330	5-point composite sample.
Background	Soil	BG-15-SS	COMP	10/07/11	48.7483000	-117.7820670	5-point composite sample.
Background	Soil	BG-1-SS	COMP	10/06/11	48.7810170	-117.7916170	5-point composite sample.
Background	Soil	BG-2-SS	COMP	10/04/11	48.7810830	-117.7833500	5-point composite sample.
Background	Soil	BG-3-SS	COMP	10/06/11	48.7810000	-117.7625170	5-point composite sample.
Background	Soil	BG-4-SS	COMP	10/06/11	8.7617830	-117.7549830	5-point composite sample.
Background	Soil	BG-5-SS	COMP	10/05/11	48.7617830	-117.7336500	5-point composite sample.
Background	Soil	BG-6-SS	COMP	10/04/11	48.7547500	-117.7428830	5-point composite sample.
Background	Soil	BG-7-SS	COMP	10/04/11	48.7469170	-117.7500170	5-point composite sample.
Background	Soil	BG-8-SS	COMP	10/03/11	48.7659000	-117.7514830	5-point composite sample.
Background	Soil	BG-9-SS	COMP	10/07/11	48.7455500	-117.7922170	5-point composite sample.
Background	Soil	BG-9-SS2	DUP	10/07/11	48.7455500	-117.7922170	Field duplicate of BG-9-SS
Background	Surface Water	BG-10-SW	DISC	10/05/11	48.7554170	-117.7734500	
Background	Surface Water	BG-11-SW	DISC	10/08/11	48.7592670	-117.7446000	
Background	Surface Water	BG-13-SW	DISC	10/05/11	48.7592000	-117.8028170	
Background	Surface Water	BG-14-SW	DISC	10/06/11	48.7648830	-117.8019330	
Background	Surface Water	BG-15-SW	DISC	10/07/11	48.7483000	-117.7820670	
Background	Surface Water	BG-1-SW	DISC	10/06/11	48.7810170	-117.7916170	
Background	Surface Water	BG-2-SW	DISC	10/04/11	48.7810830	-117.7833500	
Background	Surface Water	BG-3-SW	DISC	10/06/11	48.7810000	-117.7625170	
Background	Surface Water	BG-4-SW	DISC	10/06/11	48.7851670	-117.7549830	
Background	Surface Water	BG-5-SW	DISC	10/05/11	48.7617830	-117.7336500	
Background	Surface Water	BG-6-SW	DISC	10/04/11	48.7547500	-117.7428830	
Background	Surface Water	BG-7-SW	DISC	10/05/11	48.7469170	-117.7500170	
Background	Surface Water	BG-8-SW	DISC	10/03/11	48.7659000	-117.7514830	

Table A-1 - Sample Location Coordinates

Areas of Interest	Sampling Media	Sample Name	Sample Type	Sample Date	Sample Coordinates[1]		Location-Notes
					Latitude	Longitude	
Background	Surface Water	BG-9-SW	DISC	10/07/11	48.7455500	-117.7922170	
Background	Surface Water	BG-4-SW2	DUP	10/06/11	48.7851670	-117.7549830	Field duplicate of BG-4-SW
Background	Surface Water	BG-9-SW2	DUP	10/07/11	48.7455500	-117.7922170	Field duplicate of BG-9-SW

Notes:

AOI-1 - Mill Facility, Open Pits and Waste Rock
AOI-2 - Upper Tailings Pile
AOI-3 - Lower Tailings Pile
AOI-4 - Tailings Pipeline and Access Roads
AOI-5 - Onion Creek and Tributaries
[1] - GPS coordinates in WGS 84
NA - Not Available

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
AOI-1 - Surface Soil Upper Waste Rock and Open Pit Areas			
MS-1-Composite			
MS-A1-1C	11/4/11	(Loose), damp/frozen, red-brown, sandy angular GRAVEL (GW/GP)	
MS-1A-2C	11/4/11	(Loose), (frozen @ surface) damp, red-brown, sandy GRAVEL (GW/GP)	
MS-1A-3C	11/4/11	(Loose), damp/frozen, red-brown and gray, sandy GRAVEL (GW/GP)	
MS-1A-4C	11/4/11	Moist, brown to light brown, sandy GRAVEL (GW/GP)	
MS-1A-5C	11/4/11	Moist, light brown to gray, sandy GRAVEL (GW/GP)	
MS-1A-6C	11/4/11	Moist, light brown to gray, sandy GRAVEL (GW/GP)	
MS-1A-7C	11/4/11	Moist, tan-brown to gray, sandy GRAVEL (GW/GP)	
MS-1A-8C	11/4/11	Moist, tan-orange, sandy GRAVEL (GW/GP)	
MS-1A-9C	11/4/11	Moist, tan-brown to white, sandy GRAVEL (GW/GP)	
MS-1A-10C	11/4/11	Moist, tan-brown to orange, sandy GRAVEL (GW/GP)	
MS-1A-11C	11/4/11	Moist, light gray, sandy GRAVEL (GW/GP)	
MS-1A-12C	11/4/11	Moist, gray, sandy GRAVEL (GW/GP)	
MS-1A-13C	11/4/11	Moist, tan-brown to orange, sandy GRAVEL (GW/GP)	
MS-1A-14C	11/4/11	Moist, tan-brown, sandy GRAVEL (GW/GP)	
MS-1A-15C	11/4/11	Moist, gray to tan, sandy GRAVEL (GW/GP)	
MS-1A-16C	11/4/11	Moist, tan-brown-orange to gray, sandy GRAVEL (GW/GP)	
MS-1A-17C	11/4/11	Moist, tan-brown, sandy GRAVEL (GW/GP)	
MS-1A-18C	11/4/11	Moist, tan-brown, sandy GRAVEL (GW/GP)	
MS-1A-19C	11/4/11	Moist, light brown, sandy GRAVEL (GW/GP)	
MS-1A-20C	11/4/11	Moist, gray, sandy GRAVEL (GW/GP)	
MS-1A-21C	11/4/11	Moist, tan-brown, sandy GRAVEL (GW/GP)	
MS-1A-22C	11/4/11	Moist, tan-brown-white, sandy GRAVEL (GW/GP)	
MS-1A-23C	11/4/11	Moist, light gray, sandy GRAVEL (GW/GP)	
MS-1A-24C	11/4/11	Moist, light to medium brown, sandy GRAVEL (GW/GP)	
MS-1A-25C	11/4/11	Moist, dark to medium brown, sandy GRAVEL to gravelly SAND (GW/SW)	
MS-1A-26C	11/4/11	Moist, tan-brown, sandy GRAVEL (GW/GP)	
MS-1A-27C	11/4/11	Moist, light brown, sandy GRAVEL (GW/GP)	
MS-1A-28C	11/4/11	Moist, light brown, sandy GRAVEL (GW/GP)	
MS-1A-29C	11/4/11	Moist, tan-brown, sandy GRAVEL (GW/GP)	
MS-1A-30C	11/4/11	(Very loose), damp, light gray SAND (SP)	
MS-2-Composite			
MS-2-1C	11/12/11	Frozen, light gray, sandy GRAVEL (GW/GP)	
MS-2-2C	11/11/11	Frozen, gray-brown, sandy GRAVEL (GW/GP)	
MS-2-3C	11/11/11	Frozen, light brown, gravelly SAND (SW)	
MS-2-4C	11/11/11	Frozen, light gray, sandy GRAVEL (GW/GP)	
MS-2-5C	11/11/11	Frozen, light brown, gravelly SAND with scattered rootlets (SW)	
MS-2-6C	11/11/11	Frozen, yellow-brown, very gravelly SAND (SW)	
MS-2-7C	11/11/11	Frozen, light brown, gravelly SAND with scattered rootlets and twigs (SW)	
MS-2-8C	11/11/11	Frozen, gray-brown, gravelly SAND (SW)	
MS-2-9C	11/11/11	Frozen, light brown, very sandy GRAVEL (GW/GP)	
MS-2-10C	11/11/11	Frozen, brown, SAND with trace gravel (SW)	
MS-2-11C	11/11/11	Frozen, light brown, gravelly SAND (SW)	
MS-2-12C	11/11/11	Frozen, yellow-brown, very sandy GRAVEL (GW/GP)	
MS-2-13C	11/11/11	Frozen, light brown, sandy GRAVEL with occasional rootlets (GW/GP)	
MS-2-14C	11/11/11	Frozen, light brown, very sandy GRAVEL (GW/GP)	
MS-2-15C	11/12/11	Frozen, gray-brown, sandy GRAVEL (GW/GP)	
MS-2-16C	11/11/11	Frozen, yellow-brown, very sandy GRAVEL (GW/GP)	
MS-2-17C	11/11/11	Frozen, yellow-brown, very sandy GRAVEL (GW/GP)	
MS-2-18C	11/11/11	Frozen, brown, slightly gravelly SAND (SW)	

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
MS-2-19C	11/11/11	Frozen, gray-brown, SAND with trace gravel (SW)	
MS-2-20C	11/11/11	Frozen, brown, SAND with trace gravel (SW)	
MS-2-21C	11/12/11	Frozen, gray-brown, very sandy GRAVEL (GW/GP)	
MS-2-22C	11/12/11	Frozen, yellow-brown, sandy GRAVEL (GW/GP)	
MS-2-23C	11/11/11	Frozen, yellow-brown, very sandy GRAVEL (GW/GP)	
MS-2-24C	11/11/11	Frozen, gray-brown, very sandy GRAVEL (GW/GP)	
MS-2-25C	11/11/11	Frozen, light brown, gravelly SAND (SW)	
MS-2-26C	11/11/11	Frozen, light brown, gravelly SAND (SW)	
MS-2-27C	11/12/11	Frozen, yellow-brown, gravelly SAND (SW)	
MS-2-28C	11/12/11	Frozen, yellow-brown, very gravelly SAND (SW)	
MS-2-29C	11/11/11	Frozen, yellow-brown, gravelly SAND (SW)	
MS-2-30C	11/11/11	Frozen, light brown, very gravelly SAND (SW)	
MS-3-Composite			
MS-3-1C	11/10/11	Frozen, gray-brown, sandy GRAVEL (GW/GP)	
MS-3-2C	11/10/11	Frozen, brown, very sandy GRAVEL with numerous rootlets (GW/GP)	
MS-3-3C	11/10/11	Frozen, yellow-brown, very gravelly SAND (SW)	
MS-3-4C	11/10/11	Frozen, yellow-brown, very gravelly SAND (SW)	
MS-3-5C	11/10/11	Frozen, brown, slightly gravelly SAND (SW)	
MS-3-6C	11/10/11	Frozen, light brown, gravelly SAND (SW)	
MS-3-7C	11/10/11	Frozen, gray-brown, very gravelly SAND (SW)	
MS-3-8C	11/10/11	Frozen, gray-brown, gravelly SAND (SW)	
MS-3-9C	11/10/11	Frozen, yellow-brown, slightly gravelly SAND (SW)	
MS-3-10C	11/10/11	Frozen, yellow-brown, slightly gravelly SAND (SW)	
MS-3-11C	11/10/11	Frozen, brown, slightly gravelly SAND (SW)	
MS-3-12C	11/10/11	Frozen, light brown, gravelly SAND (SW)	
MS-3-13C	11/10/11	Frozen, light brown, very sandy GRAVEL (GW/GP)	
MS-3-14C	11/10/11	Frozen, red-brown SAND with trace gravel (SW)	
MS-3-15C	11/10/11	Frozen, yellow-brown, gravelly SAND (SW)	
MS-3-16C	11/10/11	Frozen, yellow-brown, gravelly SAND (SW)	
MS-3-17C	11/10/11	Frozen, gray, sandy GRAVEL (GW/GP)	
MS-3-18C	11/10/11	Frozen, gray-brown, very gravelly SAND (SW)	
MS-3-19C	11/10/11	Frozen, gray-brown SAND (SW)	
MS-3-20C	11/10/11	Frozen, gray-brown, very gravelly SAND (SW)	
MS-3-21C	11/10/11	Frozen, gray-brown, very gravelly SAND (SW)	
MS-3-22C	11/10/11	Frozen, light brown SAND (SW)	
MS-3-23C	11/10/11	Frozen, light brown, gravelly SAND (SW)	
MS-3-24C	11/10/11	Frozen, light brown, slightly gravelly SAND (SW)	
MS-3-25C	11/10/11	Frozen, gray-brown, slightly gravelly SAND (SW)	
MS-3-26C	11/10/11	Frozen, light brown, very gravelly SAND (SW)	
MS-3-27C	11/10/11	Frozen, light brown, very sandy GRAVEL (GW/GP)	
MS-3-28C	11/10/11	Frozen, brown, gravelly SAND (SW)	
MS-3-29C	11/10/11	Frozen, gray, very gravelly SAND (SW)	
MS-3-30C	11/10/11	Frozen, gray-brown, gravelly SAND (SW)	
MS-4-Composite			
MS-4-1	6/19/12	Moist, tan-brown, silty sandy GRAVEL (GM)	
MS-4-2	6/19/12	Moist, tan, sandy GRAVEL (GP)	
MS-4-3	6/19/12	Moist, gray, silty SAND (SM)	
MS-4-4	6/19/12	Moist, tan-brown, sandy GRAVEL (GP)	
MS-4-5	6/19/12	Moist, tan-brown, slightly silty sandy GRAVEL (GM)	
MS-4-6	6/19/12	Moist, tan-brown, slightly silty sandy GRAVEL (GM)	
MS-4-7	6/19/12	Moist, tan-brown, slightly silty sandy GRAVEL (GM)	
MS-4-8	6/19/12	Moist, tan-brown, sandy GRAVEL (GP)	
MS-4-9	6/19/12	Moist, tan-brown, sandy GRAVEL (GP)	
MS-4-10	6/19/12	Moist, brown, slightly silty sandy GRAVEL (GM)	
MS-4-11	6/19/12	Moist, gray, slightly silty sandy GRAVEL (GM)	
MS-4-12	6/19/12	Moist, tan-brown, slightly silty sandy GRAVEL (GM)	
MS-4-13	6/19/12	Moist, tan-brown, gravelly silty SAND (SP)	

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
MS-4-14	6/19/12	Damp, tan-brown, gravelly silty SAND with roots (SP)	
MS-4-15	6/19/12	Moist, tan-brown, gravelly silty SAND (SP)	
MS-4-16	6/19/12	Moist, tan-brown, slightly silty sandy GRAVEL (GM)	
MS-4-17	6/19/12	Moist, tan, sandy GRAVEL with roots (GP)	
MS-4-18	6/19/12	Moist, tan-brown, slightly silty sandy GRAVEL (GM)	
MS-4-19	6/19/12	Moist, brown, silty sandy gravel to gravelly SAND (GM/SP)	
MS-4-20	6/19/12	Moist, brown, sandy GRAVEL (GP)	
MS-4-21	6/19/12	Moist, tan-brown, silty sandy GRAVEL (GM)	
MS-4-22	6/19/12	Moist, brown, sandy GRAVEL (GP)	
MS-4-23	6/19/12	Moist, brown, slightly silty sandy GRAVEL (GM)	
MS-4-24	6/19/12	Moist, brown, slightly silty sandy GRAVEL (GM)	
MS-4-25	6/19/12	Moist, tan, sandy GRAVEL with roots (GP)	
MS-4-26	6/19/12	Moist, tan-gray, slightly silty sandy GRAVEL (GM)	
MS-4-27	6/19/12	Moist, tan-brown-red, sandy GRAVEL (GP)	
MS-4-28	6/19/12	Moist, tan-brown, sandy GRAVEL (GP)	
MS-4-29	6/19/12	Moist, tan-brown, slightly silty sandy GRAVEL (GM)	
MS-4-30	6/19/12	Moist, tan-brown, silty sandy GRAVEL (GM)	
SWR-Composite			
SWR-1C	11/5/11	Frozen, gray, slightly sandy GRAVEL (GW/GP)	
SWR-2C	11/5/11	Damp, gray-brown, sandy GRAVEL (GW/GP)	
SWR-3C	11/5/11	Damp, brown, silty gravelly SAND (GM)	
SWR-4C	11/5/11	Damp, brown, sandy GRAVEL (GW/GP)	
SWR-5C	11/5/11	Damp/frozen, brown, gravelly SAND (GW/GP)	
SWR-6C	11/5/11	Frozen, gray and brown, slightly sandy GRAVEL (GW/GP)	
SWR-7C	11/5/11	Frozen, brown, gravelly, SAND (GW/GP)	
SWR-8C	11/5/11	Damp to moist, brown, slightly silty, gravelly SAND with occasional organics (SW)	Sample described after thawed
SWR-9C	11/5/11	Frozen, light brown, slightly sandy GRAVEL (GW/GP)	
SWR-10C	11/5/11	Frozen, brown, sandy GRAVEL (GW/GP)	
SWR-11C	11/5/11	Frozen, brown, sandy GRAVEL with abundant organics (GW/GP)	
SWR-12C	11/5/11	Frozen, brown, sandy GRAVEL with scattered organics (GW/GP)	
SWR-13C	11/5/11	Frozen, brown, sandy GRAVEL with scattered organics (GW/GP)	
SWR-14C	11/5/11	Frozen, brown, GRAVEL with scattered sandy organics (GW/GP)	
SWR-15C	11/5/11	Gray/brown, sandy GRAVEL (GW/GP)	
SWR-16C	11/5/11	Frozen, red-brown, sandy GRAVEL (GW/GP)	
SWR-17C	11/5/11	Frozen red-brown sandy GRAVEL (GW/GP)	
SWR-18C	11/5/11	Sandy GRAVEL with scattered organics (GW/GP)	
SWR-19C	11/5/11	Frozen, gray brown, sandy GRAVEL (GW/GP)	
SWR-20C	11/5/11	Frozen, brown/gray, gravelly SAND (GW/GP)	
SWR-21C	11/7/11	Moist, brown, slightly silty gravelly SAND with abundant organics, pine needles and twigs (SW)	Sample described after thawed
SWR-22C	11/7/11	Moist, gray, slightly sandy to sandy GRAVEL with scattered organics (GW/GP)	Sample described after thawed
SWR-23C	11/7/11	Frozen, gray-brown, sandy GRAVEL (GW/GP)	
SWR-24C	11/7/11	Frozen, light brown, sandy GRAVEL with scattered organics (GW/GP)	
SWR-25C	11/7/11	Frozen, light brown, gravelly SAND with scattered organics (SW)	
SWR-26C	11/7/11	Frozen, gray, sandy GRAVEL (GW/GP)	
SWR-27C	11/7/11	Moist, orange to red-brown slightly gravelly silty SAND with scattered organics (SM)	Sample described after thawed
SWR-28C	11/7/11	Frozen, brown, gravelly SAND (SW)	
SWR-29C	11/7/11	Moist, brown, slightly silty gravelly SAND with abundant organics (moss, duff, roots) (SW)	Sample described after thawed

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
SWR-30C	11/7/11	Frozen, gray, sandy GRAVEL with scattered organics (GW/GP)	
SWR-1-Composite			
SWR-1-1	6/20/12	Damp, gray-brown, gravelly silty SAND with rootlets (SP-SM)	
SWR-1-2	6/20/12	Damp, light brown, very gravelly silty SAND with rootlets (SP-SM)	
SWR-1-3	6/20/12	Damp, gray-brown, very gravelly sandy SILT (SP-SM)	
SWR-1-4	6/20/12	Damp, light brown, gravelly silty SAND (SP-SM)	
SWR-1-5	6/20/12	Damp, light brown, very gravelly silty SAND (SP-SM)	
SWR-1-6	6/20/12	Damp, gray-brown, silty sandy GRAVEL (GM)	
SWR-1-7	6/20/12	Damp, yellow-brown, silty, very sandy GRAVEL (GM)	
SWR-1-8	6/20/12	Damp, gray-brown, very gravelly silty SAND (SP-SM)	
SWR-1-9	6/20/12	Damp, light brown, silty sandy GRAVEL (GM)	
SWR-1-10	6/20/12	Damp, yellow-brown, silty, sandy GRAVEL (GM)	
SWR-1-11	6/20/12	Damp, light brown, very gravelly silty SAND (SP-SM)	
SWR-1-12	6/20/12	Damp, dark gray-brown, very gravelly silty SAND (SP-SM)	
SWR-1-13	6/20/12	Damp, light brown, very gravelly silty SAND with roots (SP-SM)	
SWR-1-14	6/20/12	Damp, light brown, very gravelly silty SAND (SP-SM)	
SWR-1-15	6/20/12	Damp, yellow-brown, silty, very sandy GRAVEL (GM)	Below 1/2" needles
SWR-1-16	6/20/12	Damp, red-brown, very gravelly sandy SILT (SP-SM)	
SWR-1-17	6/20/12	Damp, light brown with orange mottling, very gravelly silty SAND (SP-SM)	
SWR-1-18	6/20/12	Damp, light brown with orange mottling, very gravelly silty SAND (SP-SM)	
SWR-1-19	6/20/12	Damp, light brown, sandy silty GRAVEL (GM)	
SWR-1-20	6/20/12	Damp, light brown, gravelly sandy SILT (SP-SM)	
SWR-1-21	6/20/12	Damp, gray-brown, silty sand with GRAVEL (SM)	
SWR-1-22	6/20/12	Damp, yellow-brown, gravelly silty SAND (SP-SM)	
SWR-1-23	6/20/12	Damp, yellow-brown, gravelly silty SAND (SP-SM)	
SWR-1-24	6/20/12	Damp, light brown, very gravelly silty SAND (SP-SM)	
SWR-1-25	6/20/12	Damp, gray-brown, very gravelly silty SAND (SP-SM)	
SWR-1-26	6/20/12	Damp, light brown, gravelly silty SAND (SP-SM)	Below 1/2" duff
SWR-1-27	6/20/12	Damp, gray-brown, gravelly silty SAND (SP-SM)	Below 1/2" duff
SWR-1-28	6/20/12	Damp, gray-brown with orange mottling, silty sandy GRAVEL (GM)	Below 1/2" needles, duff
SWR-1-29	6/20/12	Damp, brown with orange staining, very gravelly silty SAND (SP-SM)	
SWR-1-30	6/20/12	Damp, light brown, very gravelly sandy SILT (SP-SM)	
SWR-2-Composite			
SWR-2-1	6/20/12	Damp, light brown, silty sand with GRAVEL (SM)	
SWR-2-2	6/20/12	Damp, light brown, gravelly silty SAND (SP-SM)	Below ~1/2 to 1" duff
SWR-2-3	6/20/12	Damp, yellow-brown, very gravelly silty SAND (SP-SM)	Below ~1" duff
SWR-2-4	6/20/12	Damp, light brown, very gravelly sandy SILT (SP-SM)	
SWR-2-5	6/20/12	Damp, red-brown, very gravelly silty SAND (SP-SM)	Below ~1/2 to 1" duff
SWR-2-6	6/20/12	Damp, red-brown, gravelly silty SAND (SP-SM)	Below ~1" duff
SWR-2-7	6/20/12	Damp, red-brown, very gravelly silty SAND (SP-SM)	
SWR-2-8	6/20/12	Damp, red-brown, very gravelly silty SAND (SP-SM)	
SWR-2-9	6/20/12	Damp, gray-brown, very gravelly silty SAND (SP-SM)	Below ~1/2 to 1" duff
SWR-2-10	6/20/12	Damp, gray-brown, silty sandy GRAVEL (GM)	
SWR-2-11	6/20/12	Damp, light brown, silty sandy GRAVEL (GM)	Collected at 3-6" depth due to surface rocks
SWR-2-12	6/20/12	Damp, light brown, gravelly silty SAND (SP-SM)	Below ~ 1" duff
SWR-2-13	6/20/12	Damp, gray-brown, gravelly silty SAND (SP-SM)	Below ~ 1/2" moss
SWR-2-14	6/20/12	Damp, light brown, very gravelly silty SAND (SP-SM)	
SWR-2-15	6/20/12	Damp, light brown, very gravelly silty SAND (SP-SM)	Below ~1" duff
SWR-2-16	6/20/12	Damp, gray-brown, very gravelly sandy SILT (SP-SM)	Below ~1" duff
SWR-2-17	6/20/12	Damp, gray-brown, silty sandy GRAVEL (GM)	Below ~ 1/2" needles

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
SWR-2-18	6/20/12	Damp, light brown, silty sandy GRAVEL (GM)	
SWR-2-19	6/20/12	Damp, gray-brown, silty sandy GRAVEL (GM)	
SWR-2-20	6/20/12	Damp, gray-brown, very gravelly silty SAND (SP-SM)	
SWR-2-21	6/20/12	Damp, gray-brown with orange mottling, very gravelly silty SAND (SP-SM)	
SWR-2-22	6/20/12	Damp, yellow-brown, very gravelly silty SAND (SP-SM)	
SWR-2-23	6/20/12	Damp, light brown, very gravelly silty SAND (SP-SM)	Below ~ 1/2" moss
SWR-2-24	6/20/12	Damp, yellow-brown, very gravelly sandy SILT (SP-SM)	
SWR-2-25	6/20/12	Damp, yellow-brown, gravelly silty SAND (SP-SM)	
SWR-2-26	6/20/12	Damp, red-brown, gravelly silty SAND (SP-SM)	Below ~ 1/2" moss
SWR-2-27	6/20/12	Damp, light brown, slightly gravelly silty SAND (SP-SM)	
SWR-2-28	6/20/12	Damp, light brown, slightly gravelly silty SAND (SP-SM)	
SWR-2-29	6/20/12	Damp, red-brown, slightly gravelly sandy SILT (SP-SM)	
SWR-2-30	6/20/12	Damp, gray-brown, slightly gravelly sandy SILT (SP-SM)	
SWR-3-Composite			
SWR-3-1	6/19/12	Damp, gray, slightly silty sandy GRAVEL (GM)	
SWR-3-2	6/19/12	Damp, tan-brown, slightly silty sandy GRAVEL (GM)	
SWR-3-3	6/19/12	Damp, tan-brown, slightly silty sandy GRAVEL (GM)	
SWR-3-4	6/19/12	Damp, tan-brown, slightly silty sandy GRAVEL (GM)	
SWR-3-5	6/19/12	Damp, tan-brown to gray, sandy GRAVEL (GP)	
SWR-3-6	6/19/12	Damp, tan-brown, slightly silty sandy GRAVEL with roots (GM)	
SWR-3-7	6/19/12	Damp, gray, slightly silty sandy GRAVEL (GM)	Below 2" forest duff
SWR-3-8	6/19/12	Damp, gray with red staining, slightly silty sandy GRAVEL (GM)	Below 1 1/2" forest duff
SWR-3-9	6/19/12	Damp, tan-gray, sandy GRAVEL (GP)	
SWR-3-10	6/19/12	Damp, tan-brown, sandy GRAVEL (GP)	
SWR-3-11	6/19/12	Damp, gray, sandy GRAVEL (GP)	
SWR-3-12	6/19/12	Damp, tan, sandy GRAVEL (GP)	
SWR-3-13	6/19/12	Damp, tan-red, silty sandy GRAVEL (GM)	
SWR-3-14	6/19/12	Damp, gray sandy GRAVEL (GP)	
SWR-3-15	6/19/12	Damp, tan-red, silty sandy GRAVEL (GM)	
SWR-3-16	6/19/12	Damp, tan-red, silty sandy GRAVEL (GM)	
SWR-3-17	6/19/12	Damp, tan-red, silty sandy GRAVEL (GM)	
SWR-3-18	6/19/12	Damp, tan-red, silty sandy GRAVEL (GM)	
SWR-3-19	6/19/12	Damp, brown, silty sandy GRAVEL (GM)	
SWR-3-20	6/19/12	Damp, brown, silty sandy GRAVEL (GM)	
SWR-3-21	6/19/12	Damp, tan-brown, sandy GRAVEL (GP)	
SWR-3-22	6/19/12	Damp, tan-brown, silty sandy GRAVEL (GM)	
SWR-3-23	6/19/12	Damp, tan-gray, silty SAND (SM)	
SWR-3-24	6/19/12	Damp, tan-gray, silty sandy GRAVEL (GM)	
SWR-3-25	6/19/12	Damp, gray-brown, silty sandy GRAVEL (GM)	
SWR-3-26	6/19/12	Damp, gray-brown, silty sandy GRAVEL (GM)	
SWR-3-27	6/19/12	Moist, tan-gray, silty SAND (SM)	
SWR-3-28	6/19/12	Moist, tan-gray, silty sandy GRAVEL (GM)	
SWR-3-29	6/19/12	Moist, tan-gray, slightly silty SAND with gravel (SP)	
SWR-3-30	6/19/12	Wet, tan-gray, slightly silty SAND with gravel (SP)	
SWR-4-Composite			
SWR-4-1	6/19/12	Damp, light brown, slightly silty sandy GRAVEL (GM)	
SWR-4-2	6/19/12	Damp, light brown, sandy GRAVEL (GW)	
SWR-4-3	6/19/12	Damp, light brown sandy SILT (SM)	
SWR-4-4	6/19/12	Damp, light brown, tan sandy silty GRAVEL (GM)	
SWR-4-5	6/19/12	Damp, tan brown, slightly silty sandy GRAVEL (GM)	Below 1" forest duff
SWR-4-6	6/19/12	Damp, light gray, slightly silty sandy GRAVEL (GM)	

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
SWR-4-7	6/19/12	Damp, light brown, slightly silty gravelly SAND (SW)	
SWR-4-8	6/19/12	Damp, tan brown, sandy silty GRAVEL (GM)	
SWR-4-9	6/19/12	Damp, tan-brown-orange, gravelly sandy SILT (SM)	
SWR-4-10	6/19/12	Damp, red brown, slightly silty sandy GRAVEL (GM)	
SWR-4-11	6/19/12	Damp, light brown, slightly silty sandy GRAVEL with roots (GM)	
SWR-4-12	6/19/12	Damp, light brown-tan, sandy GRAVEL (GW)	
SWR-4-13	6/19/12	Damp, tan brown, slightly silty sandy GRAVEL (GM)	
SWR-4-14	6/19/12	Damp, tan-brown, gravelly sandy SILT (SM)	
SWR-4-15	6/19/12	Damp, tan brown, slight silty sandy GRAVEL (GM)	
SWR-4-16	6/19/12	Damp, light to medium brown, slightly silty sandy GRAVEL (GM)	
SWR-4-17	6/19/12	Damp, light brown, silty gravelly SAND (SP)	
SWR-4-18	6/19/12	Damp, tan-brown-light brown, slightly silty sandy GRAVEL (GM)	
SWR-4-19	6/19/12	Damp, tan brown sandy GRAVEL (GP)	
SWR-4-20	6/19/12	Damp, tan brown, slight silty sandy GRAVEL (GM)	
SWR-4-21	6/19/12	Damp, light brown-gray, sandy GRAVEL (GW)	
SWR-4-22	6/19/12	Damp, light brown-tan, sandy GRAVEL (GW)	
SWR-4-23	6/19/12	Damp, gray, sandy GRAVEL (GP)	
SWR-4-24	6/19/12	Damp, red brown, slightly silty sandy GRAVEL (GM)	
SWR-4-25	6/19/12	Damp, light gray, sandy GRAVEL with some organics (forest duff) (GW)	
SWR-4-26	6/19/12	Damp, light brown-gray, sandy GRAVEL (GW)	
SWR-4-27	6/19/12	Damp, tan-brown, silty SAND, with forest duff and roots (SM)	
SWR-4-28	6/19/12	Damp, gray, slightly silty sandy GRAVEL (GM)	
SWR-4-29	6/19/12	Damp, light gray, sandy GRAVEL (GW)	
SWR-4-30	6/19/12	Damp, light gray, sandy GRAVEL (GW)	
AOI-1 - North Open Pit and Mill Stained Soils			
NP-1-SS	10/14/11	Moist, tan-brown, sandy GRAVEL (GW/GP)	North Pit. 5-point composite.
NP-2-SS	10/14/11	Moist, tan-brown, sandy GRAVEL (GW/GP)	North Pit. 5-point composite. XRF analysis only.
NP-3-SS	10/14/11	Moist, tan-brown to gray sandy GRAVEL (GW/GP)	North Pit. 5-point composite.
MS-1	6/20/12	Tan, silty SAND with some charred material and trash (SM)	Mill Site. Stained soil.
MS-2	6/20/12	Tan-brown, sandy GRAVEL with trash (GP)	Mill Site. Stained soil.
MS-3	6/20/12	Brown-black, sandy GRAVEL with charred material (GP)	Mill Site. Stained soil. Burn pile.
MS-4	6/20/12	Brown-tan, sandy GRAVEL with waste rock and trash (GP)	Mill Site. Stained soil. Burn pile or debris pile.
MS-5	6/20/12	Black, slightly silty sandy GRAVEL with trash (GM)	Mill Site. Stained soil.
MS-6	6/20/12	Wet, gray, silty sandy GRAVEL (GM)	Mill Site. Mild solvent odor.
MS-7	6/20/12	Wet, tan-brown, slightly silty GRAVEL (GM)	Mill Site. Stained soil.
MS-8	6/20/12	Tan-black, sandy GRAVEL (GP)	Mill Site. Slight petroleum odor.
MS-9	6/20/12	Black, sandy GRAVEL (GP)	Mill Site. Stained soil.
MS-10	6/20/12	Slightly silty sandy GRAVEL (GM)	Mill Site. Stained soil.
MS-11	6/21/12	Dry, tan-brown silty SAND (SM)	
MS-12	6/21/12	Moist, gray-brown slightly silty, slightly gravelly SAND (SW)	Below 2 to 3" duff
MS-13	6/21/12	Moist, gray-brown slightly silty, slightly gravelly SAND (SW)	Below 4" duff
MS-14	6/21/12	Wet, brown, slightly gravelly silty SAND (SW)	
MS-15	6/21/12	Tan-brown, slightly silty gravelly SAND (SP)	
MS-16	6/21/12	Slightly silty SAND with gravel (SW)	Below 1" duff
MS-17	6/20/12	No description	
MS-18	6/20/12	No description	
AOI 2 - Soil Samples Upper Tailings Pile			
UT-1-SS	10/14/11	Dry, light gray-brown, slightly silty SAND with occasional rootlets (SP)	Upper tailings pile. 5-point composite. XRF analysis only.

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
UT-2-SS	10/14/11	Dry, light gray, slightly silty SAND (SP)	Upper tailings pile - west basin. 5-point composite.
UT-3-SS	10/14/11	Dry, light brown, slightly silty SAND (SP)	Upper tailings pile - east basin. 5-point composite.
UT-1	6/24/12	Moist, brown, slightly silty SAND with abundant organics and roots	South of UTP. Sample collected below 2" of forest duff, in flood plain of drainage on an old road. No evidence of tailings.
UT-2	6/24/12	Moist, tan-brown, silty SAND with gravel.	South of UTP. Sample collected below 0.5" of moss, on bank of drainage south of UTP. No evidence of tailings. Drainage next to UTP.
UT-20	6/24/12	Moist, tan-brown, silty SAND with gravel.	Field duplicate of UT-2.
UT-3	6/24/12	Moist, tan-brown, slightly silty SAND with gravel.	South of UTP. Sample collected below 1" of moss, in drainage south of UTP. No evidence of tailings. Drainage next to UTP.
UT-4	6/24/12	Moist, tan-brown-red, slightly silty gravelly SAND.	Northeast of UTP. Sample collected below 2" of moss and forest duff, in clear-cut area between two logging roads. No evidence of tailings.
UT-5	6/24/12	Moist, tan-brown, silty gravelly SAND.	Northeast of UTP. Sample collected below 0.5" of moss and roots in clear-cut area. No evidence of tailings.
UT-6	6/24/12	Moist, tan-brown, slightly silty gravelly SAND.	Northeast of UTP. Sample collected below 2" of forest duff and roots, in clear-cut area between two logging roads. No evidence of tailings.
UT-10	6/26/12	Slightly silty coarse SAND with gravel and abundant roots.	West of UTP, down slope from breach. Sample collected below 4 to 5" forest duff, on west side of small tributary. No evidence of tailings.
UT-11	6/26/12	3' thick tailings deposit over soil.	West of UTP, down slope from breach. Sample collected in tailings deposit, at confluence with small tributary. Tailings ~ 3" thick.
UT-7	6/26/12	Tailings	West of UTP, down slope from breach. Surface tailings from breach.
UT-9	6/26/12	Moist, tan-brown, silty medium to coarse SAND with roots.	West of UTP, down slope from breach. Sample collected below 4" forest duff, ~ 10' from obvious tailings deposit. No evidence of tailings.
UT-12	6/27/12	Tailings over moist, tan-brown, slightly silty coarse SAND.	West of UTP, down slope from breach. Recent tailings deposits covering vegetation.
UT-13	6/27/12	2 to 3" thick tailings over moist, brown, slightly silty coarse SAND.	West of UTP, down slope from breach. Recent tailings deposit in active erosional area.
UT-14	6/27/12	0.5 to 1" thick tailings over wet, slightly silty SAND with roots.	West of UTP, down slope from breach. Northern boundary of tailings erosional feature, on an old road. Tailings.
UT-15	6/27/12	3 to 4" thick tailings over wet, brown-black slightly silty gravelly SAND.	West of UTP, down slope from breach. Recent tailings deposit in drainage close to SE tributary.
UT-16	6/27/12	Moist, dark brown-black gravelly coarse SAND.	West of UTP. Northern observed extent of tailings, next to SE tributary. No evidence of tailings.
UT-160	6/27/12	Moist, dark brown-black gravelly coarse SAND.	Field duplicate of UT-16.
UT-17	6/27/12	1 to 1.5" thick tailings over wet, brown, gravelly SAND.	West of UTP. Drainage between two sections of UTP. Tailings ~ 1 to 1.5" thick.
AOI-3 - Soil Samples Lower Tailings Pile			
LT-DP-1	11/8/11	Wet, gray-brown, slightly silty SAND (SP)	Lower Tailings Detention Pond. 5-point composite sample. Tailings.
LT-DP-2	11/8/11	Damp, gray-brown, SAND with occasional organics (rootlets and duff) (SP)	LTP. XRF analysis only. Tailings.
LT-OC ROAD-CULVERT	11/9/11	Damp, gray-brown, slightly silty SAND (SW)	Lower Tailings Pile Onion Creek Road Culvert. 5-point composite sample
LT-1-SS	10/14/11	Dry, light gray SAND (SP)	Lower Tailings Pile. 5-point composite sample
LT-2-SS	10/14/11	Moist to dry, light gray sand (SP)	Lower Tailings Pile. 5-point composite sample
LT-3-SS	10/14/11	Dry to moist, light gray SAND (SP)	LTP. XRF analysis only. Tailings.
LT-1	6/23/12	Damp, tan brown, slightly silty gravelly fine to medium SAND.	Logged area to NE of LTP. Within old road cut and drainage. Possible tailings observed.
LT-2	6/23/12	Moist to damp, tan-brown, slightly silty gravelly fine to coarse SAND with roots.	Logged area to NE of LTP. Partway down slope above NE tributary. No tailings observed.
LT-3	6/23/12	Damp, red-brown, slightly gravelly SAND.	Logged area to NE of LTP. Sample collected below 4 to 6" forest duff. Down slope from old road. No tailings observed.

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
LT-4	6/23/12	Moist, brown, very slightly silty gravelly SAND.	Logged area to NE of LTP. Sample collected below 1 to 3" forest duff. No tailings observed.
LT-5	6/23/12	Moist, gray-brown, slightly silty SAND with abundant organics and roots.	Logged area to NE of LTP. Sample collected below 2" forest duff, in flood plain of NE tributary. No tailings observed.
LT-6	6/23/12	Moist, dark brown, silty SAND with abundant roots.	Logged area to N of LTP. Sample collected below 2 to 3" forest duff, in flood plain north of NE tributary. No tailings observed.
LT-7	6/23/12	Layer of 1/2 to 1" tailings over moist, brown, silty SAND with gravel and abundant roots.	Logged area to N of LTP. Sample collected from outer extent of tailings erosional area, below ~ 1/2" conifer needles. Collected in flood plain south of NE tributary. Tailings ~ 1/2 to 1" thick.
LT-8	6/23/12	Damp, light brown to gray, silty SAND with trace gravel.	Logged area to N of LTP. Sample collected in flood plain of south of NE tributary, ~ 50' from creek. No tailings observed.
LT-9	6/23/12	Moist, dark brown, silty SAND with abundant roots.	Logged area to N of LTP. Sample collected in flood plain of NE tributary, ~ 20' from south side of creek. No tailings observed.
LT-90	6/23/12	Moist, dark brown, silty SAND with abundant roots.	Field duplicate of LT-9
LT-10	6/23/12	Moist, dark brown, silty SAND with gravel.	Logged area to N of LTP. Sample collected in flood plan on south side of NE tributary. No tailings observed.
LT-11	6/23/12	Interbeded layers of light gray sand (tailings) with moist to damp, black, slightly silty SAND with abundant organics and roots.	Flood plain of NE tributary, northwest of LTP. Sample collected on south side of creek. Tailings.
LT-12	6/26/12	Wet, gray-brown, 2" thick layer of black organic soil over fine grained tailings.	Flood plain of NE tributary, northwest of LTP. Sample collected on south side of creek. Tailings ~ 6" thick.
LT-13	6/26/12	Wet, black, organic soil with roots overlaying moist to damp, slightly silty medium to coarse SAND.	Flood plain of NE tributary, northwest of LTP. Sample collected on north side of creek. No tailings observed.
LT-14	6/26/12	Wet, black, organic soil with sand.	Flood plain of NE tributary, northwest of LTP. Sample collected on north side of creek. No tailings observed.
LT-15	6/26/12	Wet, black, organic soil overlaying ~ 6" of tailings.	Flood plain of NE tributary, northwest of LTP. Sample collected on south side of creek. Tailings ~ 6" thick.
LT-16	6/21/12	Damp, brown, silty SAND with roots and rootlets.	Meadow southwest of LTP. Grass, herbs, and wildflowers. No tailings observed.
LT-17	6/21/12	Damp, brown, slightly gravelly silty SAND with rootlets.	Meadow south of Van Stone Mine Road to southwest of LTP. Grass, herbs, and wildflowers. No tailings observed.
LT-18	6/21/12	Damp, brown, sandy SILT.	Logged area south of LTP. Sample collected from old logging road. No tailings observed.
LT-180	6/21/12	Damp, brown, sandy SILT.	Field duplicate of LT-18
LT-19	6/21/12	Damp, red-brown with black mottling, silty SAND with trace gravel.	Logged area south of LTP. Sample collected ~10' from new logging road. No tailings observed.
LT-190	6/21/12	Damp, red-brown with black mottling, silty SAND with trace gravel.	Field duplicate of LT-19
LT-20	6/22/12	Damp, red-brown silty SAND with trace gravel.	Logged area northeast of LTP. Sample collected from below ~1/2" forest duff, next to tree stump. No tailings observed.
LT-21	6/22/12	Moist, brown, sandy SILT with trace gravel and abundant rootlets.	NE of LTP. Soggy fenced meadow with conifers and grass. No tailings observed.
LT-22	6/22/12	Damp, light brown grading to gray with black mottling, silty SAND with rootlets.	West of LTP. Drainage below detention pond. Possible tailings observed.
LT-23	6/22/12	Damp, gray-brown silty SAND with trace gravel, wood debris, and rootlets.	West of LTP. Between Van Stone Mine Road and Onion Creek. No tailings observed.
AOI-4 - Soil Samples Road and Slurry Pipeline			
Road Samples			
DR-1	6/25/12	Moist, gray-black, slightly silty gravelly SAND (SW).	Van Stone-Onion Creek Road. Between junction with Van Stone Mine Road and County Highway 9425.No evidence of surface road weathering. Road base appears to be different material than Van Stone Mine Road. No evidence of waste rock or tailings observed.

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
DR-2	6/25/12	Moist, gray-black, slightly silty gravelly SAND (SW).	Van Stone-Onion Creek Road. Between junction with Van Stone Mine Road and County Highway 9425. No evidence of surface road weathering. Road base appears to be different material than Van Stone Mine Road. No evidence of waste rock or tailings observed.
DR-3	6/25/12	Wet, gray-black, slightly silty gravelly SAND (SW).	Van Stone-Onion Creek Road. Slightly north of junction with Van Stone Mine Road. No evidence of surface road weathering. Road base appears to be different material than Van Stone Mine Road. No evidence of waste rock or tailings observed.
DR-4	6/25/12	Wet, tan-brown, slightly silty gravelly SAND (SW).	Van Stone Mine Road. Slightly south of junction with Van Stone-Onion Road. Surface road erosion in ruts. No evidence of waste rock or tailings observed.
DR-5	6/25/12	Wet, gray-black, slightly silty gravelly SAND (SW).	Van Stone-Onion Creek Road. South of Lower Tailings Pile and junction of Van Stone-Onion Road and Van Stone Mine Road. No evidence of surface road weathering. Road base appears to be different material than Van Stone Mine Road. No evidence of waste rock or tailings observed.
DR-6	6/25/12	Wet, tan-brown, slightly silty gravelly SAND (SW).	Van Stone Mine Road. Between Upper Tailings Pile Road and Lower Tailings Pile Road, slightly south of Lower Tailings Pile Road. Surface road erosion. No evidence of waste rock or tailings observed.
DR-7	6/25/12	Wet, tan-brown, slightly silty gravelly SAND (SW).	Van Stone Mine Road. Between Upper Tailings Pile Road and Lower Tailings Pile Road. Minor surface road erosion in ruts. No evidence of waste rock or tailings observed.
DR-8	6/25/12	Wet, tan-brown silty SAND with trace gravel (SM).	Van Stone Mine Road. Between Upper Tailings Pile Road and Lower Tailings Pile Road. Limited surface road erosion in ruts. No evidence of waste rock or tailings observed.
DR-9	6/25/12	Wet, tan-brown silty SAND (SM).	Van Stone Mine Road. Between Upper Tailings Pile Road and Lower Tailings Pile Road. No evidence of surface road erosion. No evidence of waste rock or tailings observed.
DR-10	6/25/12	Wet, tan-brown silty SAND with trace gravel (SM).	Van Stone Mine Road. Between Upper Tailings Pile Road and Lower Tailings Pile Road. No evidence of tailings observed. Some pieces of waste rock on shoulders of the road.
DR-11	6/25/12	Wet, tan-brown silty SAND with trace gravel (SM).	Van Stone Mine Road. Along bend where road shifts from southeast to northeast. Very minor surface road erosion. No evidence of waste rock or tailings observed.
DR-12	6/25/12	Wet, tan-brown, slightly silty gravelly SAND (SW).	Van Stone Mine Road. Between Mine Site and Upper Tailings Pile road. Some surface road erosion in main ruts. No evidence of tailings observed. Several pieces of waste rock and native bedrock observed mixed in with the road base.
DR-13	6/25/12	Wet, tan-brown, slightly silty gravelly SAND (SW).	Van Stone Mine Road. Between Mine Site and Upper Tailings Pile road. Limited surface road erosion in main ruts. No evidence of tailings observed. Several large pieces of waste rock on side of the road.
DR-14	6/25/12	Wet, tan-brown, slightly silty gravelly SAND (SW).	Van Stone Mine Road. At Y-intersection where Van Stone Mine Road forks to east, below gate to Burris residence and Van Stone Mine. Surface road erosion. No evidence of waste rock or tailings observed.
DR-15	6/25/12	Wet, brown, slightly silty gravelly SAND (SW)	Van Stone Mine Road. Below gate to Van Stone Mine. Surface road erosion. No evidence of waste rock or tailings observed.
Slurry Pipeline Samples			
PL-1	6/25/12		Between MS and LTP. Berm along access road, ~ 3' from rotting wood tailings pipe. Tailings.
PL-2	6/25/12		Between MS and LTP. Immediate vicinity of pipeline. Tailings.

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
PL-3	6/25/12	Damp, gray-brown silty SAND with roots and decomposing wood.	Between MS and UTP. Sample down slope from access road, at north boundary of tailings release. No tailings in sample. Near edge of tailings release. Wood pipes ~ 50' to east.
PL-4	6/25/12	Damp, brown, gravelly SAND.	Between MS and UTP. Outside boundary of tailings release. No tailings in sample. Near edge of tailings release.
PL-5	6/25/12		Between MS and UTP. Logged area. Sample adjacent to pipeline. Tailings ~ 1 to 3" thick.
PL-6	6/26/12		Between MS and LTP. South of pipeline/UTP access road. Tailings ~ 2' thick.
PL-7	6/26/12	Wet, brown, gravelly SAND with trace silt.	Between MS and LTP. Below elevated tailing pipe that crossed creek. No tailings in sample. Near pipeline.
PL-8	6/25/12	Tailings intermixed with native soils.	Between MS and UTP. Drainage below right angle turn in pipeline. Multiple layers of tailings observed.
PL-9	6/25/12		Between MS and UTP. Within culvert above UTP.
PL-10	6/26/12	Damp, brown, silty SAND with trace gravel and abundant roots.	Between MS and LTP. Collected from road adjacent to pipeline. No tailings in sample. Near pipeline.
PL-11	6/26/12		Between MS and LTP. Below abandoned house. Tailings 0 to 18" thick. Numerous disconnected pipes observed.
PL-12	6/27/12	Moist, brown, gravelly silty SAND.	Between MS and LTP. North side of Van Stone Mine road. No tailings observed
PL-13	6/27/12		Between MS and LTP. ~80 feet down slope from pipeline. Tailings ~ 6" thick.
PL-14	6/27/12	Moist, brown, slightly silty SAND with trace gravel.	Between MS and LTP. Logged area. No tailings observed
PL-15	6/27/12		Between MS and LTP. Collected from ditch - no pipes observed. Tailings ~ 7" thick.
TAILINGS BOX	11/6/11		Between MS and UTP. 5-point composite collected down slope from pile of pipes. Tailings observed.
UT-LT-2000'	11/10/11	Frozen, brown to light brown silty fine SAND.	Between UTP and LTP. .Collected between wooden pipe and concrete pipe. Tailings observed.
UT-LT-4000'	11/10/11	Frozen, light brown silty SAND.	Between UTP and LTP. Collected from area near broken pipeline sections. Tailings observed.
UT-LT-0	11/10/11	Frozen, light gray, slightly gravelly silty SAND (SM)	XRF Analysis only.
UT-LT-2000	11/10/11	Frozen, brown and light brown, silty fine SAND (SM)	Below 0.5" duff
UT-LT-3000	11/10/11	Frozen, brown, slightly silty SAND (SW)	XRF Analysis only.
UT-LT-pipeline culver	11/10/11	Frozen, light brown, silty SAND with scattered organics (SM)	XRF Analysis only.
UT-LT-4000	11/10/11	Frozen, light brown, silty SAND (SM)	
UT-LT-5000	11/10/11	Dry, gray-brown, silty SAND with trace gravels and occasional rootlets (SM)	XRF Analysis only.
UT-LT-6000	11/10/11	Damp, light brown, silty SAND (SM)	XRF Analysis only.
UT-LT-7000	11/10/11	Damp, brown, silty SAND (SM)	XRF Analysis only.
UT-LT-Final	11/10/11	Tailings	XRF Analysis only.
Tailings Box	11/6/11	Light gray, sandy SILT (ML)	
Drum	11/3/11	Dry, light-brown, slightly silty SAND (SW)	XRF Analysis only.
Drum #2	11/3/11	Dry, light-brown, SAND with trace gravels (SP)	XRF Analysis only.
Soil Below Drum	11/3/11	Dry, light-brown to gray-brown, slightly silty SAND (SW)	XRF Analysis only.
Pipe Soil	11/4/11	Dry, light-gray, SAND (SP)	XRF Analysis only.
Tailings #2	11/6/11	Damp, gray-brown, SAND with rootlets (SP)	
Pipeline Debris Pile	11/10/11	Damp, brown to black, slightly silty SAND with scattered organics (rootlets and duff) (SW)	5-point composite. XRF analysis only.
AOI-5 - Soil and Sediment Onion Creek			
OC-1-SD	10/9/11	Saturated, light brown SAND (SP)	
OC-2-SD	10/9/11	Saturated, gray-brown SAND (SP)	
OC-3-SD	10/12/11	Saturated, gray-brown to black, very silty SAND (SM)	
OC-4-SD	10/13/11	Saturated, light brown, slightly silty SAND (SW)	
OC-5-SD	10/13/11	Saturated, gray-brown, slightly silty SAND with trace gravel (SW)	

Table A-2 - Sample Location Descriptions

Sample & Sub Sample No.	Date Sampled	Soil Description	Observations
OC-6-SD	10/13/11	Saturated, light gray to light brown to brown (layered) silty SAND (SM)	
OC-7-SD	10/14/11	Saturated, red-brown, SAND (SP)	
OC-8-SD	10/13/11	Saturated, brown silty SAND with trace gravel (SM)	
OC-9-SD	10/12/11	Saturated, gray-brown silty SAND with occasional conifer needles (SM)	
OC-10-SD	10/12/11	Saturated, gray-brown slightly silty SAND with occasional conifer needles (SW)	
OC-11-SD	10/12/11	Saturated, gray-brown to brown, silty SAND with occasional conifer needles (SM)	
OC-12-SD	10/11/11	Saturated, gray-brown slightly silty SAND (SW)	
OC-13-SD	10/9/11	Saturated, gray-brown, SAND (SP)	
OC-14-SD	10/12/11	Saturated, light brown, SAND with occasional conifer needles (SP)	
OC-15-SD	10/14/11	Saturated, gray-brown SAND (SP)	
OC-16-SD	10/14/11	Saturated red-brown, SAND with occasional wood fragments (SP)	
OC-17-SD	10/14/11	Saturated, brown, very sandy GRAVEL (GW/GP)	
OC-18-SD	10/14/11	Saturated, gray-brown, slightly gravelly SAND with scattered wood fragments (SW)	
OC-19-SD	10/14/11	Saturated, brown, slightly gravelly SAND with occasional conifer needles and wood fragments (SW)	
NT-SD-1	6/23/12	Saturated, light brown, SAND (SP)	
BG-12-SD	10/7/11	Saturated, gray-brown, slightly silty SAND (SW)	
BG-12-SS	10/7/11	Damp, gray-brown, slightly gravelly SAND with occasional rootlets (SW)	5-point composite

Table A-3 - Onion Creek Surface Water Sample Location Channel Descriptions (AOI-5)

Van Stone Mine

Sample ID	Collection Date	Channel Dimensions and Est. Flow (cfs)*	General Location	Stream Bed Conditions	Notes
Tributary to the Southeast Tributary (Northeast of Open Pits)					
OC-12	10/11/11	~3' wide, 0.5 to 1' deep, est.< 2cfs.	Upstream at Van Stone mine entrance on a small tributary.	Stream bed: Boulders, cobbles, gravels, and sands. Undercut banks. Pools and riffles.	Sampling location is downstream of 2' diameter corrugated pipe crossing. No other immediately observable mine impacts.
OC-10	10/12/11	~3' wide, 0.5 to 1' deep, est. < 2 cfs.	Upstream at Van Stone mine entrance on a small tributary.	Stream bed: Small boulders (less than head-sized), gravels and light colored very fine sand. Pools and riffles.	Fine-grained sands observed similar to the mine tailings materials.
Tributary to the Southeast Tributary (Southeast of the Open Pits)					
OC-14	10/12/11	2-4' wide, ~ 0.5-1' deep, est. 1-2 cfs	Located on small tributary upstream of West Pit Lake, between South Pit and North Pit.	Stream bed: Angular boulders, coarse gravel. Undercut banks.	Upstream of the sampling site is a white PVC pipe crossing and immediately adjacent to the site is a historical mining road.
OC-11	10/12/11	4-6' wide, 2 to 8" depth, est. 1-2 cfs.	Located on small tributary upstream of West Pit Lake, between South Pit and North Pit downstream of West Pit Lake outfall.	Stream bed: Boulders, large gravels. Undercut banks. Pools and riffles. Gravels are less eroded, angular to sub-angular, suggesting they're closer to their source.	Possible waste rock observed in the stream: dolomite (country rock) and some iron sulfide rocks.
OC-9	10/12/11	6-8' wide, 0.5-1' deep, est. 2-4 cfs.	Located on small tributary downstream of West Pit Lake above the confluence with the SE Tributary.	Stream bed: Rounded to sub-rounded boulders, cobbles, gravels, sands. Very fine sand/silt deposited over coarser sediments. Undercut banks. Pools and riffles.	Fine-grained sands observed similar to the mine tailings materials. Two ~6" diameter black HDPE pipes cross upstream of the sampling location.
Southeast Tributary to Onion Creek					
OC-16	10/14/11	About 3-4' wide, 0.5-1' deep, est. 2-3 cfs	Located on the SE Tributary between the confluences with two small tributaries to the SE Tributary.	Stream bed: Sub-rounded to rounded granitic boulders, cobbles, coarse sands. Undercut banks.	Some orange staining on stream bed materials possibly from metal bearing minerals or biological activity. Otherwise, no immediately observable mine impacts.

Table A-3 - Onion Creek Surface Water Sample Location Channel Descriptions (AOI-5)

Van Stone Mine

Sample ID	Collection Date	Channel Dimensions and Est. Flow (cfs)*	General Location	Stream Bed Conditions	Notes
OC-15	10/14/11	About 2-3' wide, 0.5-1' deep, est. 2-3 cfs	Located on the SE Tributary between the confluences with two small tributaries to the SE Tributary and downstream of the slurry pipeline crossing.	Stream bed: Rounded and sub-rounded boulders, cobbles, coarse gravel and sand. Undercut banks.	Sampling location is down stream of an old wooden pipe crossing (likely a historical tailings pipe). No other immediately observable mine impacts.
OC-8	10/13/11	About 4-5' wide, 0.5-2' deep, est. 3-4 cfs.	SE tributary above when the breach in Upper Tailings Pile enters the SE Tributary.	Stream bed: Sub-angular to rounded boulders. Gravel where eroded from granite bedrock. Some sand in pools. Undercut banks.	No immediately observable mine impacts.
OC-7	10/14/11	About 5-6' wide, 0.5-1.5' deep, est. 4-5 cfs.	Downstream of Upper Tailings Pile breach area on SE Tributary.	Stream bed: Sub-angular to sub-rounded boulders, cobbles, coarse gravels, coarse sands. Undercut banks.	Fine-grained sands observed similar to the mine tailings materials. Pinkish-red staining on some stream bed materials where they contact with water - possibly from metal bearing minerals or biological activity.
OC-18	10/14/11	About 4-5' wide, 0.5-1.5' deep, est. 4 cfs.	SE tributary, downstream from Upper Tailings pile.	Stream bed: Minor sub-rounded granitic boulders, rounded and sub-angular cobbles, coarse sands to fine sand, dolomitic and quartz cobbles. Undercut banks. Pools and riffles.	Some orange staining on stream bed materials possibly from metal bearing minerals or biological activity. Otherwise, no immediately observable mine impacts.
OC-17	10/14/11	4-5' wide, 0.5-1' deep, est. 5 cfs.	SE tributary, below power lines.	Stream bed: Sub-rounded boulders, rounded cobbles, gravels. Undercut banks.	Some orange staining on stream bed materials possibly from metal bearing minerals or biological activity. Otherwise, no immediately observable mine impacts.
BG-12 (Not a background Sample)	10/7/11	About 8-10 wide	SE tributary.	Grassy area with small trees and shrubs. Close to road.	~150' from Onion Creek Road.

Table A-3 - Onion Creek Surface Water Sample Location Channel Descriptions (AOI-5)

Van Stone Mine

Sample ID	Collection Date	Channel Dimensions and Est. Flow (cfs)*	General Location	Stream Bed Conditions	Notes
OC-6	10/13/11	About 20' wide, ~ 4' deep, est. 9 cfs	SE tributary culvert discharge into a pool created to obtain water for fire fighting. (Stream flow est. down stream of the pool)	Pool bed: Rounded boulders dam creek to form pool. Edges of pool rounded cobbles and boulders. Center of pool - coarse gravel and sand.	Fine-grained sands observed similar to the mine tailings materials in the pool. Minor orange staining on stream bed materials in the pool possibly from metal bearing minerals or biological activity.
OC-5	10/13/11	About 3-6' wide, 0.5-1.5' deep, est. 9-10 cfs.	SE tributary upstream from confluence with Onion Creek.	Stream bed: Sub-angular to rounded coarse gravels and coarse sands. Undercut banks.	Fine-grained sands observed similar to the mine tailings materials.
Northeast Tributary (Lotze Creek) to Onion Creek					
OC-3	10/12/11	3-4' wide, 0.5-1' deep, est. 0.5-2 cfs.	Upstream of Lower Tailings Pile, NE tributary.	Stream bed: Rounded boulders, gravels, coarse sands. Fine grained sands in pools. Undercut banks.	Fine-grained sands observed similar to the mine tailings materials in the pool. Minor orange staining on stream bed materials possibly from metal bearing minerals or biological activity.
NT-SD-1	6/23/12	About 4' wide, 1.5' deep	NE tributary, north of Lower Tailings Pile.	Stream bed: Boulders, gravels, sand.	No tailings material observed.
OC-2	10/9/11	About 4' wide, 0.5 to 1' depth, est. 2-4 cfs.	NE tributary, upstream of confluence with Onion Creek.	Stream bed: Boulders, gravels. Some muscovite crystals in sand. Minor pools and riffles.	Sampling site is offset ~10' from an abandoned road. No other immediately observable mine impacts.
Onion Creek from West of SR-9425 to SE Tributary Confluence					
OC-4	10/13/11	~8-10' wide, 0.5-1' deep, est. 15-20 cfs.	Onion Creek downstream of SE tributary confluence and upstream of NE tributary confluence.	Stream bed: Boulders, cobbles, coarse gravels, sands. Rounded, sub-angular.	Some orange staining on stream bed materials possibly from metal bearing minerals or biological activity. Otherwise, no immediately observable mine impacts.
OC-1	10/9/11	About 14' wide, 0.5 to 3' deep	Downstream from confluence of NE tributary and Onion Creek.	Stream bed: Rounded boulders and cobbles, sand in pools. Some muscovite crystals in sand. Flooding and undercutting at banks.	Some orange staining on stream bed materials possibly from metal bearing minerals or biological activity. Otherwise, no immediately observable mine impacts.

Table A-3 - Onion Creek Surface Water Sample Location Channel Descriptions (AOI-5)

Van Stone Mine

Sample ID	Collection Date	Channel Dimensions and Est. Flow (cfs)*	General Location	Stream Bed Conditions	Notes
OC-19	10/14/11	About 10-12' wide and 0.5- 3' deep	Onion Creek, near School house and upstream from SR-9425.	Stream bed: Rounded to sub-rounded boulders, coarse gravels, cobbles, sand at depth.	Some orange staining on stream bed materials possibly from metal bearing minerals or biological activity. Otherwise, no immediately observable mine impacts.
OC-13	10/9/11	10-20' wide, 0.5-2' deep	West of SR-9425 in downstream pool where road culvert discharge occurs.	Stream bed: Gravels, boulders (marble), sands. Flood debris (metal). Flooding and cutting at banks.	Some orange staining on stream bed materials possibly from metal bearing minerals or biological activity. Otherwise, no immediately observable mine impacts.

Notes:

cfs - Cubic Feet per Second
OC - Onion Creek
SD - Sediment Sample
cfs - Cubic Feet per Second
NE - Northeast
SE - Southeast
SR-9425 - State Route 9425

* Where accessible, a 4-12’ section of stream length with uniform flow (few changes in flow direction, minimal flow

Table A-4 - Onion Creek Water Quality Parameters (AOI-5)
Van Stone Mine

Sample ID	Collection Date	pH	Conductivity (mS/m) [1]	Turbidity (NTUs) [2]	Dissolved Oxygen (mg/L) [3]	Temperature (°C) [4]	Total Dissolved Solids (g/L) [5]	ORP (mV) [6]	Notes
OC-1	10/9/11	8.36	50.8	5.3	*2.95*	7.3	0.32	70	
OC-2	10/9/11	8.24	6.08	1.7	*2.93*	7.3	0.39	76	
OC-3	10/12/11	8.24	31.3	2.8	*2.68*	7.9	0.2	110	
OC-4	10/13/11	7.77	50.6	1.6	*0*	5.3	0.32	135	
OC-5	10/13/11	8.26	55.8	4.4	*2.64*	5.1	0.36	119	
OC-6	10/13/11	8.16	55.9	18.2	*2.13*	4.7	0.36	119	
OC-7	10/14/11	8.41	58.8	1.0	*2.95*	4.6	0.38	130	
OC-8	10/13/11	8.24	61.5	9.2	*1.57*	5.9	0.39	118	
OC-9	10/12/11	8.48	60.4	4.5	*2.72*	7.3	0.39	119	
OC-10	10/12/11	8.22	45.1	1.9	*0*	5.9	0.31	108	
OC-11	10/12/11	8.32	43.0	2.1	*2.40*	7.4	0.28	110	
OC-12	10/11/11	8.29	47.7	2.5	*2.73*	6.9	0.31	130	
OC-13	10/9/11	8.26	52.1	2.2	*0*	6.7	0.33	27	
OC-14	10/12/11	8.27	29.9	6.0	*3.00*	6.2	0.19	117	
OC-15	10/14/11	8.41	39.8	0.1	*3.36*	4.8	0.26	134	
OC-16	10/14/11	8.41	37.3	6.6	*3.36*	4.9	0.25	121	
OC-17	10/14/11	8.44	50.7	0	*3.2*	5.9	0.32	134	
OC-18	10/14/11	8.48	58.9	1.1	*3.09*	6.1	0.38	137	
OC-19	10/14/11	8.54	48.9	0.6	*3.14*	6.7	0.32	135	
BG-12	10/7/11	8.01	51.4	0	2.57	8.8	0.33	108	Not used as Background Sample

1 - mS/m - milli-siemens per meter

2 - NTUs - nephelometric turbidity units

3 - Dissolved oxygen (DO) sensor did not calibrate - problem with sensor that could not be fixed in the field. DO values are not accurate.

4 - °C - degrees celsius

5 - g/L - grams per liter

6 - mV - millivolts - oxygen reduction potential (ORP)

Table A-5 - Background Sediment and Surface Soil Sample Descriptions

Van Stone Mine

Sample Number	Collection Date	Soil Description	Comments
BG-1-SD	10/6/11	Saturated, brown, silty SAND with numerous wood fragments (SM)	
BG-1-SS	10/6/11	Moist, brown-black, SILT with numerous rootlets (ML)	5-point composite; highly organic, dark brown, wet, abundant worms, grass rootlets, fiber material.
BG-2-SD	10/4/11	Saturated, brown SILT with numerous wood fragments and conifer needles (ML)	
BG-2-SS	10/4/11	Dry, brown, sandy SILT with numerous rootlets and wood fragments (ML)	5-point composite; forest duff, roots, worms, dry to wet, rootlets were removed, wood debris, burnt wood present in area, 1-3" duff, needles
BG-3-SD	10/6/11	Saturated, gray to brown, silty SAND (SM)	
BG-3-SS	10/6/11	Dry, red-brown, sandy organic SILT with numerous rootlets (ML)	5-point composite; 2-6" forest duff, high organic material, abundant roots and wood pieces.
BG-4-SD	10/6/11	Saturated, gray-black sandy GRAVEL (GW/GP)	
BG-4-SS	10/6/11	Dry, brown, sandy SILT with numerous rootlets and wood fragments (ML)	5-point composite; 6" duff, highly organic, roots and rootlets, leaf litter, wood debris, wet, dark brown.
BG-5-SD	10/5/11	Saturated, brown, very gravelly SAND with trace silt (SW)	
BG-5-SS	10/5/11	Dry, yellow-brown SILT with numerous rootlets (ML)	5-point composite; ~4" forest duff, light brown, abundant needles, roots and rootlets, high organics.
BG-6-SD	10/4/11	Saturated, red-brown, slightly silty SAND (SW)	
BG-6-SS	10/4/11	Dry, light brown, very silty SAND with numerous rootlets (SM)	5-point composite; 1-4" forest duff, roots and rootlets, high amounts of organic material, dry, light tan brown, slightly gravelly fine to medium sand
BG-7-SD	10/4/11	Saturated, gray-brown, very silty SAND with occasional conifer needles (SM)	
BG-7-SS	10/4/11	Dry, light brown, gravelly SAND with scattered rootlets (SW)	5-point composite; 1-4" forest duff, wet, leaf and needle litter, lots of roots, high organics, slightly gravelly sand with fines
BG-8-SD	10/3/11	Saturated, gray-brown, slightly silty SAND (SW)	
BG-8-SS	10/3/11	Dry, red-brown, silty SAND with trace gravel and scattered rootlets (SM)	5-point composite
BG-9-SD	10/7/11	Saturated, red-brown, gravelly SAND (SW)	
BG-9-SS	10/7/11	Damp, brown organic SILT with numerous rootlets (ML)	5-point composite; dark brown, highly organic, some forest duff, worms, fines, abundant roots.
BG-10-SD	10/5/11	Saturated, brown organic SILT (ML)	

Table A-5 - Background Sediment and Surface Soil Sample Descriptions

Van Stone Mine

Sample Number	Collection Date	Soil Description	Comments
BG-10-SS	10/5/11	Damp, brown organic SILT with numerous rootlets (ML)	5-point composite; ~4" duff, high organics, lots of roots, pine needles, tan-brown.
BG-11-SD	10/8/11	Saturated, red-brown, gravelly SAND (SW)	
BG-11-SS	10/8/11	Dry, light brown, silty SAND with scattered rootlets (SM)	5-point composite; gravelly soil with medium-coarse sand, 1-4" forest duff, some roots.
BG-13-SD	10/5/11	Saturated, gray-brown SAND (SP)	
BG-13-SS	10/5/11	Dry, red-brown, sandy SILT with numerous rootlets (ML)	5-point composite;
BG-14-SD	10/6/11	Saturated, gray-brown slightly silty SAND (SW)	
BG-14-SS	10/6/11	Dry, light brown silty SAND with scattered rootlets (SM)	5-point composite; tan brown, fine sand; 1 point was beneath 4" duff; 4 points fine sand with limited organics, forest duff roots, pine needles
BG-15-SD	10/7/11	Saturated, gray-brown very gravelly SAND with occasional rootlets (SW)	
BG-15-SS	10/7/11	Dry, brown, slightly gravelly SAND with scattered rootlets (SW)	5-point composite; tan-brown, sandy soil with limited organics and some fines, roots, leaves.

Table A-6 - Background Sample Channel Location Descriptions

Sample ID	Collection Date	Channel Description	General Location	Observations	Evidence of Human Impacts
BG-1	10/6/11	About 3' wide	Along NE tributary, above Lower Tailings Pile.	Below confluence with small tributary, above road. Grassy, organic, lots of worms in soil sample.	Mowed area. Apparently previously used as pasture.
BG-2	10/4/11	About 2-3' wide	NE tributary, upstream from Lower Tailings Pile.	Creek bottom has been logged previously. Currently heavy tree cover and undergrowth, in an about 50' wide creek basin. Some marshy areas with skunk cabbage.	Previously logged. Burnt wood observed in soil sample.
BG-3	10/6/11	About 1.5' wide	Upstream of Lower Tailings Pile, NE tributary.	Small stream between logged areas. Stumps, downed trees, newer tree growth. Creek disappears under tree roots and forest duff.	Previously logged.
BG-4	10/6/11	About 1' wide	NE tributary, upstream from Lower Tailings Pile.	Small stream between logged areas. Small trees, heavy undergrowth, downed logs. Creek disappears under logs, debris and forest duff. Two grouse in area.	Clear cuts nearby. Upstream from logging road.
BG-5	10/5/11	About 3' wide	Above main mine area, on tributary which flows into different watershed	Small creek flowing within wider flat valley (50' wide). Heavily forested with downed logs, minor undergrowth. Creek disappears below forest litter in some areas.	Between clear cuts, upstream from logging road. Old flagging tape observed near one soil subsample.
BG-6	10/4/11	About 1.5' wide	Above main mine area, on tributary which flows into SE tributary	Small creek flowing within wider flat valley (about 20-30' wide). High tree cover, downed trees, little undergrowth. Aerial photos show heavily logged away from stream area.	Between clear cuts, uphill from logging road.
BG-7	10/4/11	About 1.5' wide	Above main mine area, on tributary which flows into SE tributary	Small creek with steep drainage banks above logging road. Heavy tree cover and undergrowth; Downed logs and mossy banks.	Close to logging road.

Table A-6 - Background Sample Channel Location Descriptions

Sample ID	Collection Date	Channel Description	General Location	Observations	Evidence of Human Impacts
BG-8	10/3/11	About 1.5' wide, 2-6" deep	Above main mine area, on tributary which flows into SE tributary	Small creek flowing within wider flat valley (about 50' wide). Downed trees crossing creek, low shrubs and plants in valley, forested on upper banks. Aerial photos show heavily logged away from stream area.	Two to 5 pieces of clear plastic found in creek bed from old milk carton
BG-9	10/7/11	About 10' wide	Onion Creek, above confluence with SE tributary	Heavily forested, appears unlogged. Downed trees, undergrowth.	Near forest road, ATV trails
BG-10	10/5/11	About 3' wide	Small tributary upstream from upper tailings pile, feeds into SE tributary	Small creek, appears to be intermittent. Small trees, tree stumps, downed trees, minor undergrowth.	About 50 feet from road. Previously logged
BG-11	10/8/11	About 2' wide.	Above main mine area, on tributary which flows into SE tributary	Small creek in open area, many small trees, medium undergrowth. Animal game trail.	Upstream from old road bed. Clear cuts to both sides of creek area.
BG-13	10/5/11	About 6-8' wide	Onion Creek, above confluence with SE tributary	Flat creek bed, area cleared for DNR management, large trees, some downed logs. Fish in creek.	Area cleared of undergrowth for DNR management.
BG-14	10/6/11	About 8' wide	Onion Creek, above confluence with SE tributary	Flat creek bed, undercut banks, medium dense forest undergrowth, trees and stumps	About 50 feet from road.
BG-15	10/7/11	About 3' wide	Tributary that drains into SE tributary	Heavy undergrowth, logs, trees and stumps.	Upstream from very old logging road. Two old log (early 1900s?) cabin structures downstream on old road.

Notes:
Sample BG-12 was located on the SE tributary, and included with the Onion Creek samples.
BG - background
SD - sediment sample
NE - northeast
SE - southeast
SR-9425 - State Route 9425

Table A-7 - Water Quality Parameters at Background Sample Locations

Sample ID	Collection Date	pH	Conductivity (mS/m) [1]	Turbidity (NTUs) [2]	Dissolved Oxygen (mg/L) [3]	Temperature (°C) [4]	Total Dissolved Solids (g/L) [5]	ORP (mV) [6]
BG-1	10/6/11	7.16	30.4	2.9	2.49	8.5	0.20	61
BG-2	10/4/11	7.23 to 7.45	27.1	1.1	0	8.8	0.17	140
BG-3	10/6/11	7.45	21.2	0	1.03	7.6	0.14	106
BG-4	10/6/11	7.29	10.1	0.8	2.67	8.1	0.07	118
BG-5	10/5/11	7.00	26.5	0	2.49	6.1	0.17	171
BG-6	10/4/11	7.88	27.2	2.3	2.36	6.6	0.18	135
BG-7	10/5/11	5.68	4.4	5.5	2.98	5.4	0.03	190
BG-8	10/3/11	7.41	52.6	11.3	2.80	10.3	0.33	61
BG-9	10/7/11	7.69	31.6	0	2.83	7.6	0.20	83
BG-10	10/5/11	7.41	71.0	2.9	2.50	7.8	0.46	169
BG-11	10/8/11	7.80	44.6	6.7	3.13	5.7	0.29	64
BG-13	10/5/11	8.34	30.8	3.1	2.72	7.5	0.20	141
BG-14	10/6/11	7.97	32.1	0	2.64	8.7	0.21	115
BG-15	10/7/11	7.87	25.0	0	2.73	8.2	0.16	103

1 - mS/m - milli-siemens per meter

2 - NTUs - nephelometric turbidity units

3 - milligrams per liter

4 - Dissolved Oxygen (DO) sensor did not calibrate - sensor problrm could not be fixed in the field. DO values are not accurate.

5 - °C - degrees celsius

6 - g/L - grams per liter

7 - mV - millivolts - Oxygen Reduction Potential (ORP)

Table A-8 - Monitoring Well Development Records

Monitoring Well ID	Date of Well Development	Well Depth (feet)	Monument Stick up (feet)	Depth to Water (feet)	Depth to Sediment (feet)	Sediment Thickness (feet)	Casing Volume (gallons)	Method of Developing	Volume Purged (gallons)	Comments
MW-1	11/8/11			DRY						DRY
MW-2	11/7/11	74.5	2.6	70.95	77.25	-0.15	1.9	Bailer	20	Bailed dry after 4 gallons, bailed dry a second time
MW-3	11/7/11	30	2.7	18.05	32.1	0.6	1.9	Bailer & Whalen Pump	35	Started running clear at 25 gallons, pumped dry 3 times, used bailer in between pumping dry
MW-4	11/9/11	25	2.63	25.63	26.65	0.975	0.16	Bailer & Whalen Pump	2.1	Water very turbid to start and then slightly turbid at the end
MW-5	11/9/11	50	2.37	45.09	53.07	-0.7	1.3	Bailer & Whalen Pump	15	Water gradually cleared very turbid to start, slightly turbid after 12 gallons

Table A-9 - Residential and Monitoring Well Groundwater Sampling Field Data

Sample ID	Date & Time	Groundwater Parameters							Notes
		pH	Conductivity (mS/m) [1]	Turbidity (NTUs) [2]	Dissolved Oxygen (mg/L) [3]	Temperature (°C) [4]	Total Dissolved Solids (g/L) [5]	ORP (mV) [6]	
DH-2	11/8/11 1350								Not Measured
W-1(DH-8)	11/10/11 1509	6.8	228	19.2	8.42 [7]	13.6	1.5	131	
W-2	11/9/11 1440								Not Measured
MW-2	11/9/11 1235	6.97	257	>999	1.97	17.1	1.7	78 [8]	
MW-3	11/10/11 1258	7.19	83	774	3.04	10.8	0.53	40	
MW-4	11/11/11 0845	6.42	247	38.5	7.37 [7]	5.8	1.6	263	
MW-5	11/11/11 1040	6.67	112	200	0.63 [7]	10.7	0.7	2 [8]	
RW-1	11/5/11 1600	6.76	34.7	9.0	8.2 [7]	7.2	0.22	157	
RW-2	11/6/11 1305	7.48	56.6	1.9 [7]	8.45 [7]	6.1	0.36	146 [8]	
RW-3	11/6/11 1550	7.29	61.4	1.3 [7]	7.85 [7]	8.7	0.39	122	
RW-4	11/9/11 1612	7.13	59.2	10.2	3.82	8.3	0.38	116	
RW-5	11/10/11 1025	7.36	62.5	-	4.49	8.8	0.4	182	
RW-6	11/11/11 1521	7.09	21.7	6.1 [7,8]	8.54 [7]	8.1	0.14	134	
RW-7	11/11/11 1705	7.33	76.6	7.6 [7,8]	4.14	6.5	0.49	205	

Notes:

1 - mS/m - milli-siemens per meter

2 - NTUs - nephelometric turbidity units

3 - Dissolved Oxygen (DO) sensor did not calibrate - problem with sensor which could not be fixed in the field. DO values are not accurate.

4 - °C - degrees celsius

5 - g/L - grams per liter

6 - mV - millivolts - Oxygen Reduction Potential (ORP)

7 - Suspect result.

8 - Meter not working.

Table A-10 - Residential and Monitoring Well Well Construction and Water Level Data

Monitoring Well ID and Date Well Sampled	Measuring Point (MP)	Elevation at MP (TOC) (feet)	Well Diameter (Inches)	Screen Interval	Well Depth (feet)	Depth to Water from TOC (feet)	Well Casing Stick Up (feet)	Elevation of Ground Surface	Depth to Water from Ground Surface (feet)	Elevation of Water Table (feet)
RW-1										
	TOC North	2828	6	22-34	38.0	11.03	NA			2817.0
RW-3										
	TOC North	2667	6	No Screen	120.0	27.48	NA			2639.5
W-1 (DH89-8 or DH-8)										
11/1/11	TOC North	2688.7	2	18.4-27.9	27.9	23.90	2.8	2685.8	21.07	2664.8
11/2/11						24.76			24.76	2663.9
11/10/11						23.70			23.70	2665.0
6/22/12						23.34			23.34	2665.3
6/27/12						23.36			23.36	2665.3
W-2 (W2)										
11/1/11	TOC North	2664.8	2	13.5-23	23.5	22.28	2.3	2662.5	19.98	2642.5
11/9/11						22.44			22.44	2642.4
6/24/12						16.33			16.33	2648.5
6/27/12						16.25			16.25	2648.6
DH-2 (DH89-2)										
11/1/11	TOC North	2684.7	1	42-52	52.0	46.47	2	2682.7	44.47	2638.2
11/2/11						46.22			46.22	2638.5
11/8/11						47.45			47.45	2637.2
6/24/12						45.21			45.21	2639.5
6/27/12						23.20			23.20	2661.5
DH-5 (DH89-5)										
11/1/11	TOC North	2674.7	1	45-55	54.0	DRY	6.7	2668.0		-
6/22/12						DRY				-
6/27/12						DRY				-
MW-1										
11/8/11	TOC North	2656.9	2	72-82	82.0	DRY	2.7	2654.2		-
6/22/12						DRY				-
6/27/12						DRY				-
MW-2										
11/8/11	TOC North	2680.5	2	65-75	74.5	69.88	2.6	2677.9	67.28	2610.6
11/9/11						70.76			70.76	2609.7
6/21/12						68.74			68.74	2611.7
6/27/12						68.21			68.21	2612.3
MW-3										
11/10/11	TOC North	2773.2	2	20-30	30.0	8.60	2.4	2770.8	6.20	2764.8
6/24/11						2.92			2.92	2770.5
6/27/11						2.46			2.46	2770.9
MW-4										
11/11/11	TOC North	3158.4	2	15-25	25.0	25.55	2.8	3155.6	22.72	3133.1
6/22/12						23.36			23.36	3135.3
6/27/12						22.88			22.88	3135.8
MW-5										
11/11/11	TOC North	3143.6	2	40-50	50.0	44.72	2.9	3140.7	41.85	3098.9
6/22/12						43.33			43.33	3100.3
6/27/12						42.20			42.20	3101.4

Notes:
MP - Measuring Point
TOC - Top of Casing

Table A-11 - Surface Water Sampling Field Data

Sample ID	Date	Surface Water Parameters						
		pH	Conductivity (mS/m) [1]	Turbidity (NTUs) [2]	Dissolved Oxygen (mg/L) [3]	Temperature (°C) [4]	Total Dissolved Solids (g/L) [5]	ORP (mV) [6]
BG-1	10/06/11	7.16	30.4	2.9	2.49	8.5	0.20	61
BG-2	10/04/11	7.23 to 7.45	27.1	1.1	0*	8.8	0.17	140
BG-3	10/06/11	7.45	21.2	0	1.03	7.6	0.14	106
BG-4	10/06/11	7.29	10.1	0.8	2.67	8.1	0.07	118
BG-5	10/05/11	7.00	26.5	0	2.49	6.1	0.17	171
BG-6	10/04/11	7.88	27.2	2.3	2.36	6.6	0.18	135
BG-7	10/05/11	5.68	4.4	5.5	2.98	5.4	0.03	190
BG-8	10/03/11	7.41	52.6	11.3	2.80	10.3	0.33	61
BG-9	10/07/11	7.69	31.6	0	2.83	7.6	0.20	83
BG-10	10/05/11	7.41	71.0	2.9	2.50	7.8	0.46	169
BG-11	10/08/11	7.80	44.6	6.7	3.13	5.7	0.29	64
BG-12	10/07/11	8.01	51.4	0	2.57	8.8	0.33	108
BG-13	10/05/11	8.34	30.8	3.1	2.72	7.5	0.20	141
BG-14	10/06/11	7.97	32.1	0	2.64	8.7	0.21	115
BG-15	10/07/11	7.87	25.0	0	2.73	8.2	0.16	103
OC-1	10/09/11	8.36	50.8	5.3	2.95*	7.3	0.32	70
OC-2	10/09/11	8.24	6.08	1.7	2.93*	7.3	0.39	76
OC-3	10/12/11	8.24	31.3	2.8	2.68*	7.9	0.2	110
OC-4	10/13/11	7.77	50.6	1.6	0*	5.3	0.32	135
OC-5	10/13/11	8.26	55.8	4.4	2.64*	5.1	0.36	119
OC-6	10/13/11	8.16	55.9	18.2	2.13*	4.7	0.36	119
OC-7	10/14/11	8.41	58.8	1.0	2.95*	4.6	0.38	130
OC-8	10/13/11	8.24	61.5	9.2	1.57*	5.9	0.39	118
OC-9	10/12/11	8.48	60.4	4.5	2.72*	7.3	0.39	119
OC-10	10/12/11	8.22	45.1	1.9	0*	5.9	0.31	108
OC-11	10/12/11	8.32	43.0	2.1	2.4*	7.4	0.28	110
OC-12	10/11/11	8.29	47.7	2.5	2.73*	6.9	0.31	130
OC-13	10/09/11	8.26	52.1	2.2	0*	6.7	0.33	27
OC-14	10/12/11	8.27	29.9	6.0	3*	6.2	0.19	117
OC-15	10/14/11	8.41	39.8	0.1	3.36*	4.8	0.26	134
OC-16	10/14/11	8.41	37.3	6.6	3.36*	4.9	0.25	121
OC-17	10/14/11	8.44	50.7	0	3.2*	5.9	0.32	134
OC-18	10/14/11	8.48	58.9	1.1	3.09*	6.1	0.38	137
OC-19	10/14/11	8.54	48.9	0.6	3.14*	6.7	0.32	135
WP-SW-1	11/02/11	7.46	64.5	0	10.56	8.0	--	273
NP-SW-1	11/02/11	8.0	66.0	154	9.95	7.3	--	275
SP-SW-1	11/03/11	6.29	49.0	2.6	10.91	0.5	--	290
UT-SW-1	11/09/11	7.36	159	70.1	0.24	6.9	--	167

* Meter not functioning properly.

1 - mS/m - milli-siemens per meter

2 - NTUs - nephelometric turbidity units

3 - Dissolved Oxygen (DO) sensor did not calibrate - problem with sensor which could not be fixed in the field. DO values are not accurate.

4 - °C - degrees celsius

5 - g/L - grams per liter

6 - mV - millivolts - Oxygen Reduction Potential (ORP)

Key to Exploration Logs

Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:
Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits and probes is estimated based on visual observation and is presented parenthetically on the logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 to 4	Very soft	0 to 2	<0.125
Loose	4 to 10	Soft	2 to 4	0.125 to 0.25
Medium dense	10 to 30	Medium stiff	4 to 8	0.25 to 0.5
Dense	30 to 50	Stiff	8 to 15	0.5 to 1.0
Very dense	>50	Very stiff	15 to 30	1.0 to 2.0
		Hard	>30	>2.0

Sampling Test Symbols

- 1.5" I.D. Split Spoon
- Grab (Jar)
- 3.0" I.D. Split Spoon
- Shelby Tube (Pushed)
- Bag
- Cuttings
- Core Run

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE			GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

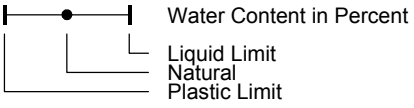
Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, likely below optimum
Moist	Likely near optimum moisture content
Wet	Much perceptible moisture, likely above optimum

Minor Constituents	Estimated Percentage
Trace	<5
Slightly (clayey, silty, etc.)	5 - 12
Clayey, silty, sandy, gravelly	12 - 30
Very (clayey, silty, etc.)	30 - 50

Laboratory Test Symbols

GS	Grain Size Classification
CN	Consolidation
UU	Unconsolidated Undrained Triaxial
CU	Consolidated Undrained Triaxial
CD	Consolidated Drained Triaxial
QU	Unconfined Compression
DS	Direct Shear
K	Permeability
PP	Pocket Penetrometer Approximate Compressive Strength in TSF
TV	Torvane Approximate Shear Strength in TSF
CBR	California Bearing Ratio
MD	Moisture Density Relationship
AL	Atterberg Limits

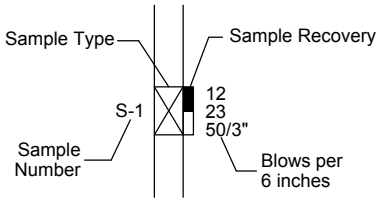


PID	Photoionization Detector Reading
CA	Chemical Analysis
DT	In Situ Density in PCF
OT	Tests by Others

Groundwater Indicators

- Groundwater Level on Date or (ATD) At Time of Drilling
- Groundwater Seepage (Test Pits)

Sample Key



HARTCROWSER

17800-11 *11/11*

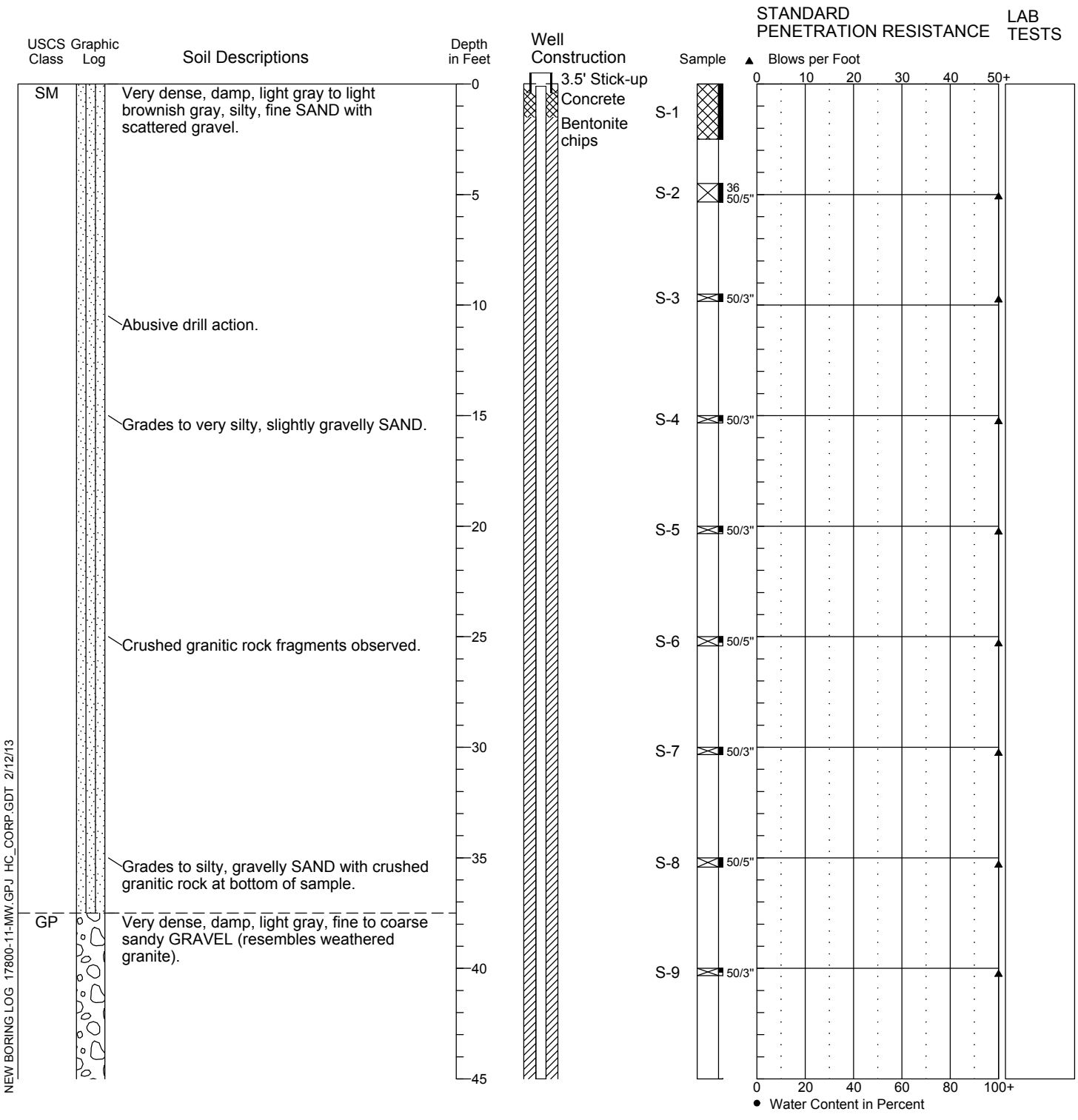
Figure A-1

KEY SHEET 17800-11-MW.GPJ HC_CORP.GDT 2/8/13

Boring Log & Construction Data for Monitoring Well MW-1

Location: -117.804037 48.776528
Approximate Ground Surface Elevation: 2654.2 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
5. Depth to water: ATD - 79.0' Well dry when checked on 11/8/11, 6/22/12, and 6/27/12.

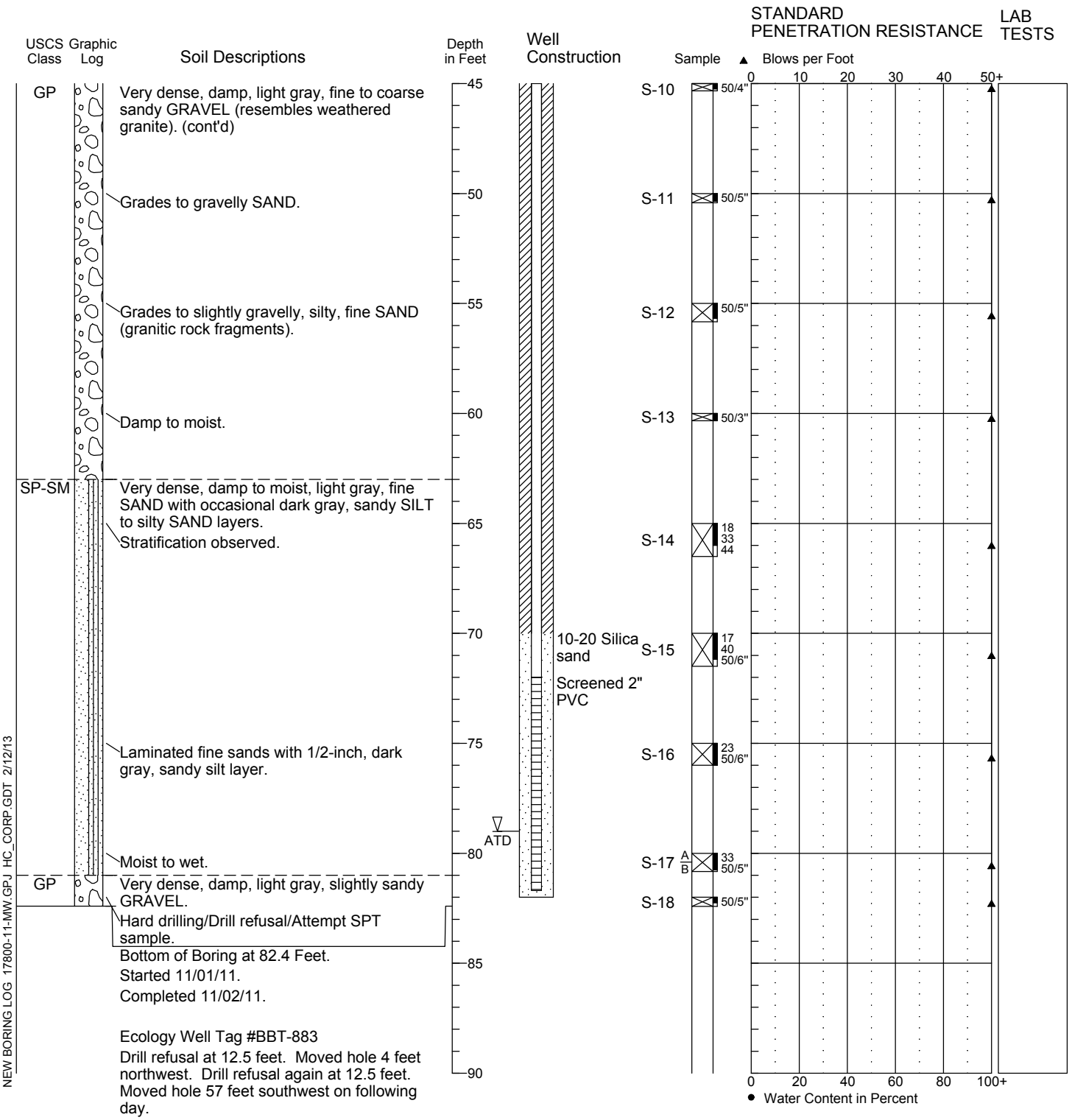
HARTCROWSER

17800-11 *11/11*
Figure A-2 *1/2*

Boring Log & Construction Data for Monitoring Well MW-1

Location: -117.804037 48.776528
Approximate Ground Surface Elevation: 2654.2 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



NEW BORING LOG 17800-11-MW.GPJ HC_CORP.GDT 2/12/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
5. Depth to water: ATD - 79.0' Well dry when checked on 11/8/11, 6/22/12, and 6/27/12.

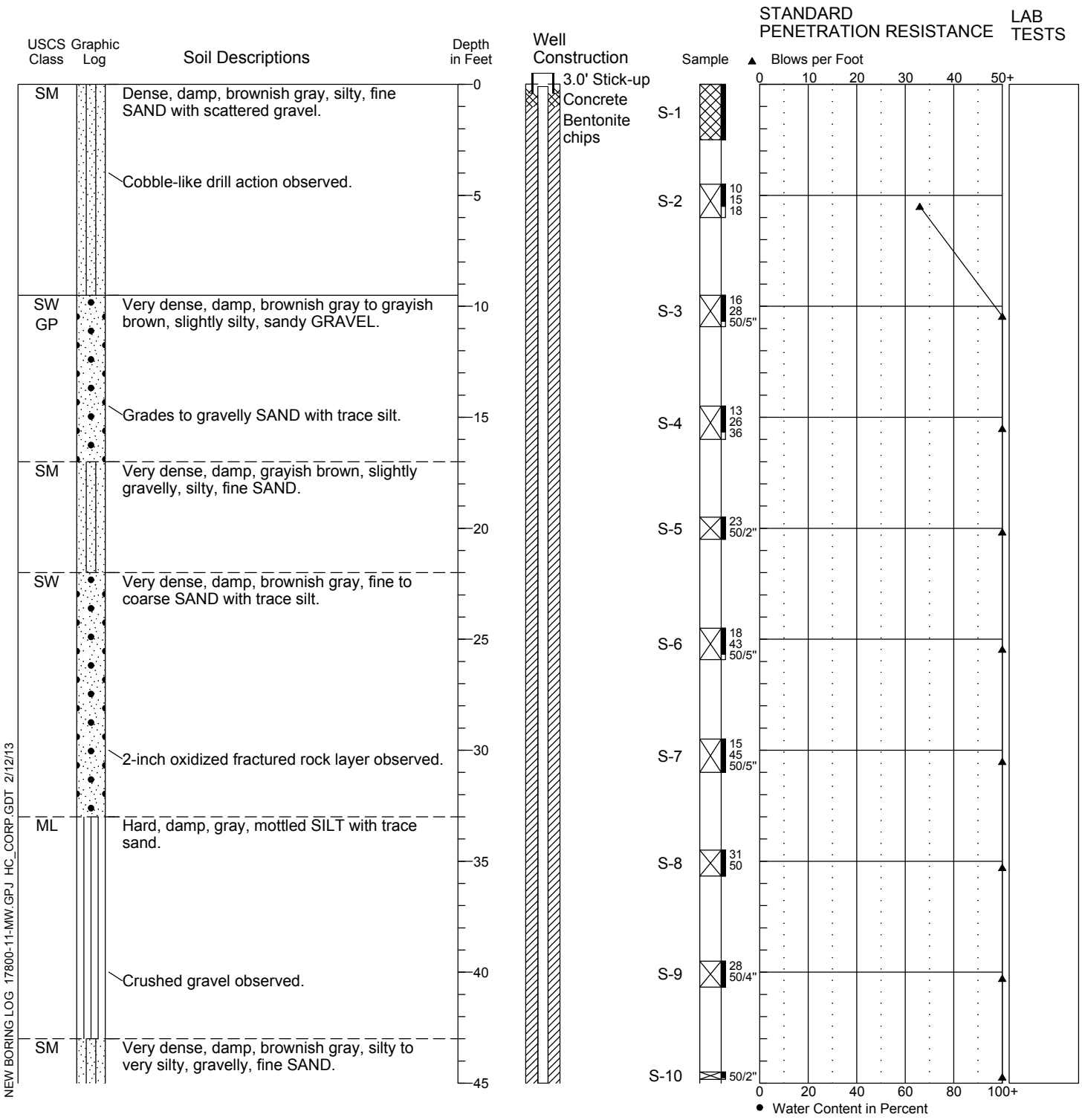
HARTCROWSER

17800-11 *11/11*
Figure A-2 *2/2*

Boring Log & Construction Data for Monitoring Well MW-2

Location: -1173802482 48.775271
Approximate Ground Surface Elevation: 2677.9 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



NEW BORING LOG 17800-11-MW.GPJ HC_CORP.GDT 2/12/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
5. Depth to water: ATD - 69.5', 11/8/11 - 67.28', 11/9/11 - 70.76', 6/21/12 - 68.74', 6/27/12 - 68.21'

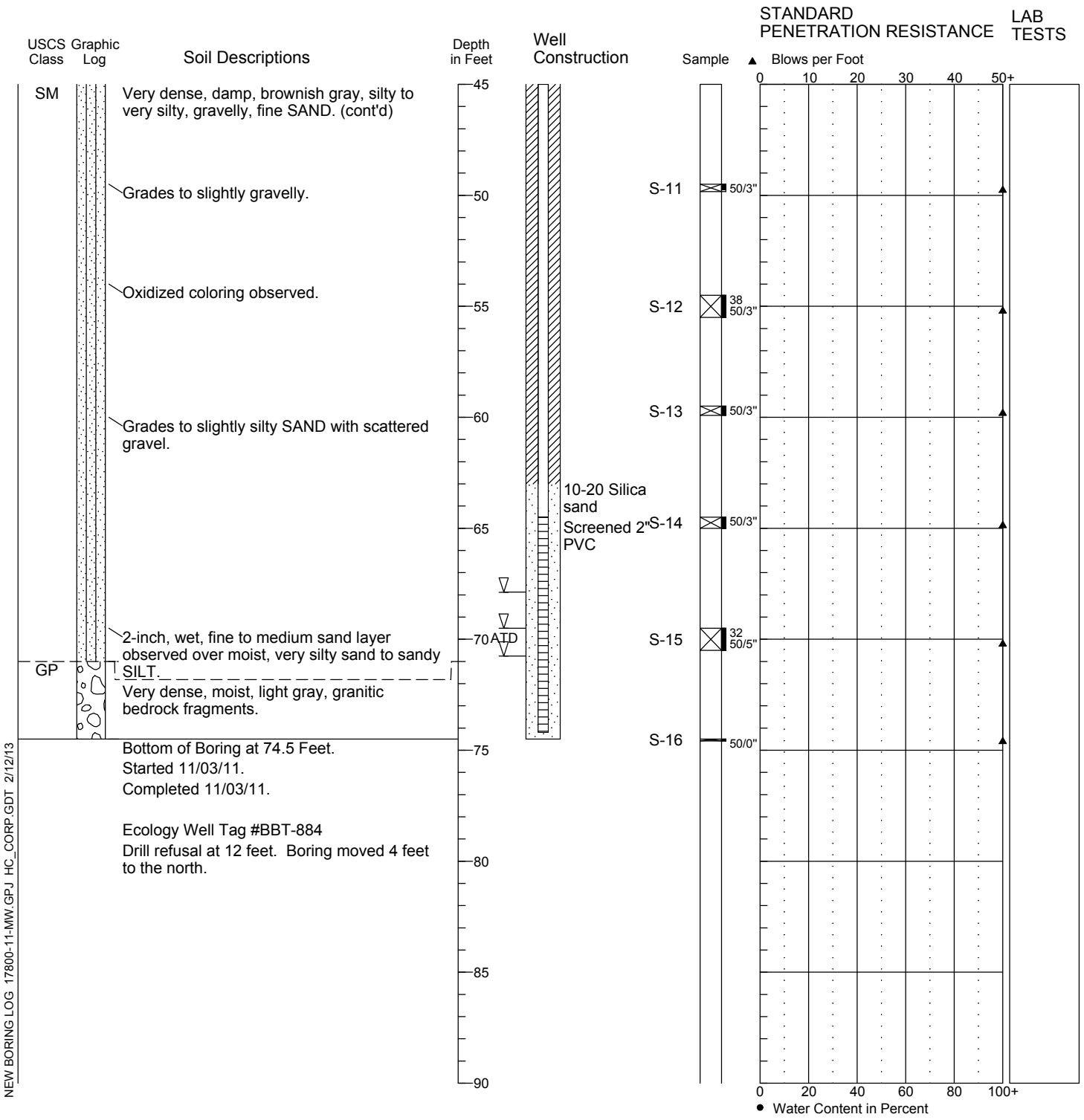
HARTCROWSER

17800-11 *11/11*
Figure A-3 *1/2*

Boring Log & Construction Data for Monitoring Well MW-2

Location: -1173802482 48.775271
Approximate Ground Surface Elevation: 2677.9 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



NEW BORING LOG 17800-11-MW.GPJ HC_CORP.GDT 2/12/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
5. Depth to water: ATD - 69.5', 11/8/11 - 67.28', 11/9/11 - 70.76', 6/21/12 - 68.74', 6/27/12 - 68.21'

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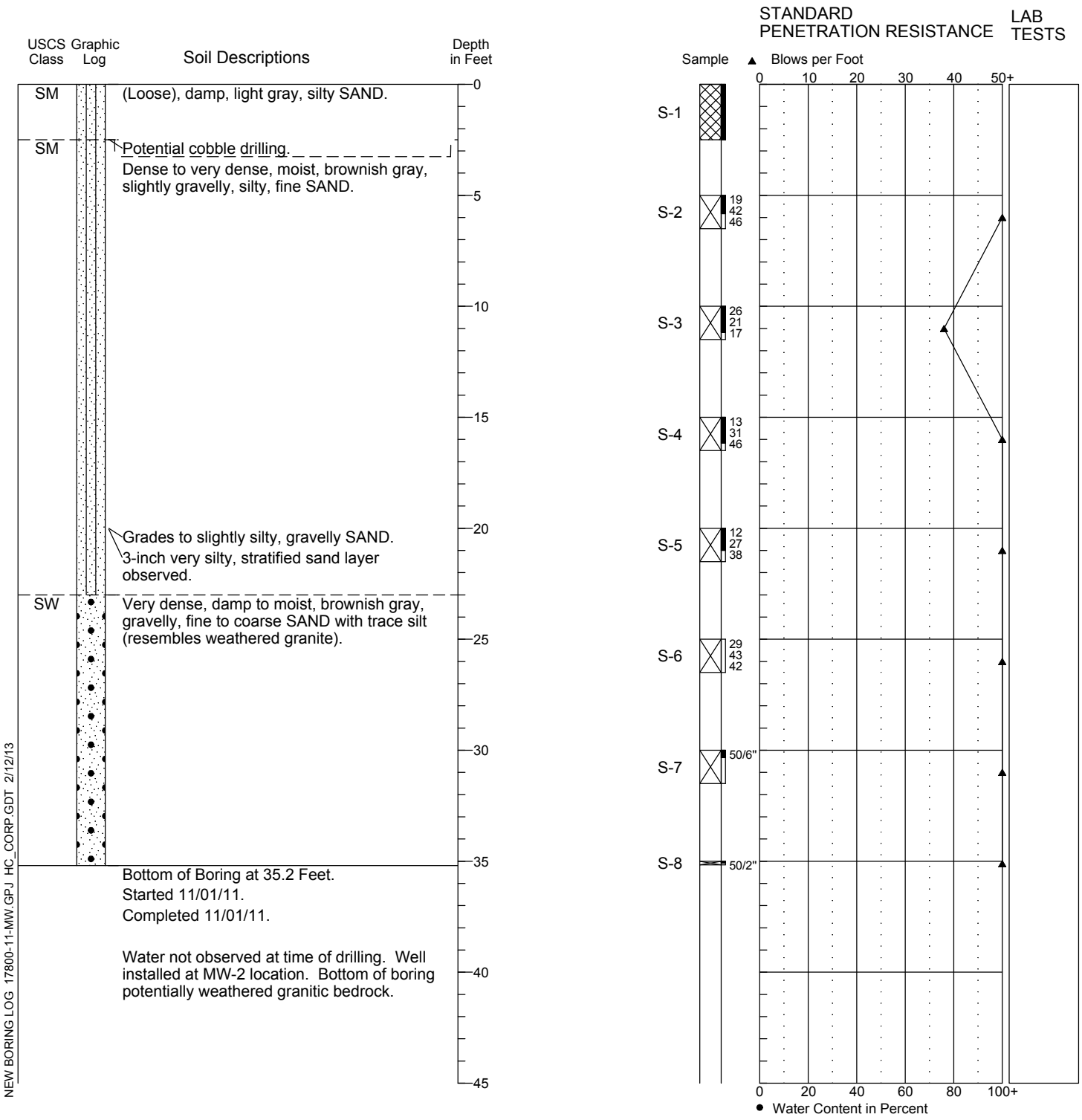
17800-11 *11/11*
Figure A-3 *2/2*

Boring Log & Construction Data for Monitoring Well MW-2A

Location: -117.803489 48.774849
Approximate Ground Surface Elevation: ~2677 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



NEW BORING LOG 17800-11-MW.GPJ HC_CORP.GDT 2/12/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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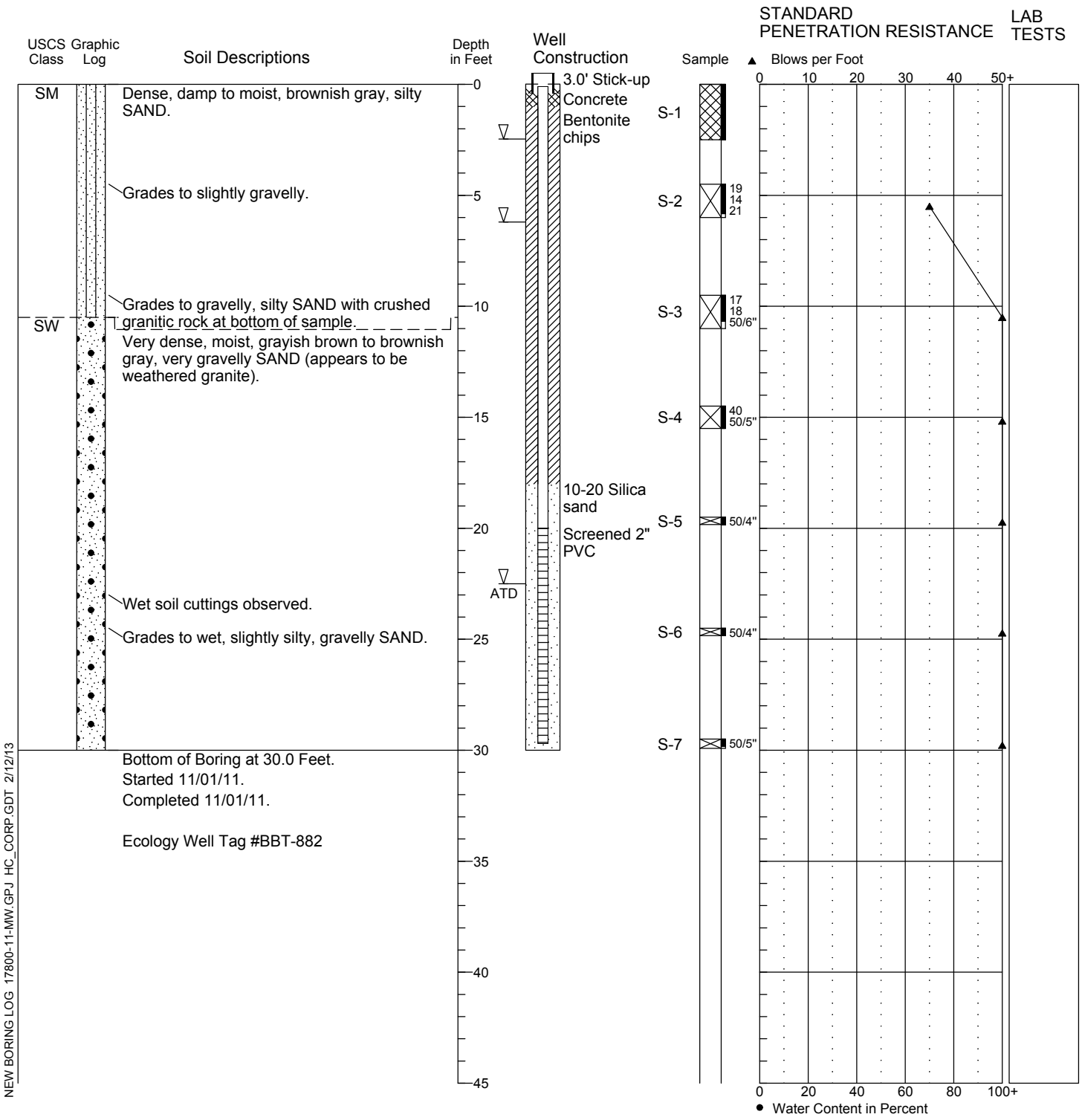
17800-11 *11/11*

Figure A-4

Boring Log & Construction Data for Monitoring Well MW-3

Location: -117.796329 48.777115
Approximate Ground Surface Elevation: 2770.8 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
5. Depth to water: ATD - 22.5', 11/10/11 - 6.20', 6/24/12 - 2.92', 6/27/12 - 2.46'

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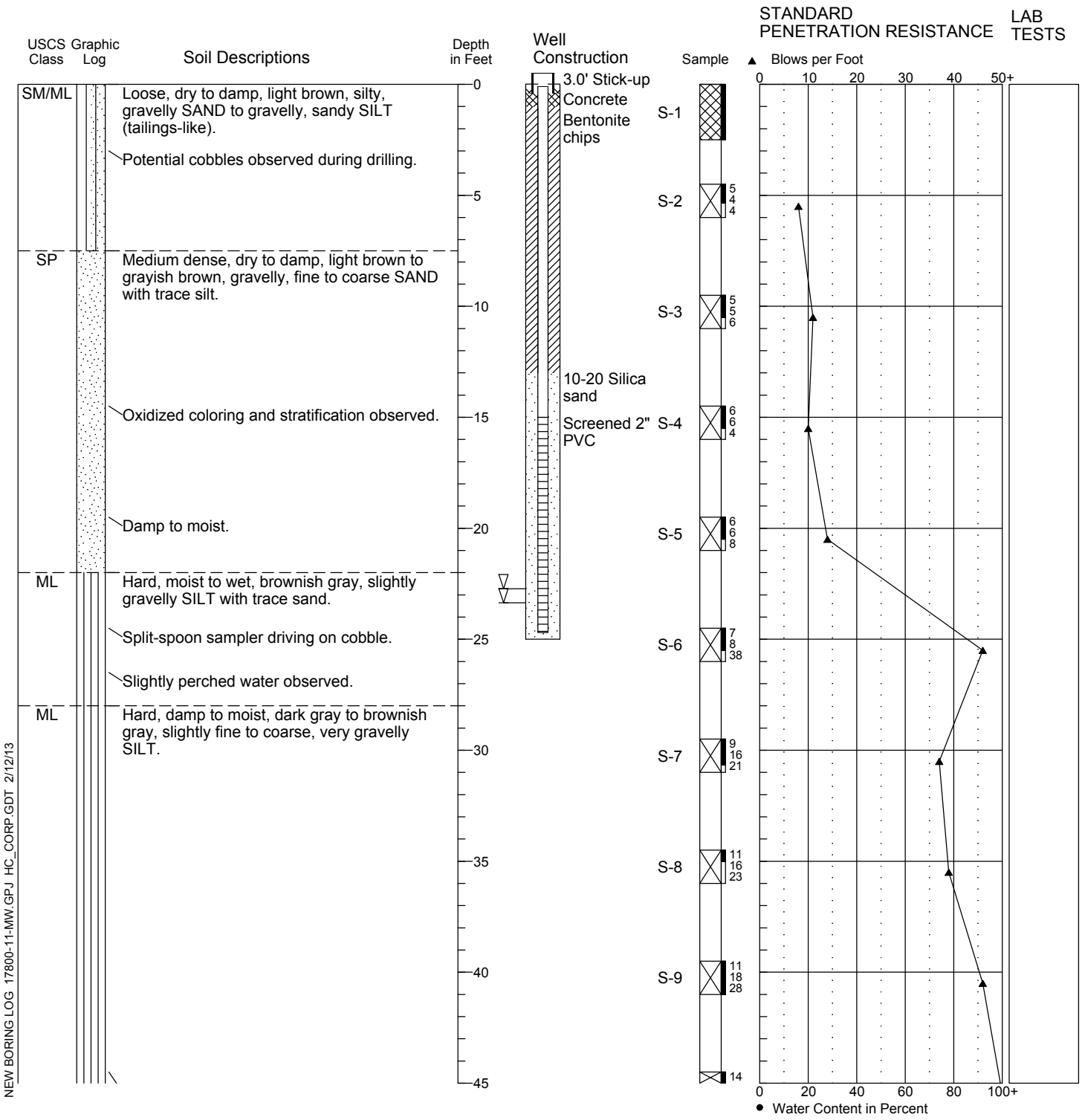
17800-11 ***11/11***

Figure A-5

Boring Log & Construction Data for Monitoring Well MW-4

Location: -117.776082 48.762427
Approximate Ground Surface Elevation: 3155.6 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



NEW BORING LOG 17800-11-MW.GPJ HC_CORP.GDT 2/12/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
5. Depth to water: 11/11/11 - 22.72', 6/22/12 - 23.36', 6/27/12 - 22.88'

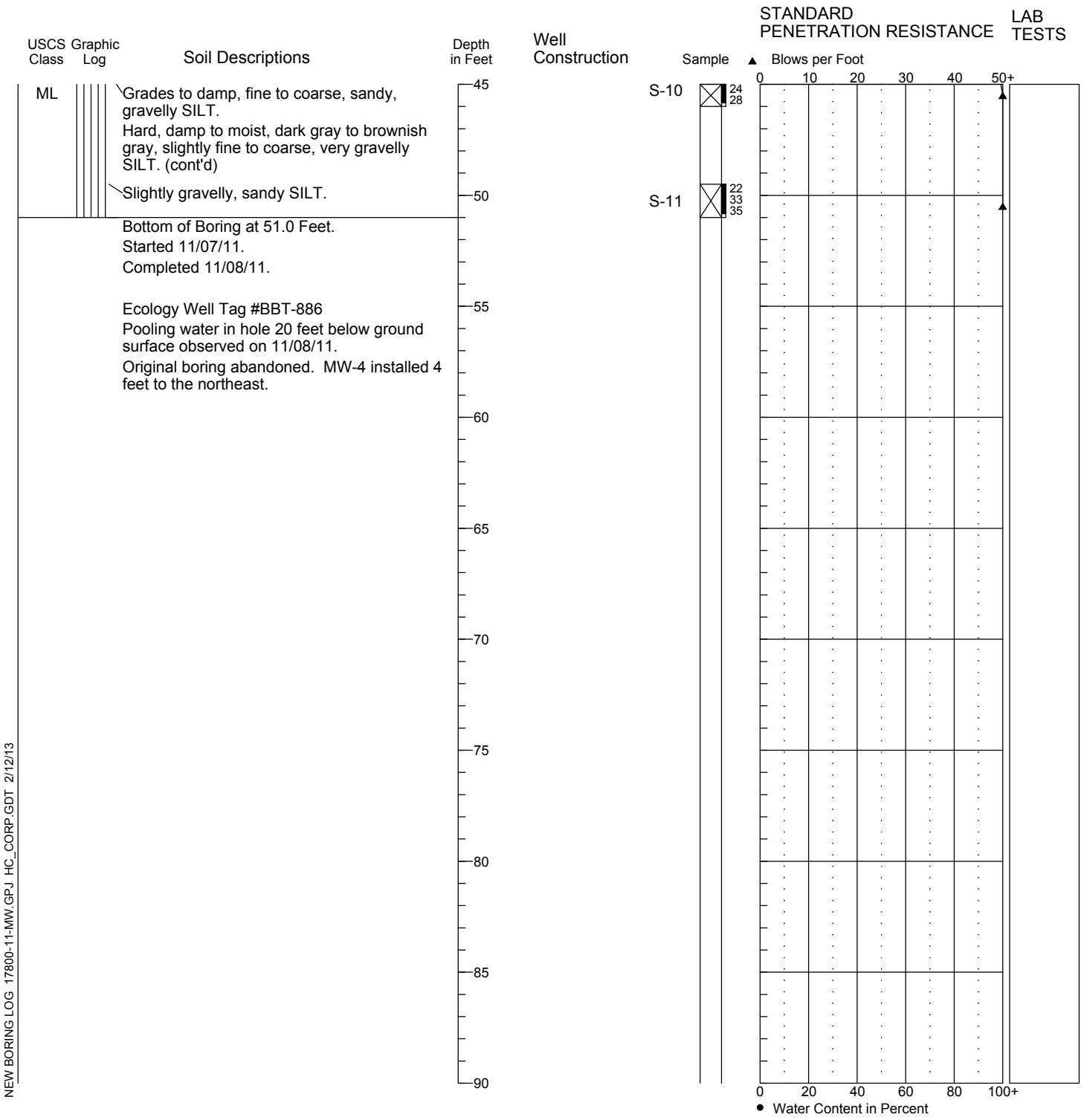
HARTCROWSER

17800-11 *11/11*
Figure A-6 *1/2*

Boring Log & Construction Data for Monitoring Well MW-4

Location: -117.776082 48.762427
Approximate Ground Surface Elevation: 3155.6 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



NEW BORING LOG 17800-11-MW.GPJ HC_CORP.GDT 2/12/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
5. Depth to water: 11/11/11 - 22.72', 6/22/12 - 23.36', 6/27/12 - 22.88'

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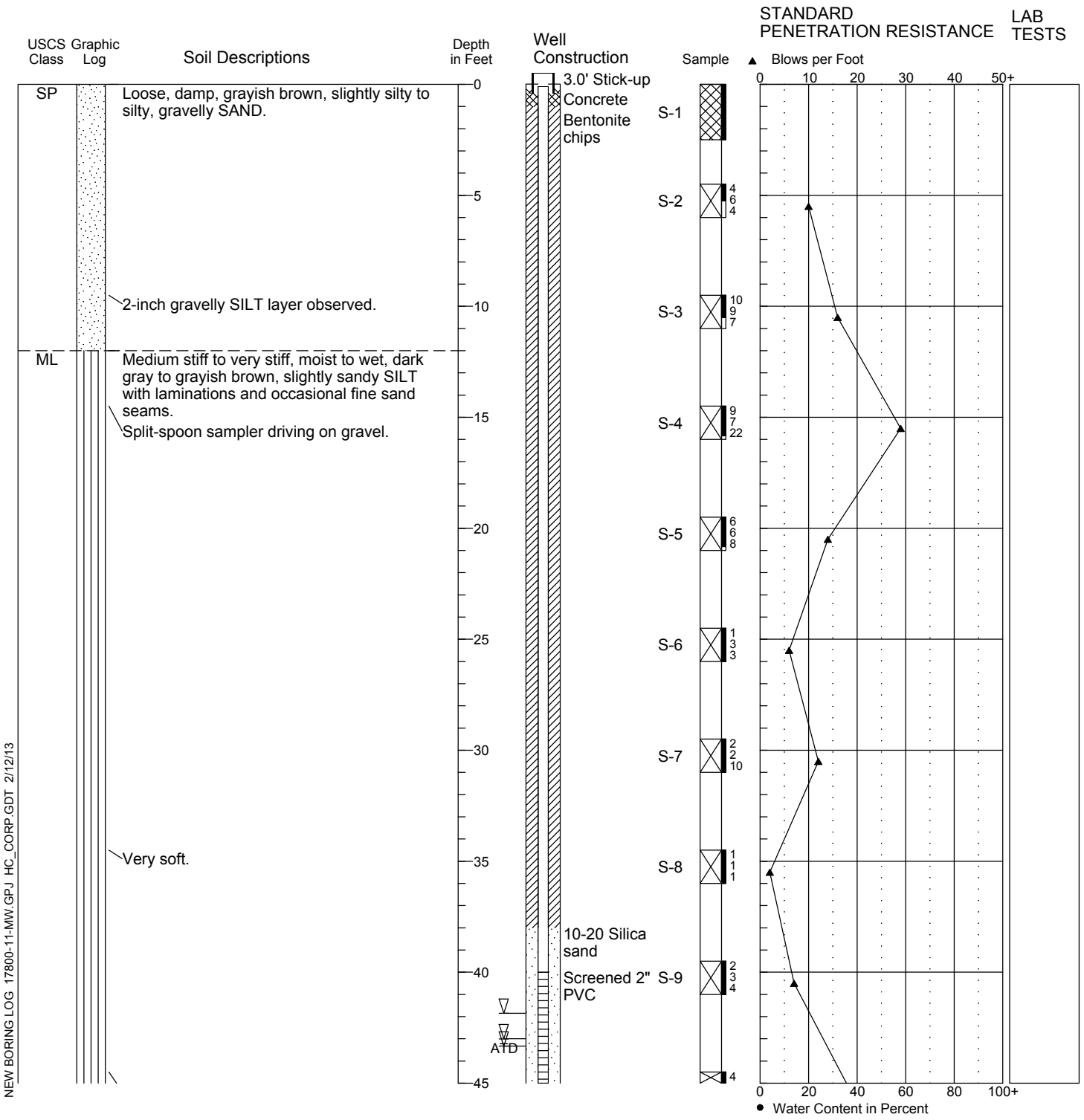
17800-11 *11/11*
Figure A-6 *2/2*

Boring Log & Construction Data for Monitoring Well MW-5

Location: -117.777492 48.7610068
Approximate Ground Surface Elevation: 3140.7 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
5. Depth to water: ATD - 43.0, 11/11/11 - 41.85', 6/22/12 - 43.33', 6/27/12 - 42.20'

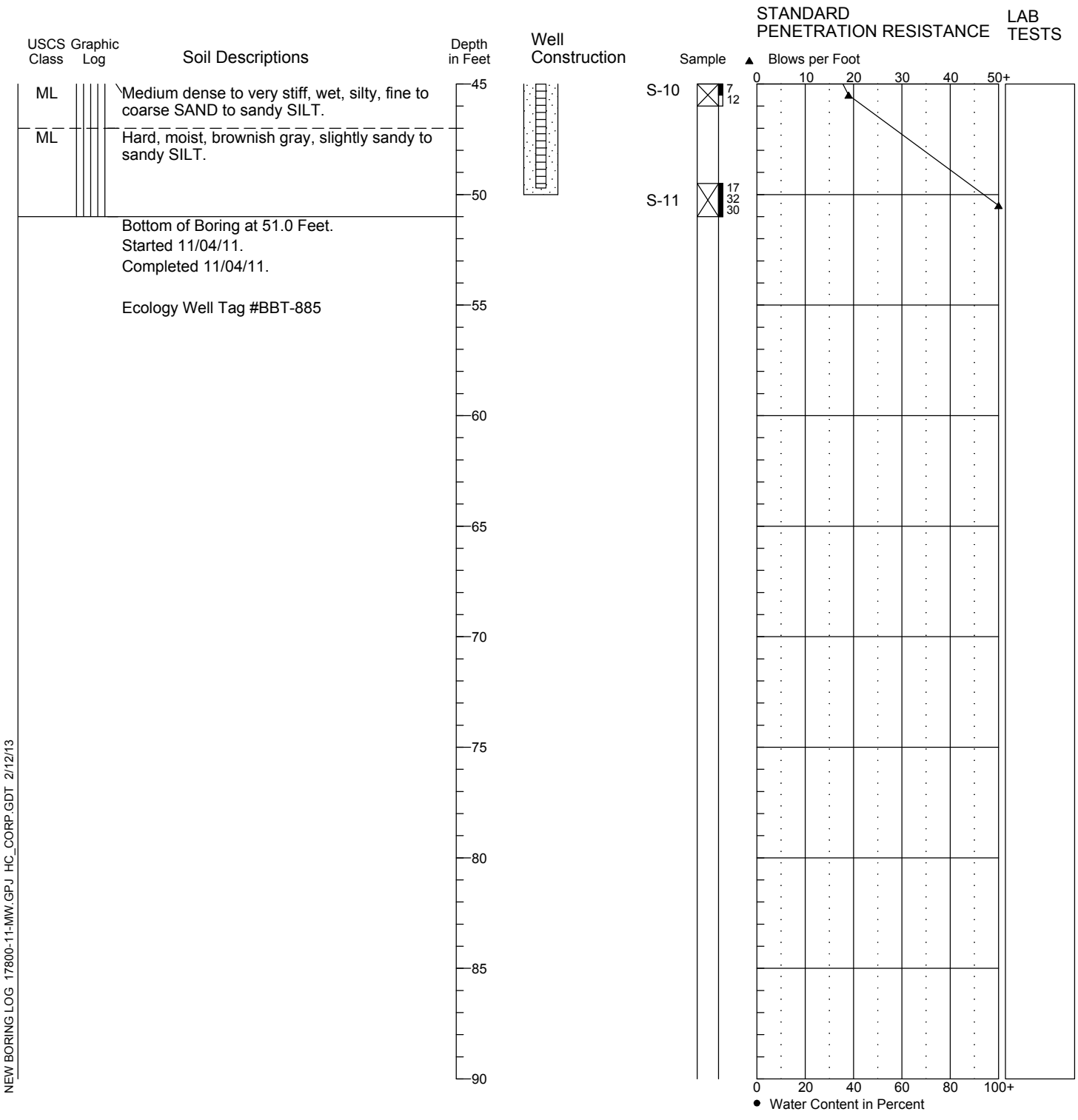
HARTCROWSER

17800-11 *11/11*
Figure A-7 *1/2*

Boring Log & Construction Data for Monitoring Well MW-5

Location: -117.777492 48.7610068
Approximate Ground Surface Elevation: 3140.7 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: CME-850 Track Rig and HSA
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 8 inches
Logged By: W. McDonald Reviewed By: M. Higgins



NEW BORING LOG 17800-11-MW.GPJ HC_CORP.GDT 2/12/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.
5. Depth to water: ATD - 43.0, 11/11/11 - 41.85', 6/22/12 - 43.33', 6/27/12 - 42.20'

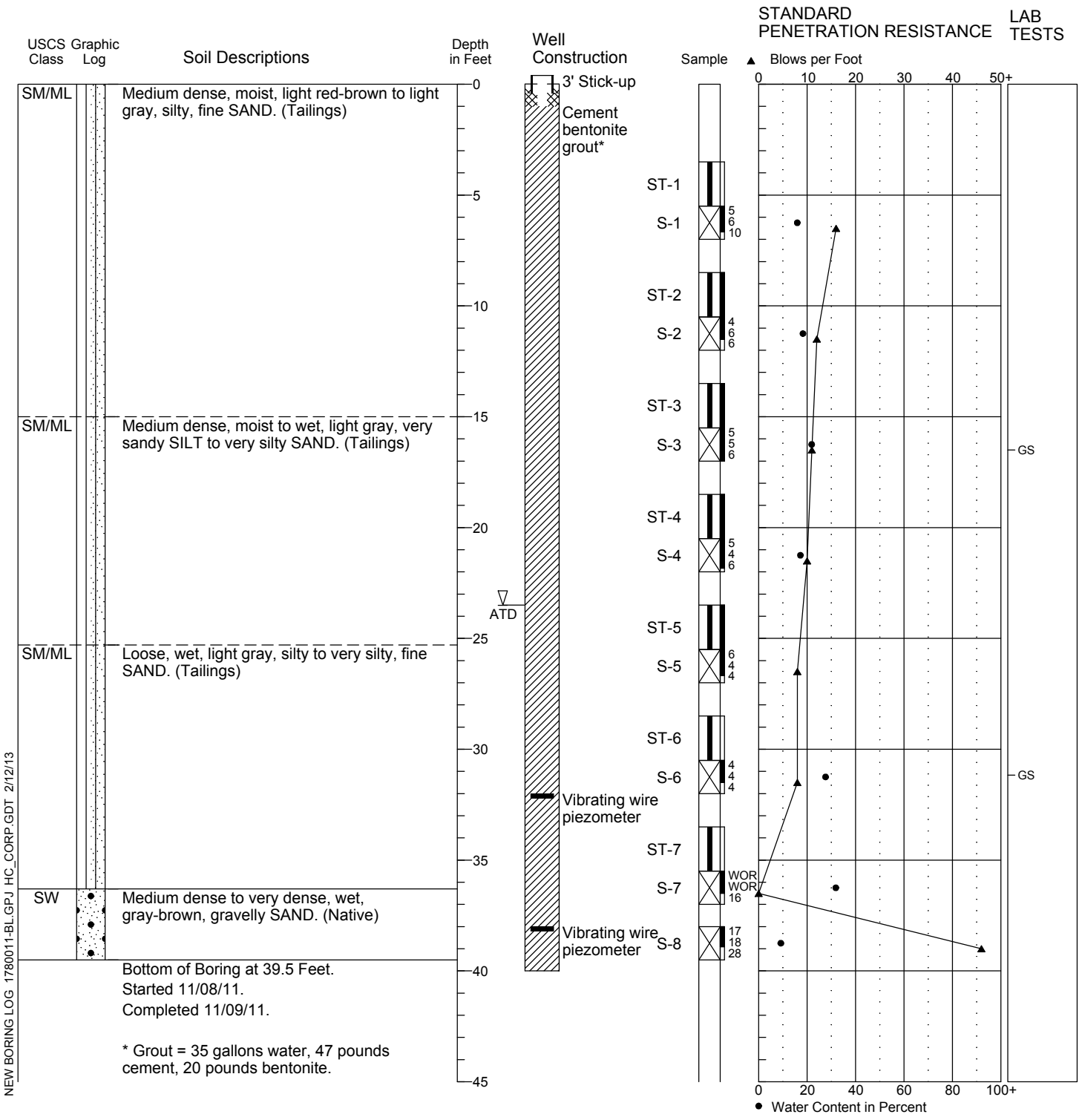
HARTCROWSER

17800-11 *11/11*
Figure A-7 *2/2*

Boring Log & Construction Data for VWP UT-HC-1

Location: -117.777272 48.760464
Approximate Ground Surface Elevation: 3173.6 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: Mud Rotary w/CME-850 Track Rig
Hammer Type: Shelby Tube and SPT w/140 lb Autohammer
Hole Diameter: 4 inches
Logged By: W. McDonald Reviewed By: M. Higgins



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
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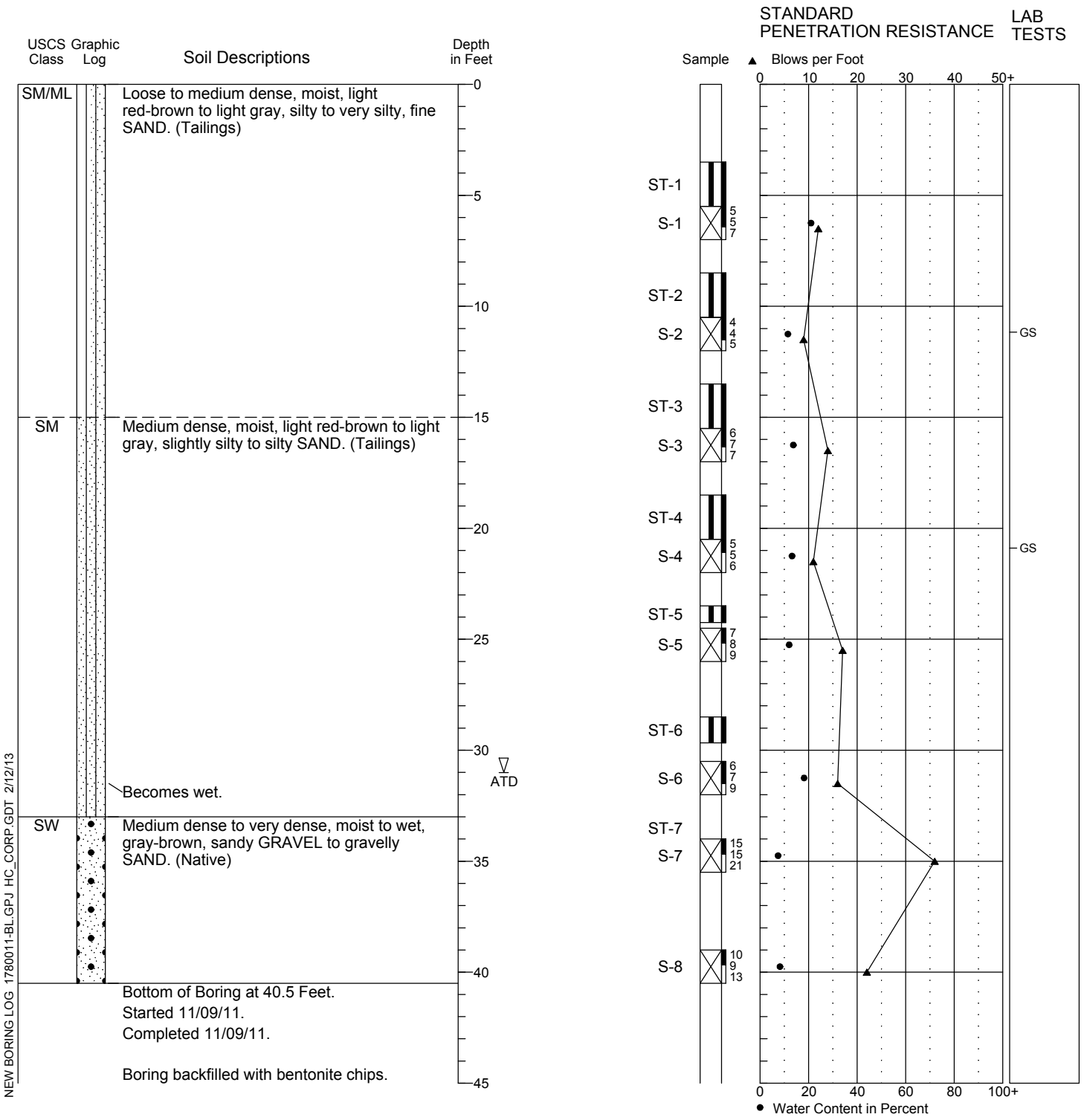
17800-11 ***11/11***

Figure A-8

Boring Log UT-HC-2

Location: -117.775835 48.762487
Approximate Ground Surface Elevation: 3185.9 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: Mud Rotary w/CME-850 Track Rig
Hammer Type: Shelby Tube and SPT w/140 lb Autohammer
Hole Diameter: 4 inches
Logged By: W. McDonald Reviewed By: M. Higgins



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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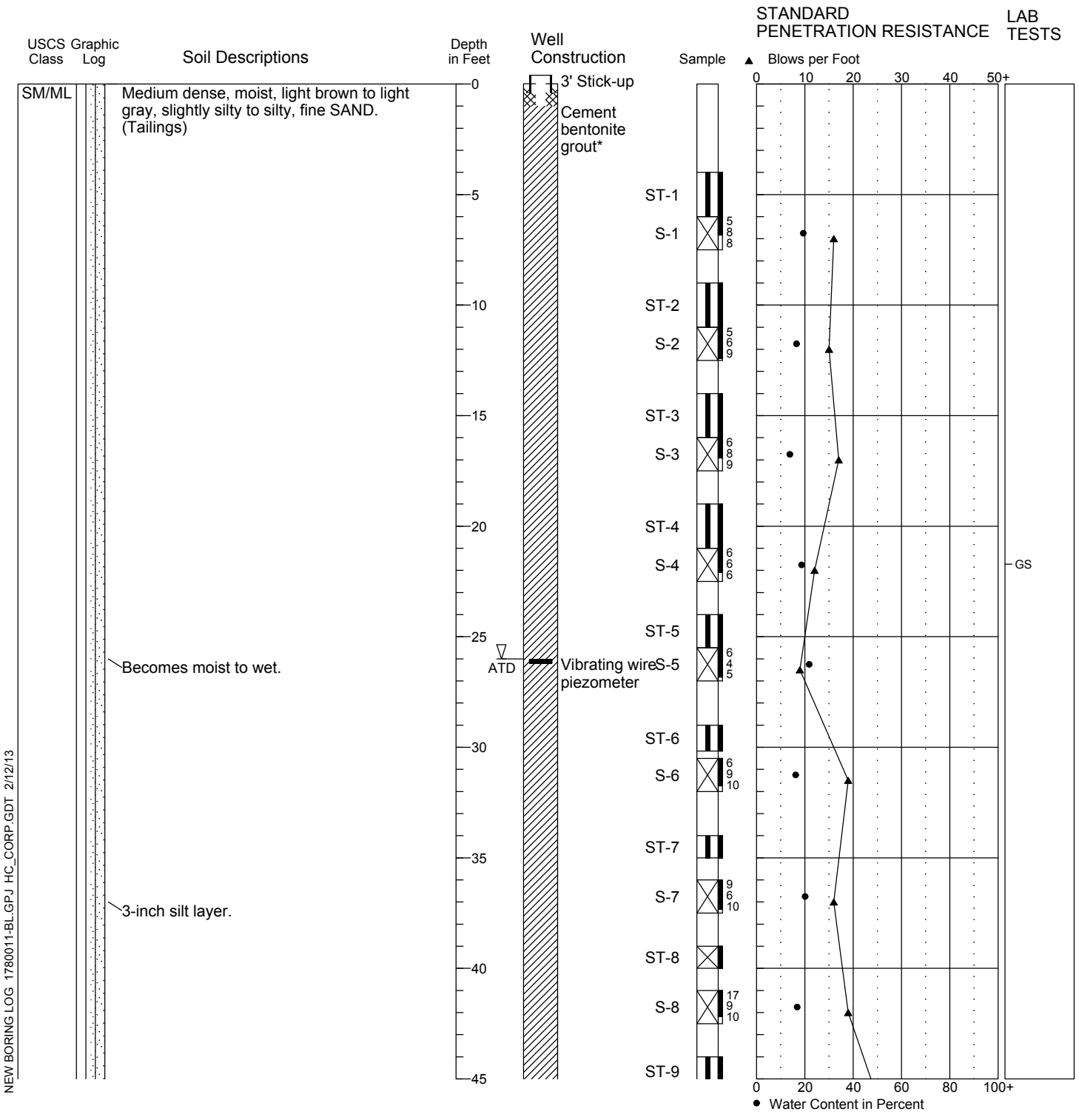
17800-11 ***11/11***

Figure A-9

Boring Log & Construction Data for VWP LT-HC-3

Location: -117.800617 48.776068
Approximate Ground Surface Elevation: 2742.5 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: Mud Rotary w/CME-850 Track Rig
Hammer Type: Shelby Tube and SPT w/140 lb Autohammer
Hole Diameter: 4 inches
Logged By: W. McDonald Reviewed By: M. Higgins



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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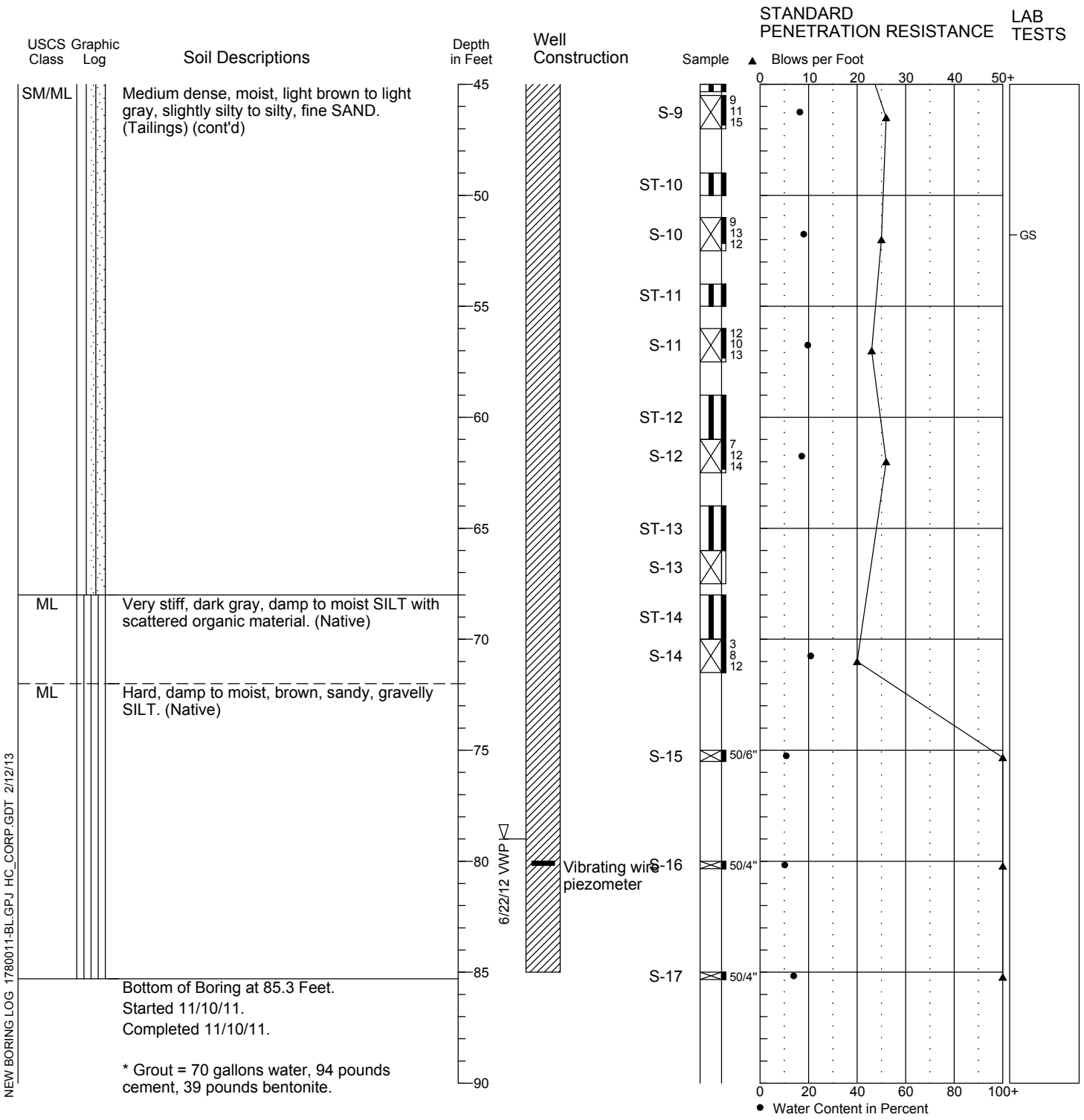
Figure A-10 *1/2*

Boring Log & Construction Data for VWP LT-HC-3

Location: -117.800617 48.776068
Approximate Ground Surface Elevation: 2742.5 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: Mud Rotary w/CME-850 Track Rig
Hammer Type: Shelby Tube and SPT w/140 lb Autohammer
Hole Diameter: 4 inches
Logged By: W. McDonald Reviewed By: M. Higgins



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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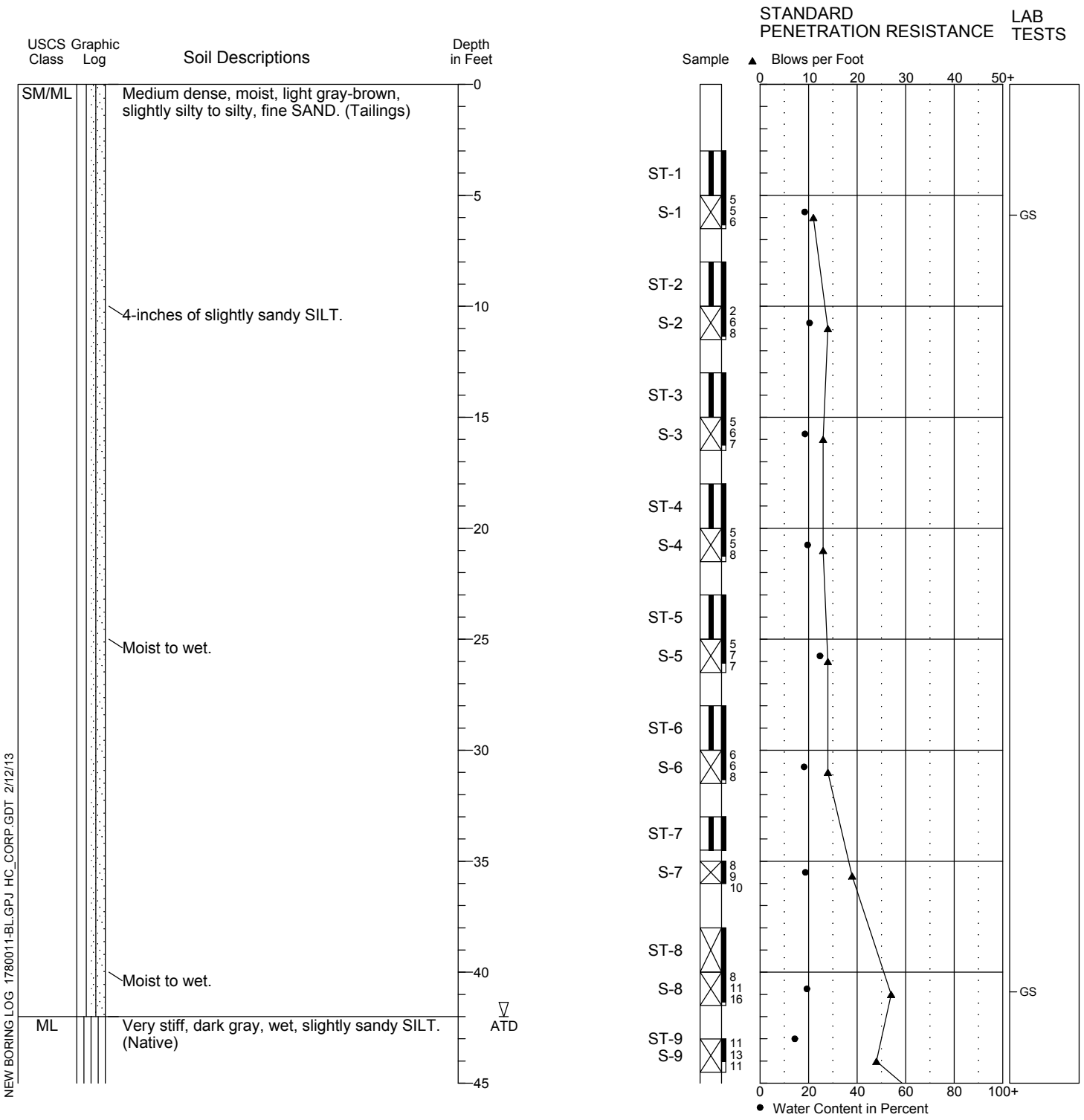
17800-11 *11/11*

Figure A-10 *2/2*

Boring Log LT-HC-4

Location: -117.798682 48.778510
Approximate Ground Surface Elevation: 2743.6 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: Mud Rotary w/CME-850 Track Rig
Hammer Type: Shelby Tube and SPT w/140 lb Autohammer
Hole Diameter: 4 inches
Logged By: W. McDonald Reviewed By: M. Higgins



NEW BORING LOG 1780011-BL.GPJ HC_CORP.GDT 2/12/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

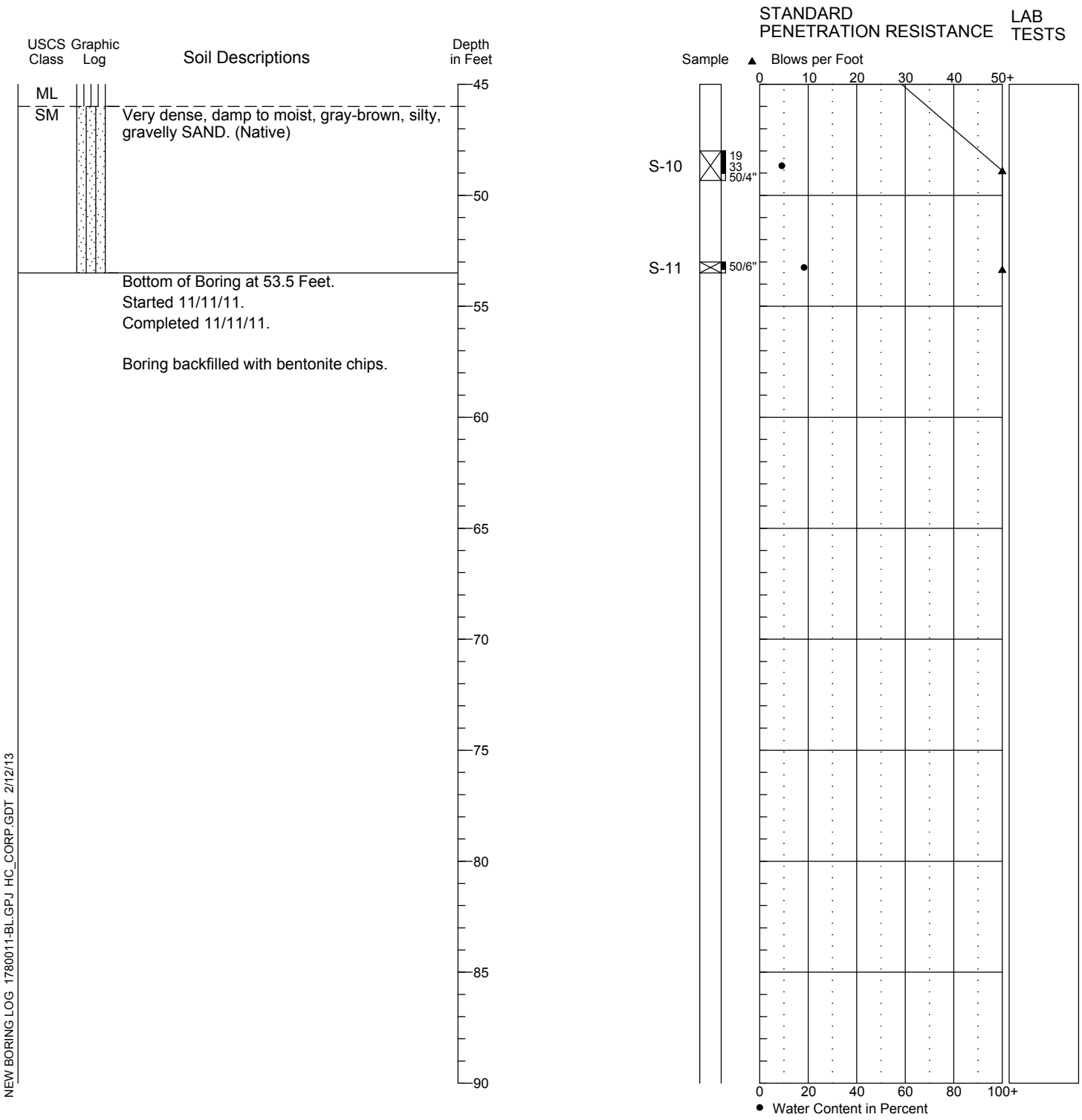
HARTCROWSER

17800-11 *11/11*
Figure A-11 *1/2*

Boring Log LT-HC-4

Location: -117.798682 48.778510
Approximate Ground Surface Elevation: 2743.6 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: Mud Rotary w/CME-850 Track Rig
Hammer Type: Shelby Tube and SPT w/140 lb Autohammer
Hole Diameter: 4 inches
Logged By: W. McDonald Reviewed By: M. Higgins



NEW BORING LOG 1780011-BL.GPJ HC_CORP.GDT 2/12/13

1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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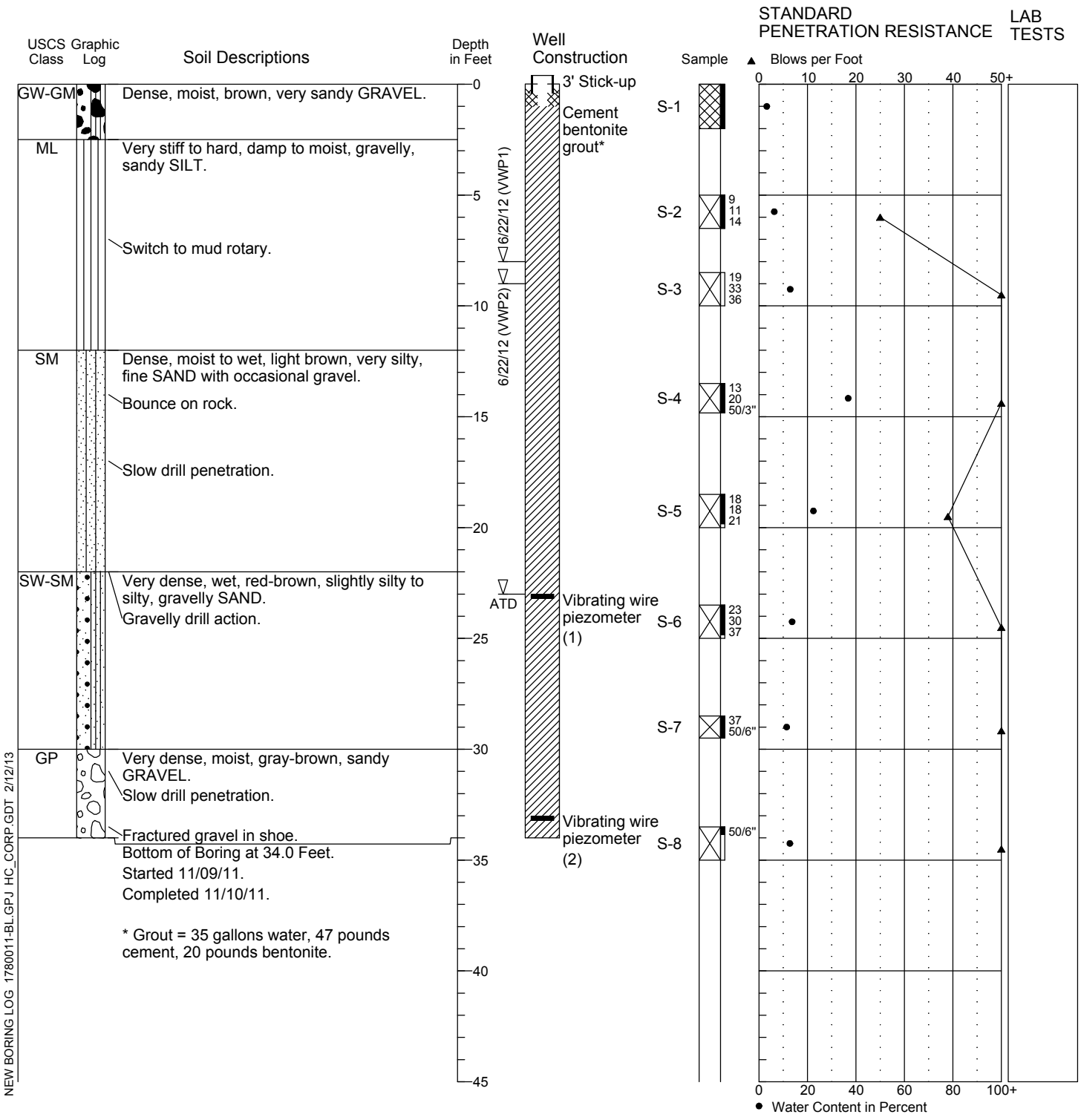
17800-11 ***11/11***
Figure A-11 ***2/2***

Boring Log & Construction Data for VWP PL-HC-5

Location: -117.761955 48.760179
Approximate Ground Surface Elevation: 3523.8 Feet
Horizontal Datum: WGS 1984
Vertical Datum: MSL

Drill Equipment: Hollow Stem Auger/Mud Rotary w/CME-850 Track Rig
Hammer Type: SPT w/140 lb Autohammer
Hole Diameter: 4 inches
Logged By: W. McDonald Reviewed By: M. Higgins



1. Refer to Figure A-1 for explanation of descriptions and symbols.
2. Soil descriptions and stratum lines are interpretive and actual changes may be gradual.
3. USCS designations are based on visual manual classification (ASTM D 2488) unless otherwise supported by laboratory testing (ASTM D 2487).
4. Groundwater level, if indicated, is at time of drilling (ATD) or for date specified. Level may vary with time.

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17800-11 ***11/11***

Figure A-12

SLOPE INDICATOR

VW Piezometer Calibration Certificate

Serial #: 11-6323
Range : 350 kPa
Cable Length: 50 ft
Date of Calibration: 10/25/2011

Part #: 52611020
Cable Part # : 50613524
Calibrated by: KB
Note:

ABC Calibration Factors

	A	B	C
kPa	-1.146421E-4	-2.054247E-1	1.481762E+3
psi	-1.662743E-5	-2.979434E-2	2.149114E+2

Pressure in kPa/psi = $(A \times Hz^2) + (B \times Hz) + C$, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	1.479815E+3	-2.061414E-1	1.110294E-1	-1.147045E-4	8.052727E-5	-2.010929E-3
psi	2.146215E+2	-2.989723E-2	1.610289E-2	-1.663590E-5	1.167908E-5	-2.916503E-4

Pressure in kPa/psi = $C0 + (C1 \times Hz) + (C2 \times T) + (C3 \times Hz^2) + (C4 \times Hz \times T) + (C5 \times T^2)$

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.
TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.
Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

Thermistor reading is 14.5 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

Applied (kPa)	Equivalent (psi)	Frequency (Hz)	Calculated (kPa)	Calculated (psi)	Error (%FS)
0.0	0.00	2809.1	0.1	0.01	-0.02
35.0	5.08	2767.7	35.0	5.08	-0.01
70.0	10.15	2725.9	69.9	10.14	0.02
105.0	15.23	2683.5	105.0	15.22	0.02
140.0	20.31	2640.6	139.9	20.30	0.02
175.0	25.38	2597.2	174.9	25.37	0.02
210.0	30.46	2553.1	210.0	30.46	-0.01
245.0	35.53	2508.5	245.1	35.54	-0.02
280.0	40.61	2463.3	280.1	40.63	-0.03
315.0	45.69	2417.6	315.1	45.70	-0.02
350.0	50.76	2371.4	349.9	50.75	0.02

Van Stone Mine
Onion Creek, WA

Vibrating Wire Calibration Certificates

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HARTCROWSER

Figure
A-13

EAL 02/08/13 A-13 thru A-18.cdr

SLOPE INDICATOR

VW Piezometer Calibration Certificate

Serial #: 11-6324
Range : 350 kPa
Cable Length: 50 ft
Date of Calibration: 10/25/2011

Part #: 52611020
Cable Part # : 50613524
Calibrated by: KB
Note:

ABC Calibration Factors

	A	B	C
kPa	-1.091203E-4	-2.207630E-1	1.614245E+3
psi	-1.582656E-5	-3.201897E-2	2.341265E+2

Pressure in kPa/psi = $(A \times Hz^2) + (B \times Hz) + C$, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	1.609674E+3	-2.230726E-1	7.565857E-1	-1.084041E-4	-1.283447E-4	-1.547286E-3
psi	2.334553E+2	-3.235281E-2	1.097296E-1	-1.572213E-5	-1.861417E-5	-2.244070E-4

Pressure in kPa/psi = $C0 + (C1 \times Hz) + (C2 \times T) + (C3 \times Hz^2) + (C4 \times Hz \times T) + (C5 \times T^2)$

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.
TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.
Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

Thermistor reading is 14.4 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

Applied (kPa)	Equivalent (psi)	Frequency (Hz)	Calculated (kPa)	Calculated (psi)	Error (%FS)
0.0	0.00	2965.3	0.1	0.02	-0.03
35.0	5.08	2924.9	35.0	5.08	0.00
70.0	10.15	2884.2	69.8	10.12	0.06
105.0	15.23	2842.6	105.0	15.22	0.01
140.0	20.31	2800.8	139.9	20.30	0.02
175.0	25.38	2758.2	175.2	25.41	-0.05
210.0	30.46	2715.7	209.9	30.45	0.01
245.0	35.53	2672.3	245.1	35.54	-0.01
280.0	40.61	2628.5	280.1	40.62	-0.02
315.0	45.69	2584.2	315.0	45.69	-0.01
350.0	50.76	2539.5	349.9	50.75	0.03

Van Stone Mine
Onion Creek, WA

Vibrating Wire Calibration Certificates

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HARTCROWSER

Figure
A-14

EAL 02/08/13 A-13 thru A-18.cdr

SLOPE INDICATOR

VW Piezometer Calibration Certificate

Serial #: 11-6325
Range : 350 kPa
Cable Length: 60 ft
Date of Calibration: 10/25/2011

Part #: 52611020
Cable Part # : 50613524
Calibrated by: KB
Note:

ABC Calibration Factors

	A	B	C
kPa	-1.367783E-4	-1.519740E-2	1.115410E+3
psi	-1.983802E-5	-2.204197E-3	1.617765E+2

Pressure in kPa/psi = $(A \times Hz^2) + (B \times Hz) + C$, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	1.113118E+3	-1.630753E-2	2.016053E-1	-1.366972E-4	5.444752E-5	-1.514095E-3
psi	1.614384E+2	-2.365124E-3	2.923935E-2	-1.982555E-5	7.896667E-6	-2.195932E-4

Pressure in kPa/psi = $C0 + (C1 \times Hz) + (C2 \times T) + (C3 \times Hz^2) + (C4 \times Hz \times T) + (C5 \times T^2)$

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.
TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.
Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

Thermistor reading is 14.4 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

Applied (kPa)	Equivalent (psi)	Frequency (Hz)	Calculated (kPa)	Calculated (psi)	Error (%FS)
0.0	0.00	2800.7	-0.0	-0.00	0.01
35.0	5.08	2755.5	35.0	5.08	0.00
70.0	10.15	2709.5	70.1	10.17	-0.03
105.0	15.23	2663.0	105.0	15.22	0.01
140.0	20.31	2615.5	140.0	20.30	0.00
175.0	25.38	2567.1	175.0	25.39	-0.01
210.0	30.46	2517.9	210.0	30.46	0.00
245.0	35.53	2467.8	244.9	35.52	0.02
280.0	40.61	2416.5	280.0	40.61	0.01
315.0	45.69	2364.0	315.1	45.70	-0.03
350.0	50.76	2310.7	350.0	50.76	0.00

Van Stone Mine
Onion Creek, WA

Vibrating Wire Calibration Certificates

17800-11 2/13

HARTCROWSER

Figure
A-15

EAL 02/08/13 A-13 thru A-18.cdr

SLOPE INDICATOR

VW Piezometer Calibration Certificate

Serial #: 11-6326
Range : 350 kPa
Cable Length: 60 ft
Date of Calibration: 10/25/2011

Part #: 52611020
Cable Part # : 50613524
Calibrated by: KB
Note:

ABC Calibration Factors

	A	B	C
kPa	-1.424050E-4	4.604538E-2	1.028349E+3
psi	-2.065410E-5	6.678318E-3	1.491494E+2

Pressure in kPa/psi = $(A \times Hz^2) + (B \times Hz) + C$, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	1.024503E+3	4.615744E-2	2.147643E-1	-1.425485E-4	4.703195E-5	-1.587380E-3
psi	1.485864E+2	6.694335E-3	3.114783E-2	-2.067418E-5	6.821168E-6	-2.302219E-4

Pressure in kPa/psi = $C0 + (C1 \times Hz) + (C2 \times T) + (C3 \times Hz^2) + (C4 \times Hz \times T) + (C5 \times T^2)$

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.
TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.
Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

Thermistor reading is 14.4 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

Applied (kPa)	Equivalent (psi)	Frequency (Hz)	Calculated (kPa)	Calculated (psi)	Error (%FS)
0.0	0.00	2853.8	-0.0	-0.00	0.00
35.0	5.08	2807.7	35.0	5.08	-0.01
70.0	10.15	2760.8	70.1	10.16	-0.02
105.0	15.23	2713.2	105.0	15.22	0.01
140.0	20.31	2664.5	140.0	20.31	-0.01
175.0	25.38	2614.9	175.0	25.39	-0.01
210.0	30.46	2564.3	210.0	30.46	-0.01
245.0	35.53	2512.6	245.0	35.54	-0.01
280.0	40.61	2459.8	280.0	40.61	0.01
315.0	45.69	2405.7	315.0	45.68	0.01
350.0	50.76	2350.2	350.0	50.76	0.00

Van Stone Mine
Onion Creek, WA

Vibrating Wire Calibration Certificates

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Figure
A-16

EAL 02/08/13 A-13 thru A-18.cdr

SLOPE INDICATOR

VW Piezometer Calibration Certificate

Serial #: 11-6327
Range : 350 kPa
Cable Length: 85 ft
Date of Calibration: 10/25/2011

Part #: 52611020
Cable Part # : 50613524
Calibrated by: KB
Note:

ABC Calibration Factors

	A	B	C
kPa	-1.455023E-4	4.607255E-2	1.050480E+3
psi	-2.110333E-5	6.682259E-3	1.523592E+2

Pressure in kPa/psi = $(A \times Hz^2) + (B \times Hz) + C$, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	1.050910E+3	4.283668E-2	1.892407E-1	-1.449881E-4	5.307279E-5	-9.944932E-4
psi	1.524162E+2	6.212716E-3	2.744608E-2	-2.102801E-5	7.697286E-6	-1.442340E-4

Pressure in kPa/psi = $C0 + (C1 \times Hz) + (C2 \times T) + (C3 \times Hz^2) + (C4 \times Hz \times T) + (C5 \times T^2)$

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.
TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.
Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

Thermistor reading is 14.4 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

Applied (kPa)	Equivalent (psi)	Frequency (Hz)	Calculated (kPa)	Calculated (psi)	Error (%FS)
0.0	0.00	2849.8	0.1	0.01	-0.03
35.0	5.08	2804.9	35.0	5.07	0.01
70.0	10.15	2759.1	69.9	10.14	0.02
105.0	15.23	2712.4	105.0	15.22	0.01
140.0	20.31	2664.8	140.0	20.31	-0.01
175.0	25.38	2616.4	175.0	25.38	0.01
210.0	30.46	2567.0	210.0	30.45	0.01
245.0	35.53	2516.4	245.1	35.54	-0.02
280.0	40.61	2464.8	280.1	40.62	-0.02
315.0	45.69	2412.2	315.0	45.68	0.01
350.0	50.76	2358.2	350.0	50.76	0.01

Van Stone Mine
Onion Creek, WA

Vibrating Wire Calibration Certificates

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Figure
A-17

EAL 02/08/13 A-13 thru A-18.cdr

SLOPE INDICATOR

VW Piezometer Calibration Certificate

Serial #: 11-6328
Range : 350 kPa
Cable Length: 85 ft
Date of Calibration: 10/25/2011

Part #: 52611020
Cable Part # : 50613524
Calibrated by: KB
Note:

ABC Calibration Factors

	A	B	C
kPa	-1.353109E-4	1.473662E-2	1.046295E+3
psi	-1.962519E-5	2.137366E-3	1.517523E+2

Pressure in kPa/psi = $(A \times Hz^2) + (B \times Hz) + C$, where Hz is frequency in Hertz.

TI Calibration Factors

	C0	C1	C2	C3	C4	C5
kPa	1.035195E+3	2.028070E-2	2.147832E-1	-1.365347E-4	5.604464E-5	-1.086420E-3
psi	1.501371E+2	2.941363E-3	3.115057E-2	-1.980199E-5	8.128302E-6	-1.575664E-4

Pressure in kPa/psi = $C0 + (C1 \times Hz) + (C2 \times T) + (C3 \times Hz^2) + (C4 \times Hz \times T) + (C5 \times T^2)$

Where Hz is the frequency reading in Hertz and T is the Thermistor reading in degrees C.
TI factors are calculated from temperatures at 5.0, 15.0 and 25.0 degrees C.
Applied pressure and temperature are NIST traceable.

Summary of Test Results at 15°C

Thermistor reading is 14.5 °C.

Applied Pressure is referenced to 1 atm. Calculated Pressure uses ABC Calibration factors.

Applied (kPa)	Equivalent (psi)	Frequency (Hz)	Calculated (kPa)	Calculated (psi)	Error (%FS)
0.0	0.00	2835.9	-0.1	-0.02	0.04
35.0	5.08	2788.7	35.1	5.09	-0.03
70.0	10.15	2741.1	70.0	10.15	0.00
105.0	15.23	2692.5	105.0	15.23	-0.01
140.0	20.31	2643.0	140.0	20.31	-0.01
175.0	25.38	2592.6	175.0	25.38	0.00
210.0	30.46	2541.2	209.9	30.45	0.02
245.0	35.53	2488.6	245.0	35.53	0.01
280.0	40.61	2434.8	280.0	40.61	-0.01
315.0	45.69	2379.9	315.0	45.68	0.01
350.0	50.76	2323.5	350.0	50.77	-0.01

Van Stone Mine
Onion Creek, WA

Vibrating Wire Calibration Certificates

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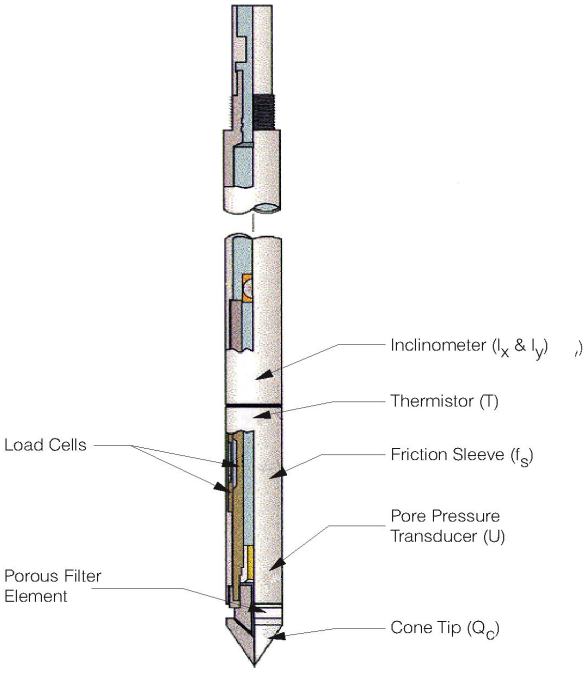
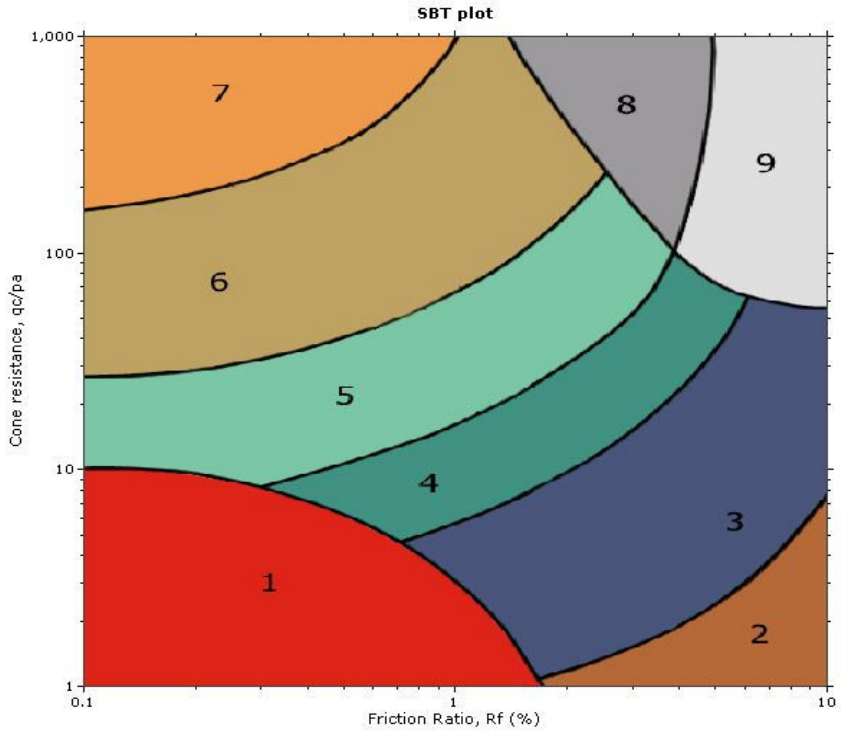
Figure
A-18

EAL 02/08/13 A-13 thru A-18.cdr

Schematic of Electric Piezocone (Typical)



Simplified Classification Chart (Robertson et al., 1986)



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

Total corrected cone resistance, q_t (tsf or MPa)

$q_t = q_c + u \times (1-a)$

Measured cone tip resistance, q_c

Measured penetration pore pressure, u

Net area ratio for cone, a (default to 0.80)

Friction ratio, R_f (%)

$R_f = (f_s/q_t) \times 100\%$

Measured sleeve friction, f_s

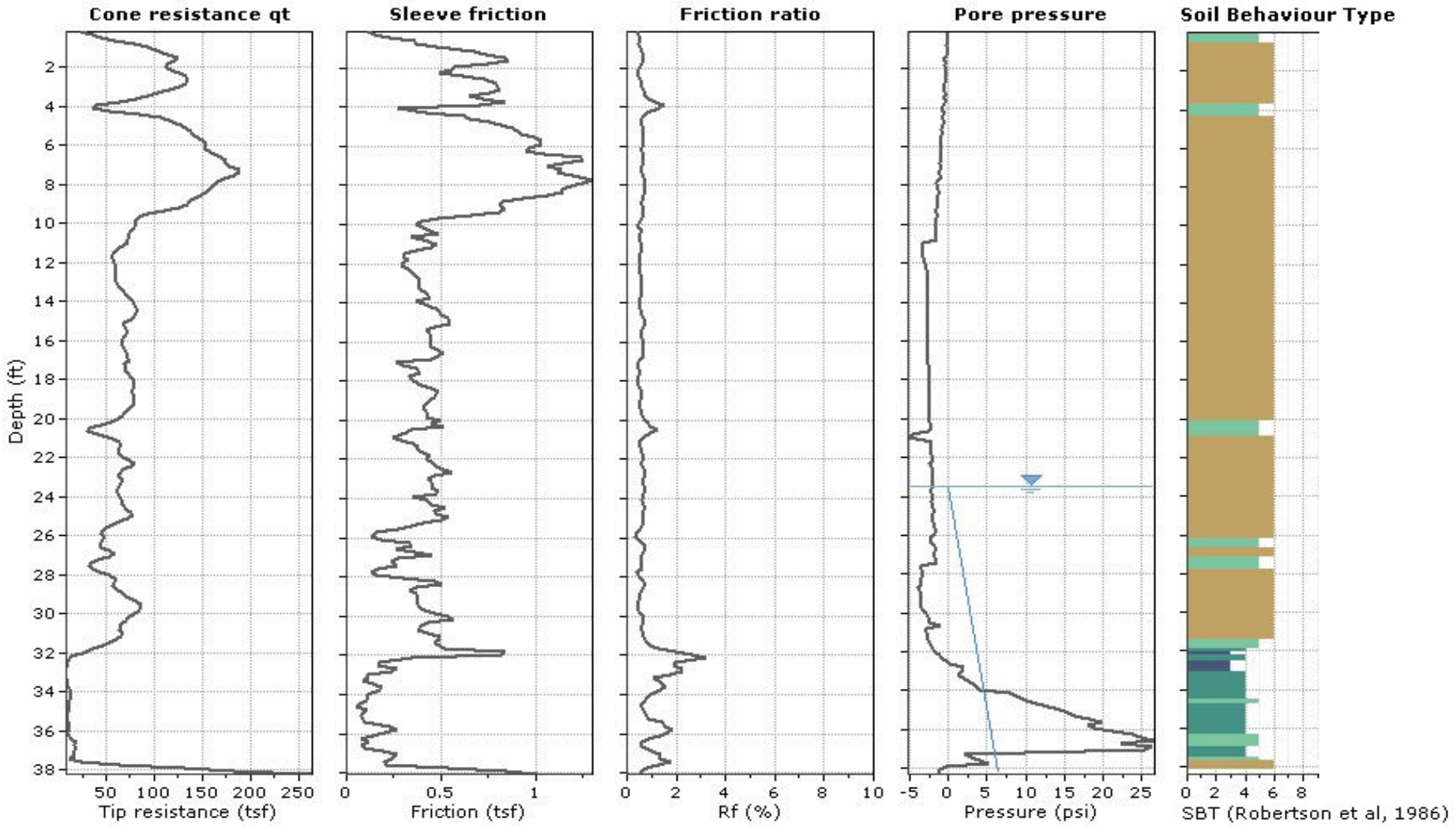
Van Stone Mine
Onion Creek, WA

Electric (Piezocone) Cone Penetrometer Key

17800-11 2/13

HARTCROWSER

Figure
A-19



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

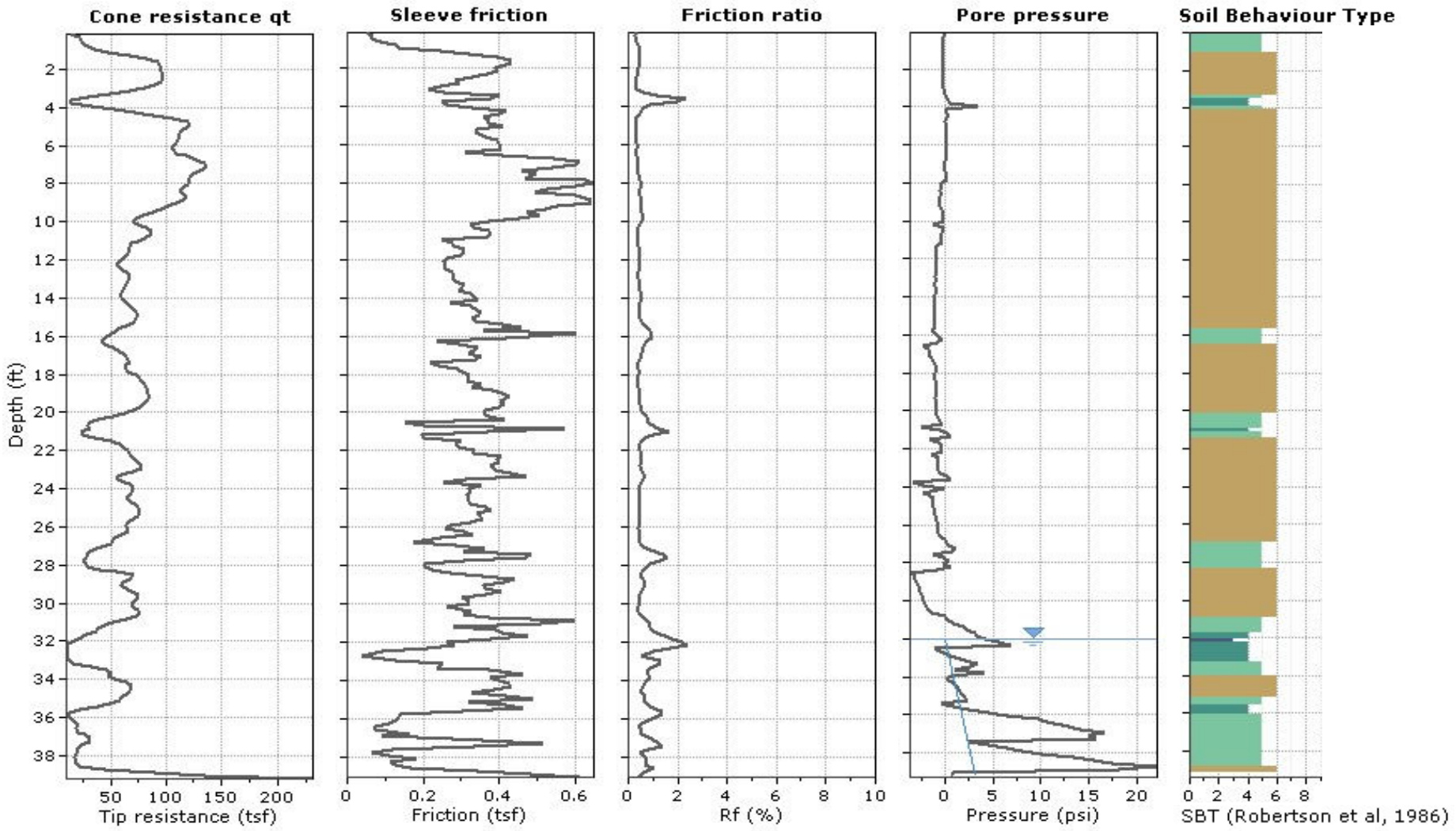
Location: Lat: 48.760462 Long: -117.777290
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 3170 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

UT-CPT-1
17800-11 2/13
Figure A-20



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

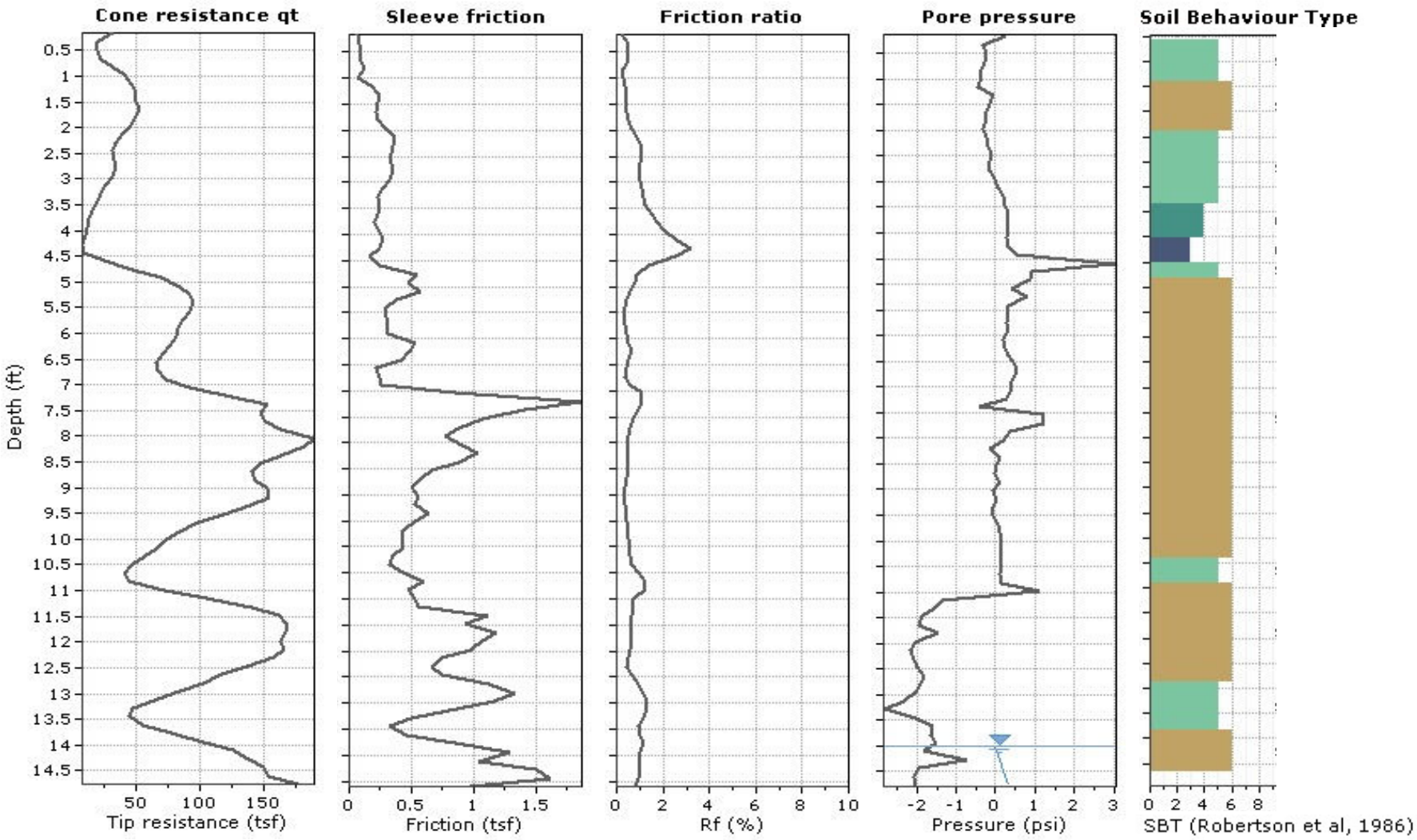
Location: Lat: 48.760483 Long: -117.777216
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 3170 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

UT-CPT-2
17800-11 2/13
Figure A-21



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

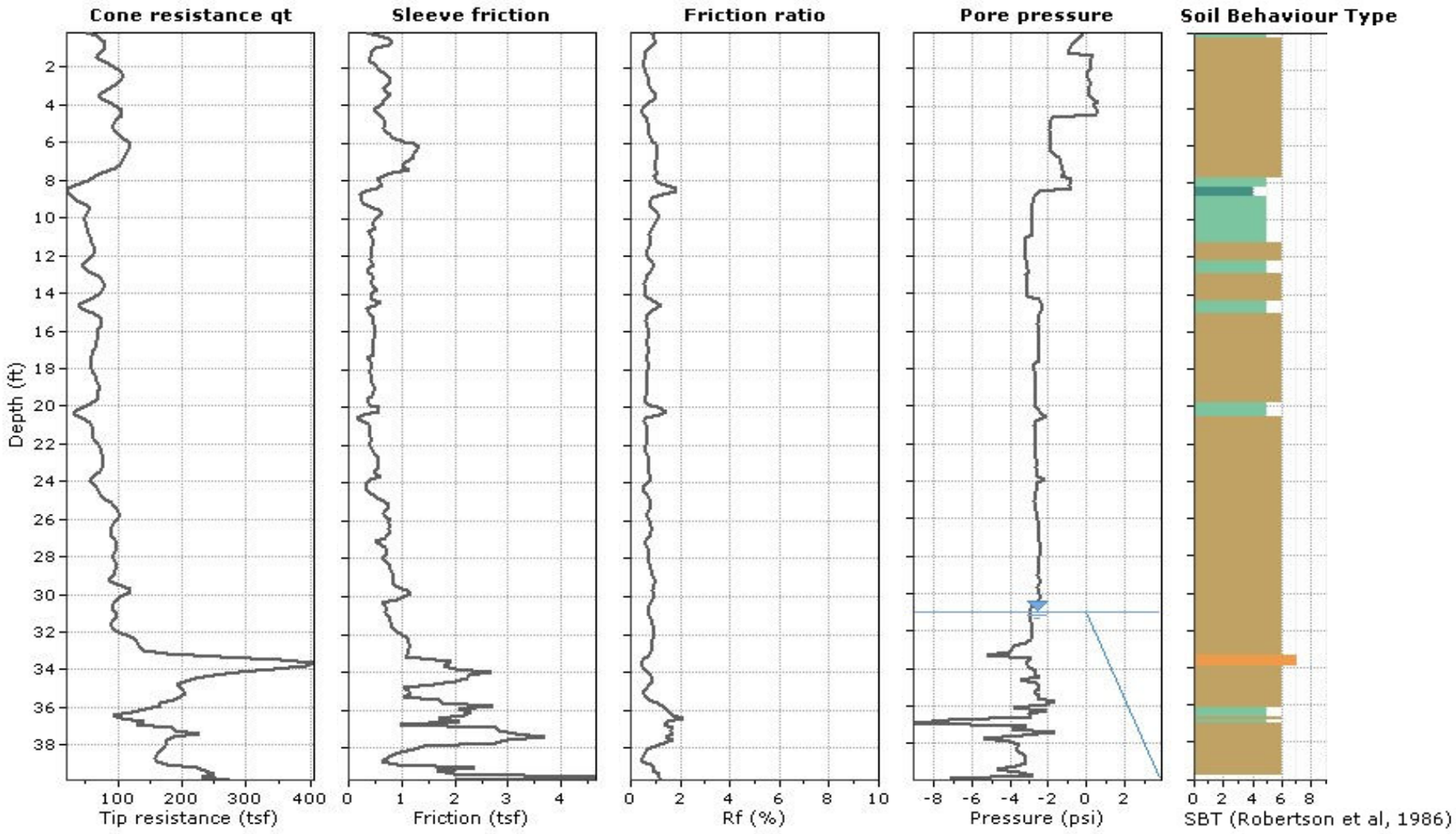
Location: Lat: 48.762554 Long: -117.776025
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 3172 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

UT-CPT-3
17800-11 2/13
Figure A-22



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

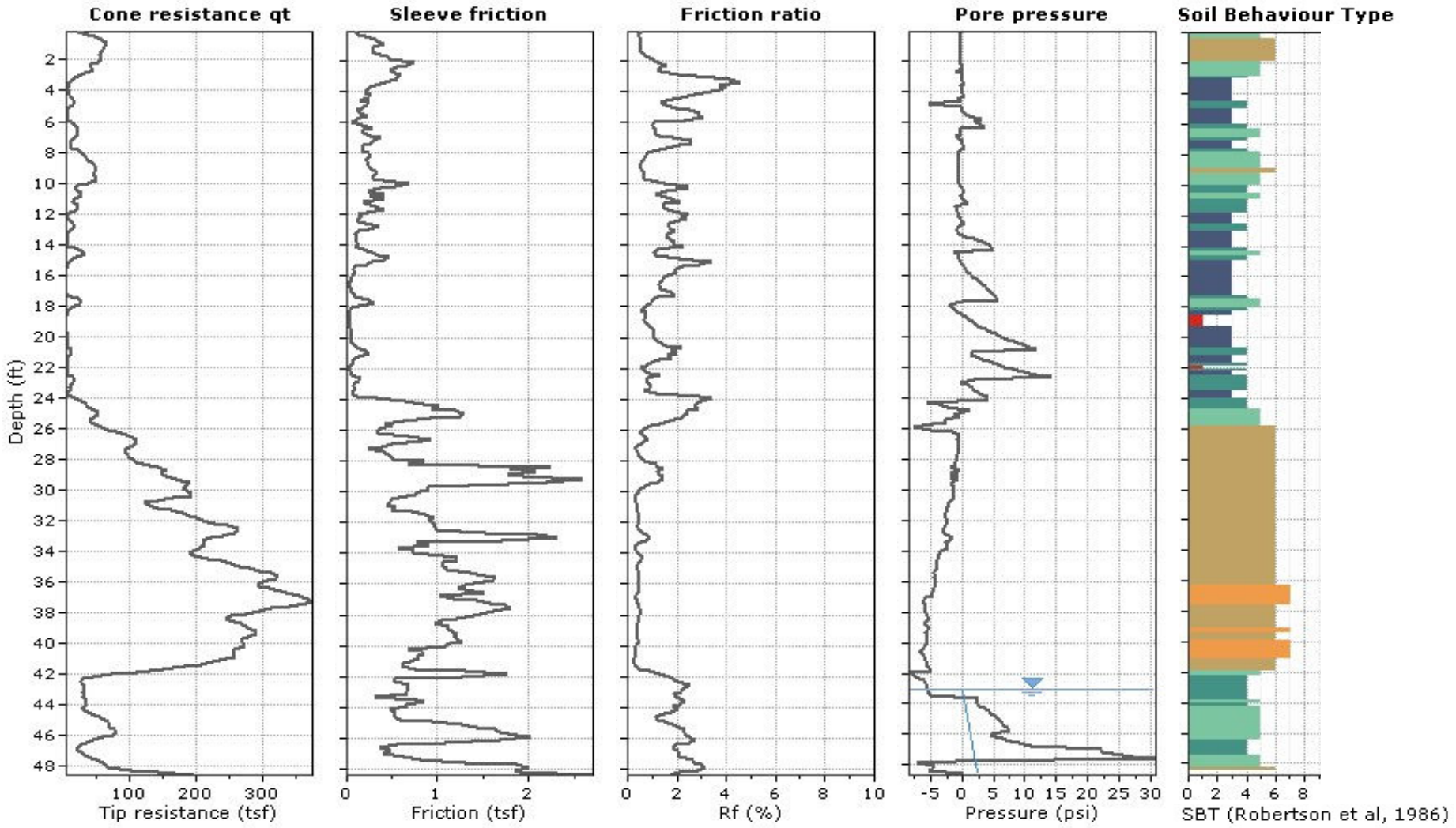
Location: Lat: 48.762486 Long: -117.775834
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 3186 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

UT-CPT-4
17800-11 2/13
Figure A-23



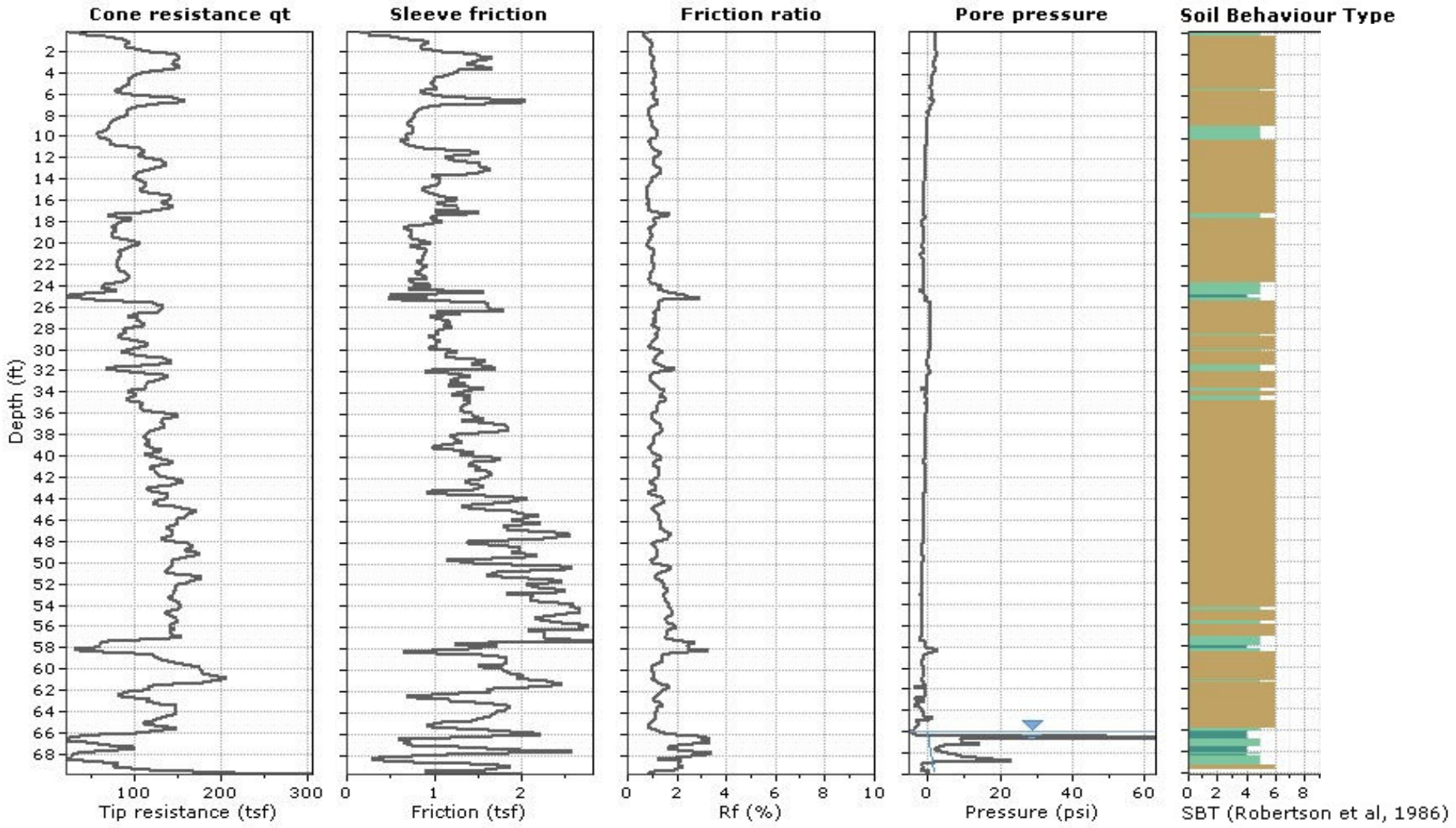
Location: Lat: 48.761039 Long: -117.776806
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 3168 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

UT-CPT-5
17800-11 2/13
Figure A-24



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

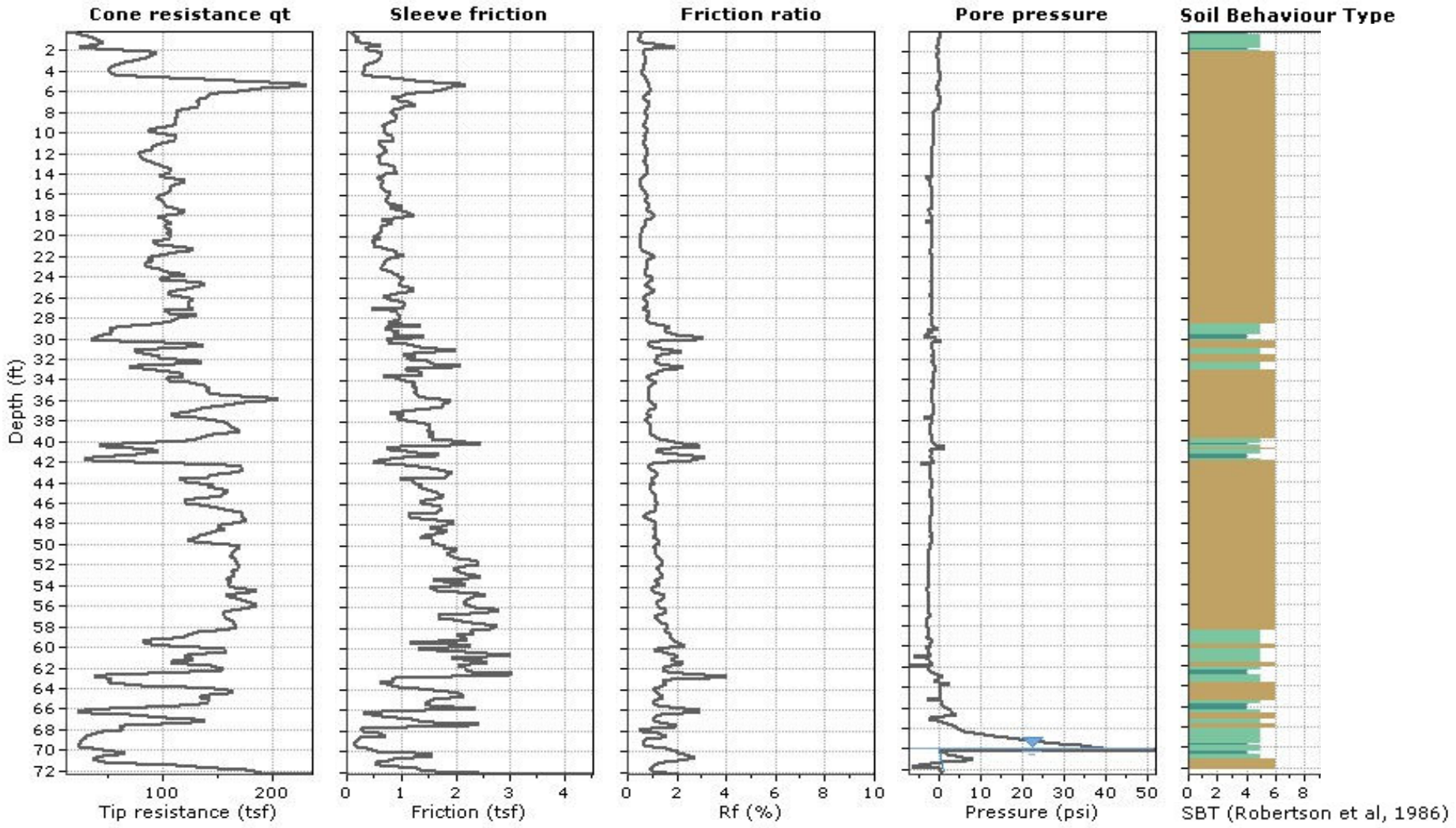
Location: Lat: 48.776014 Long: -117.800633
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 2738 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

LT-CPT-6
17800-11 2/13
Figure A-25



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

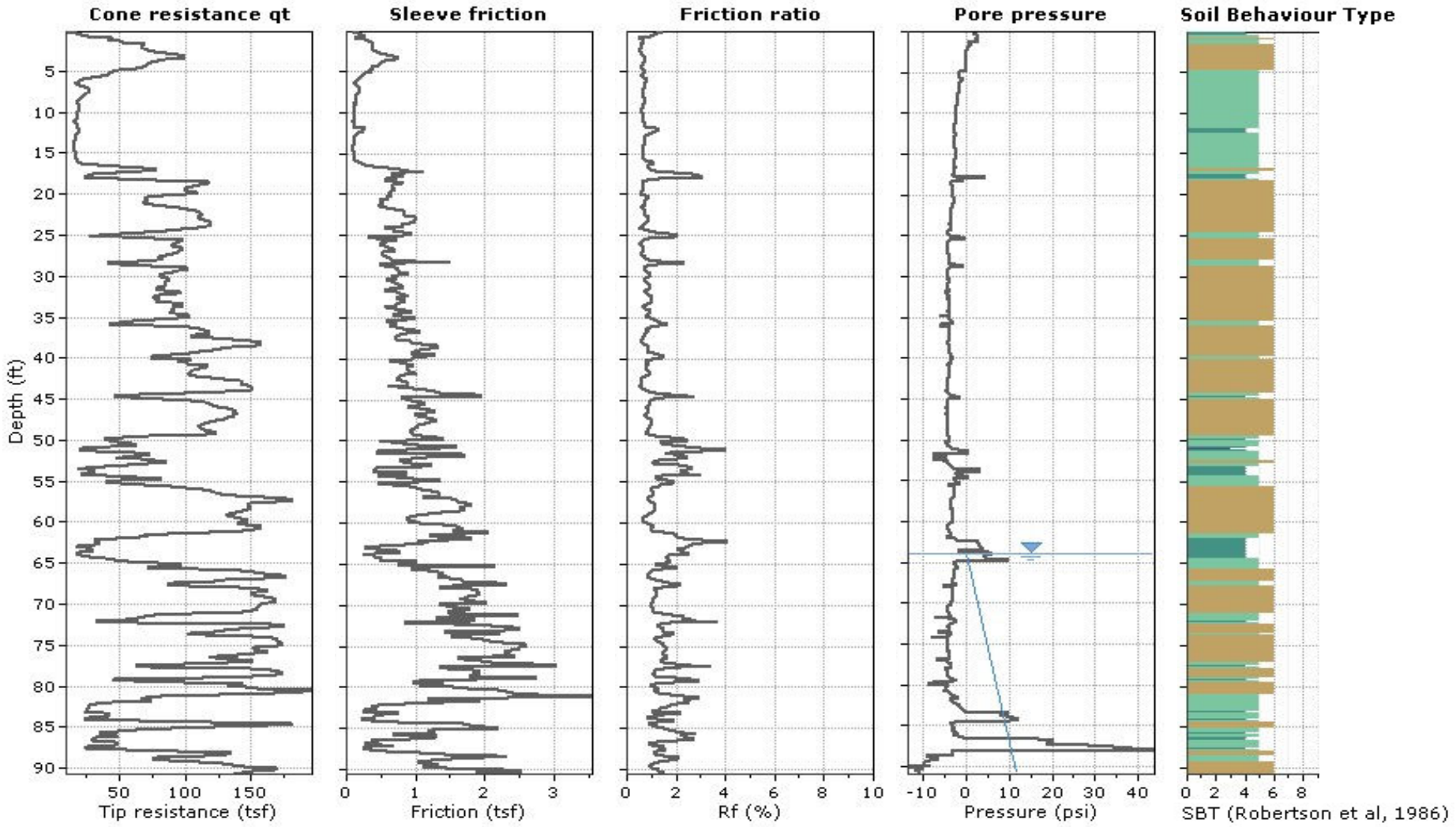
Location: Lat: 48.776126 Long: -117.800608
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 2742 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

LT-CPT-7
17800-11 1/13
Figure A-26



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

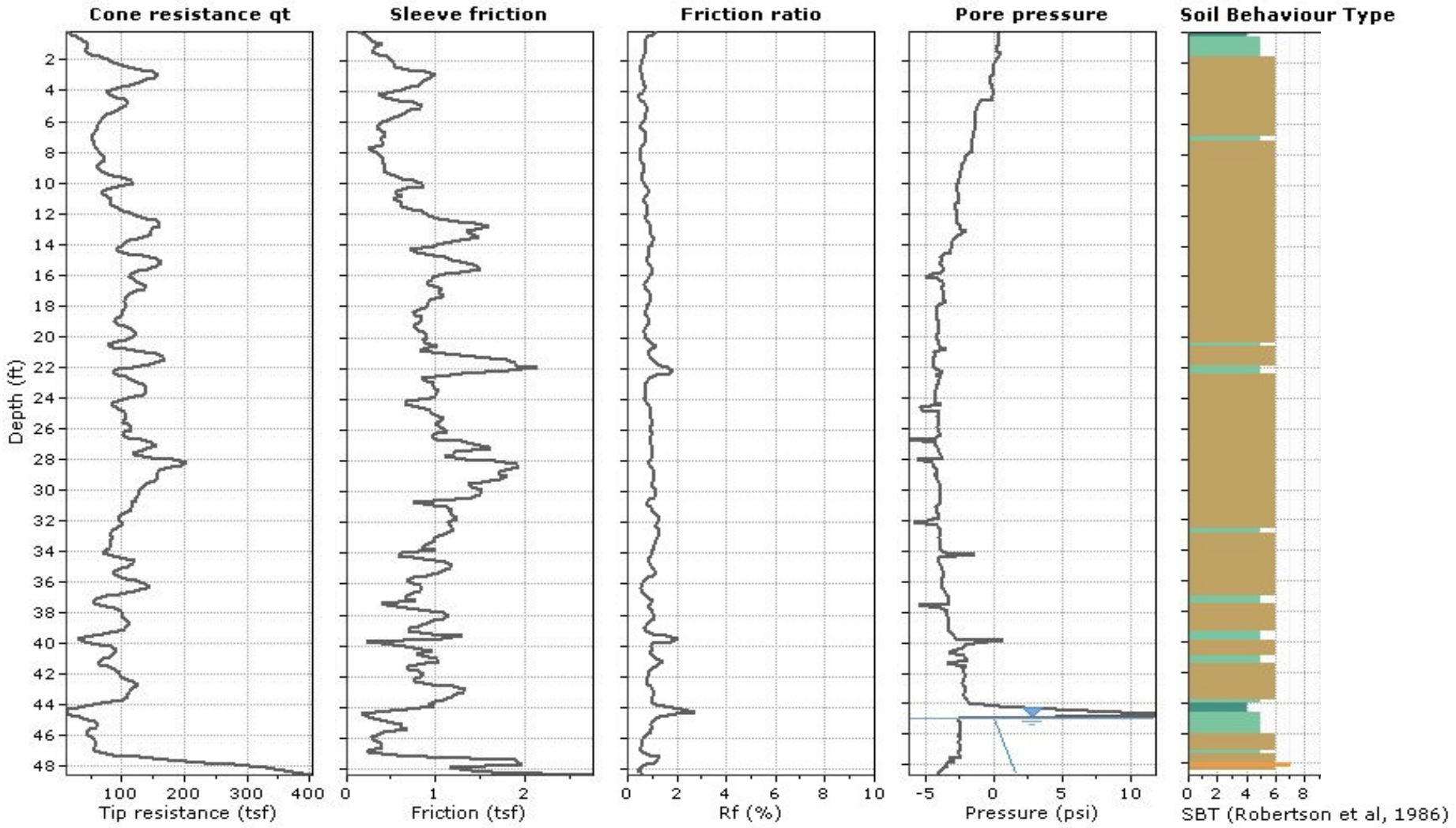
Location: Lat: 48.776272 Long:-117.800563
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 2763 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

LT-CPT-8
17800-11 2/13
Figure A-27



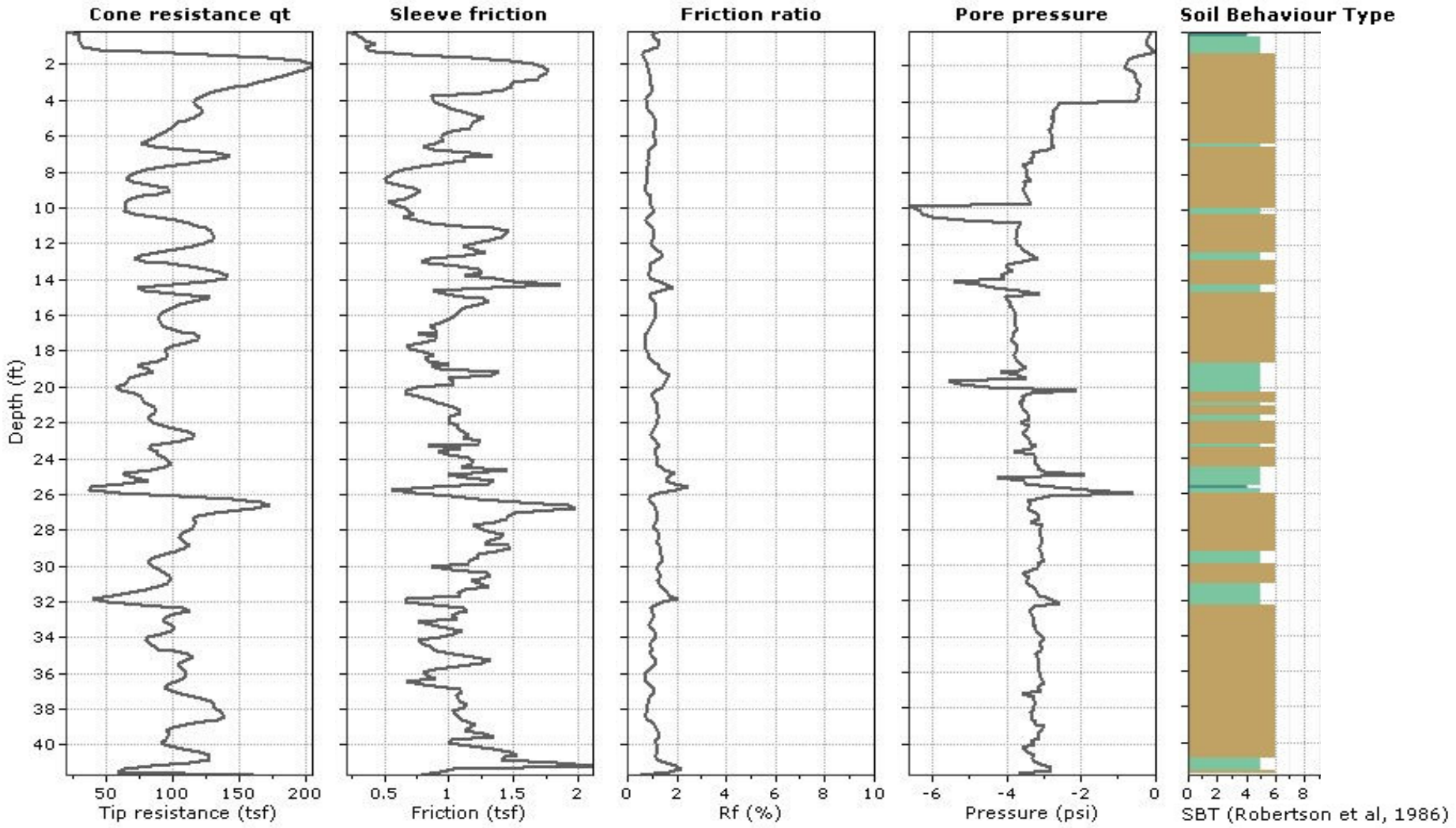
Location: Lat: 48.778600 Long: -117.798663
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 2745 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

LT-CPT-9
17800-11 2/13
Figure A-28



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

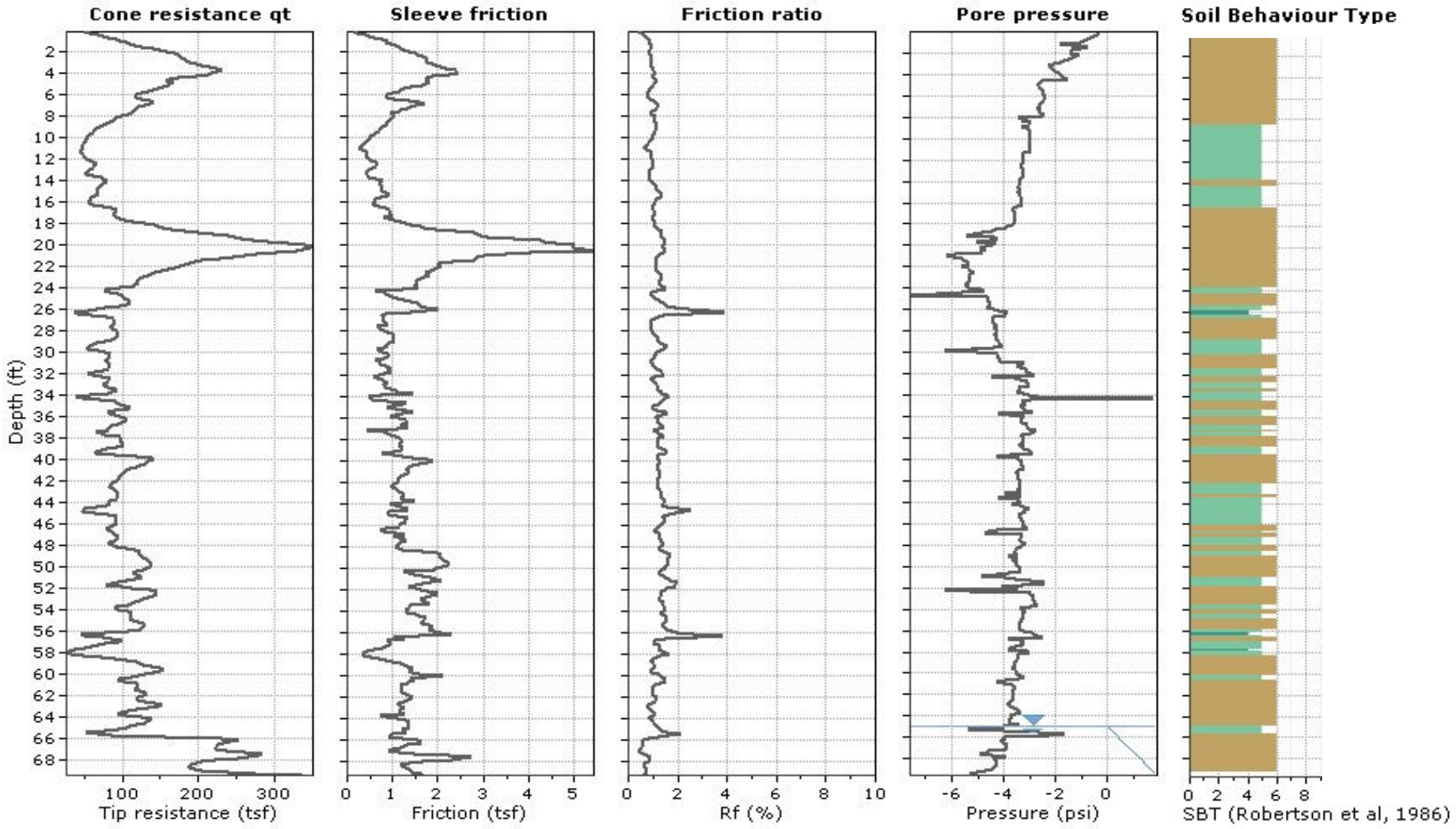
Location: Lat: 48.778509 Long: -117.798681
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 2743 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

LT-CPT-10
17800-11 2/13
Figure A-29



SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

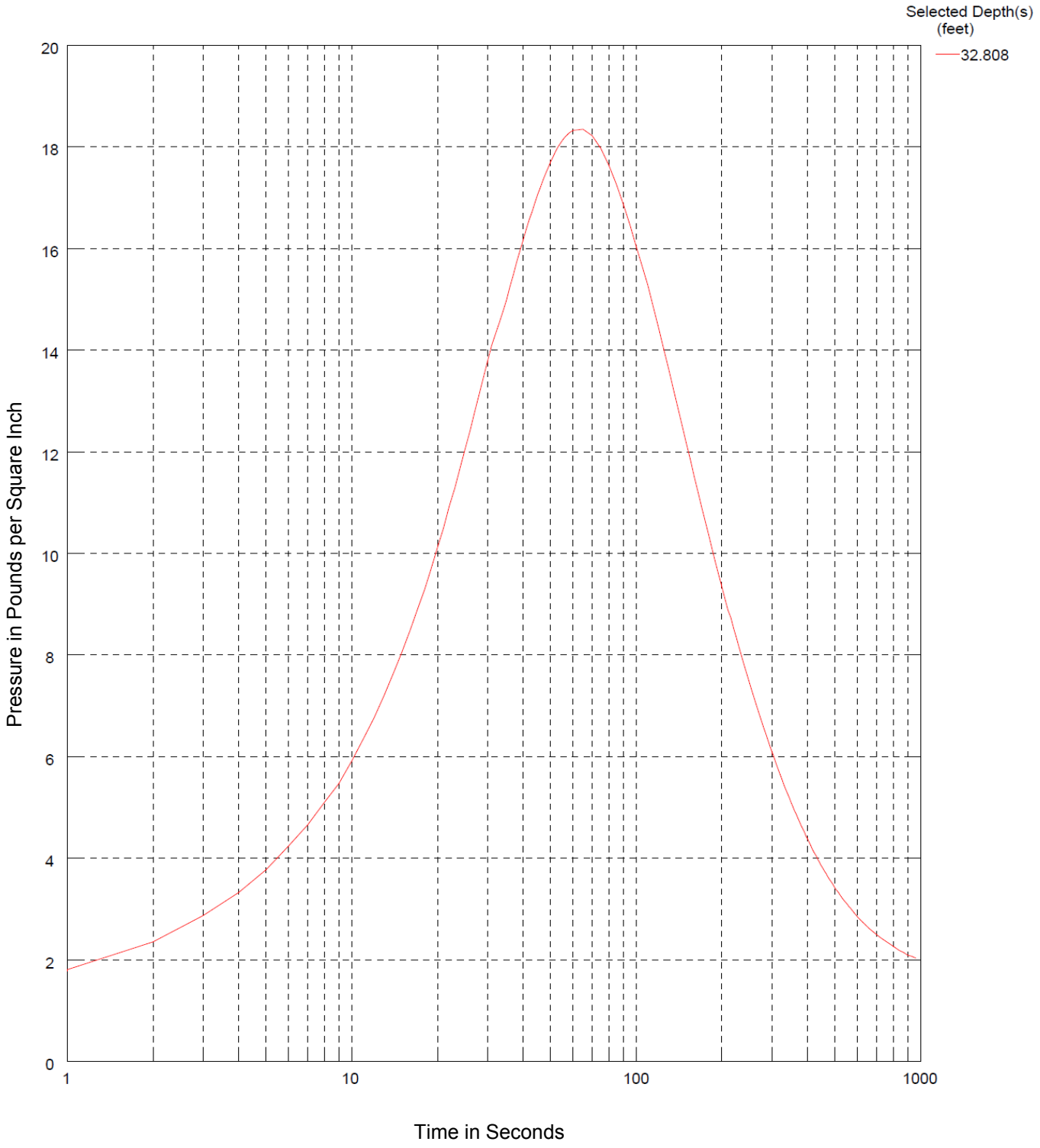
Location: Lat: 48.778382 Long: -117.798703
Horizontal Datum: WGS 1984

Approximate Ground Surface Elevation: 2762 feet
Vertical Datum: MSL

Note: Refer to Electric (Piezocone) Cone Penetrometer Key for additional information

HARTCROWSER

LT-CPT-11
17800-11 2/13
Figure A-30



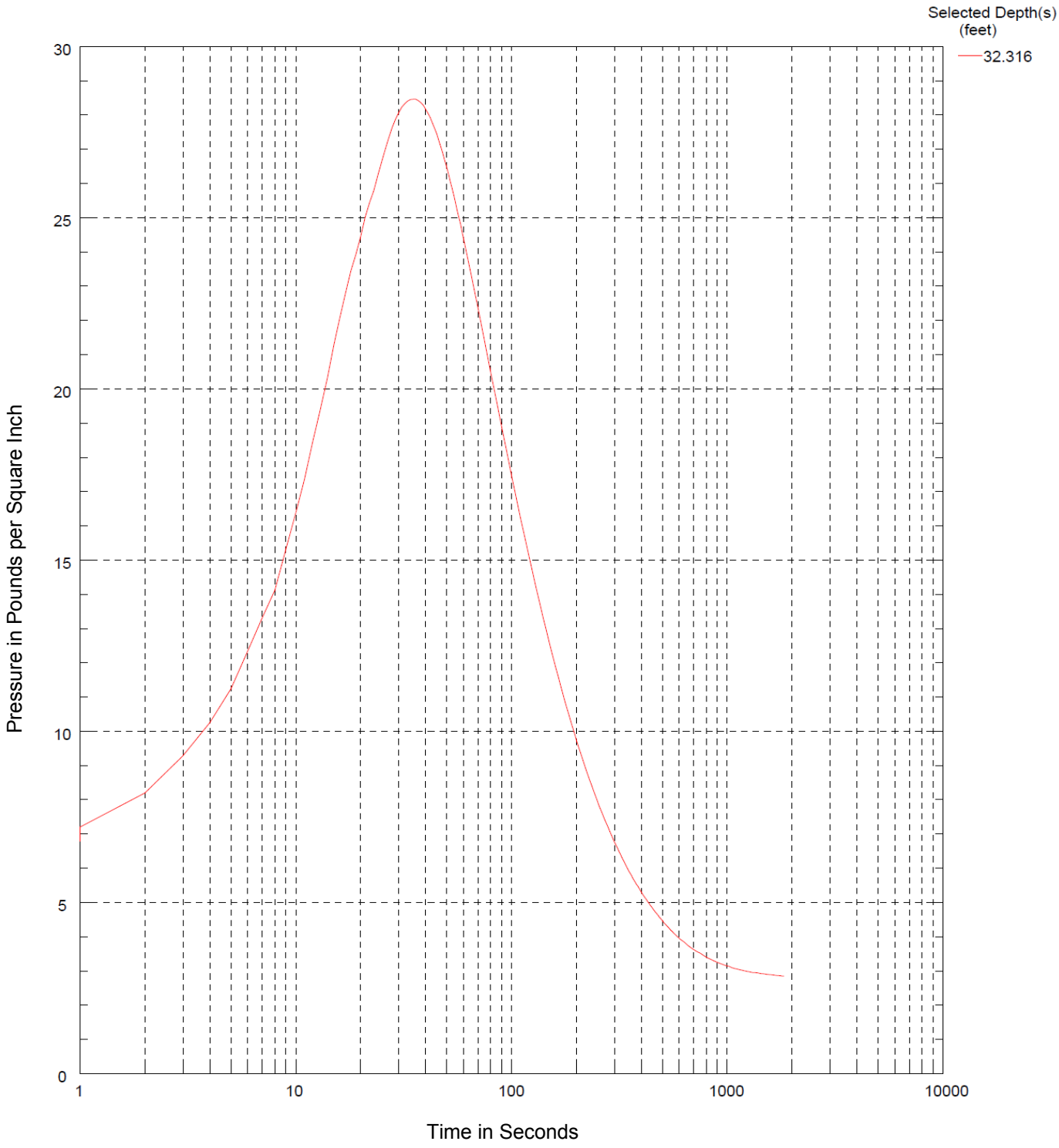
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
UT-CPT-1 - 33 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-31



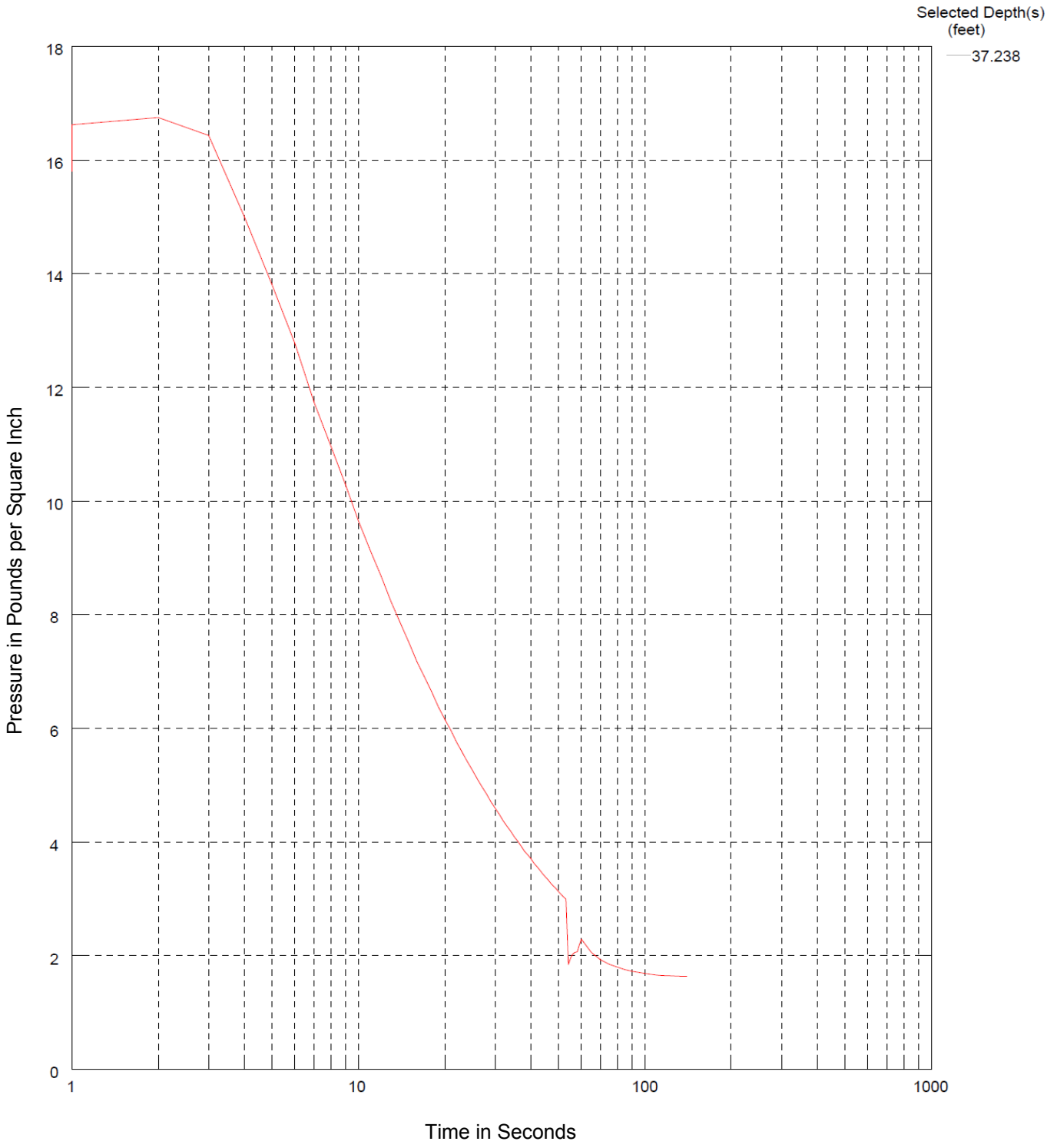
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
UT-CPT-2 - 32 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-32



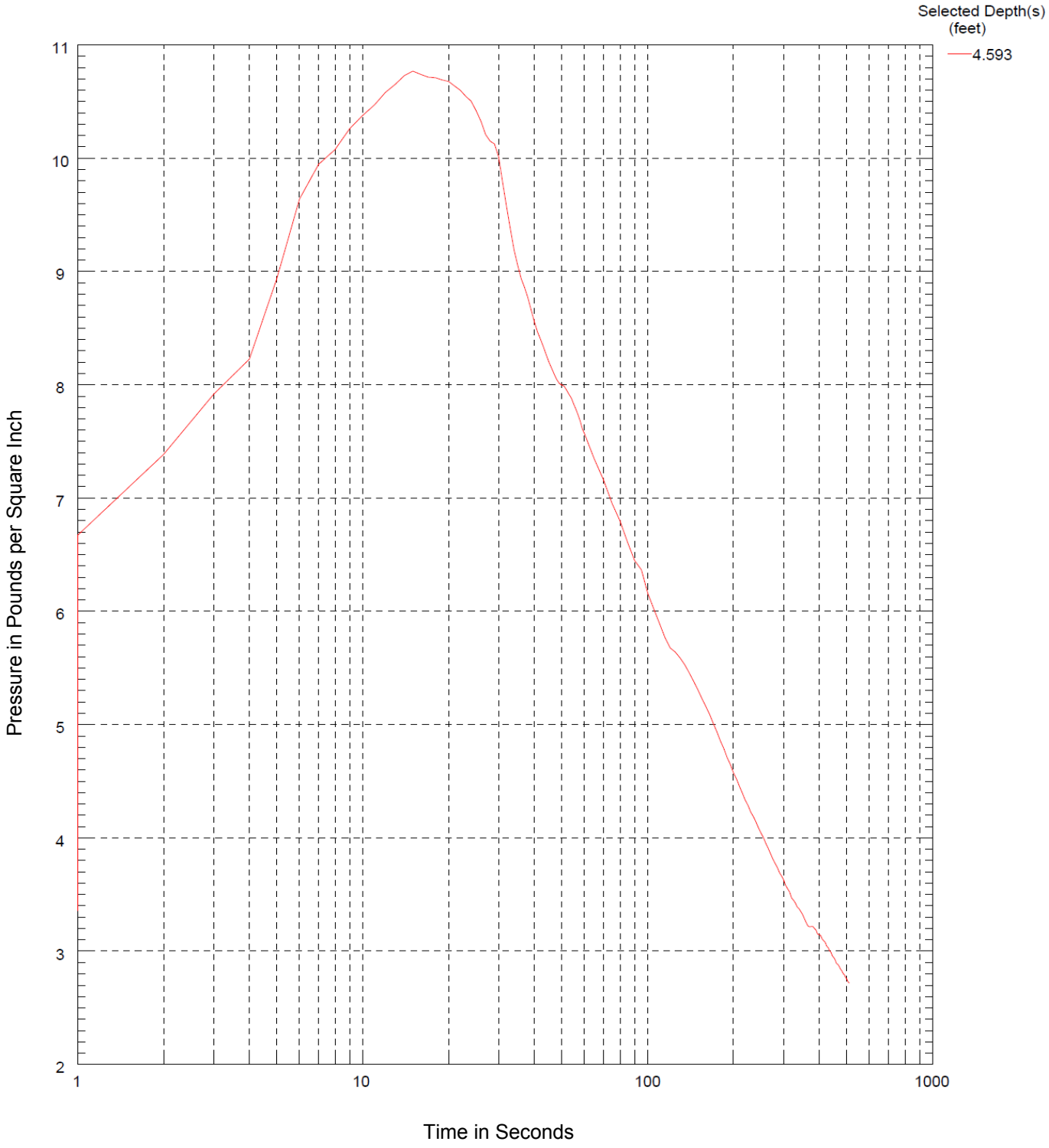
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
UT-CPT-2 - 37 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-33



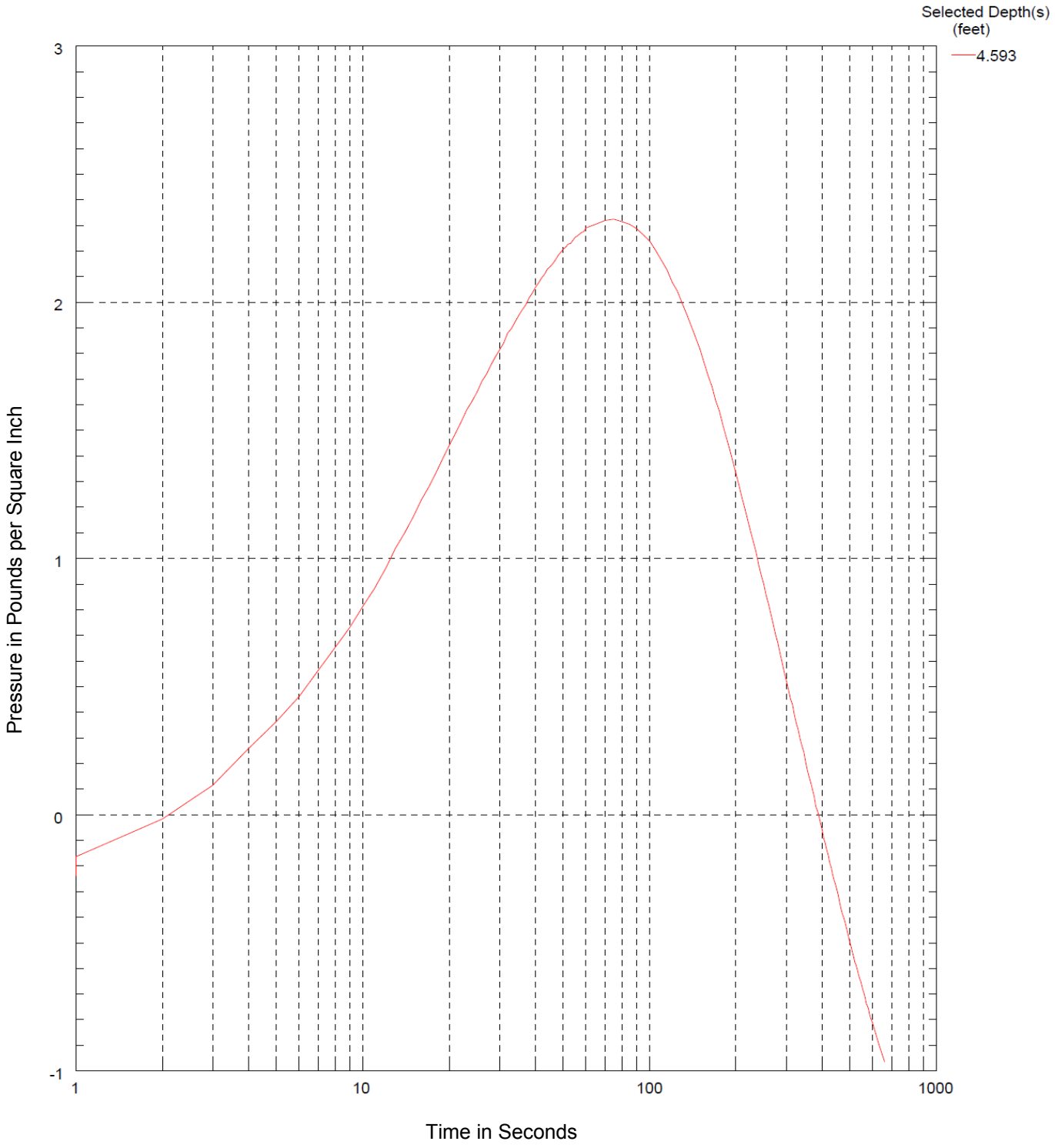
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
UT-CPT-3 - 4.6 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-34



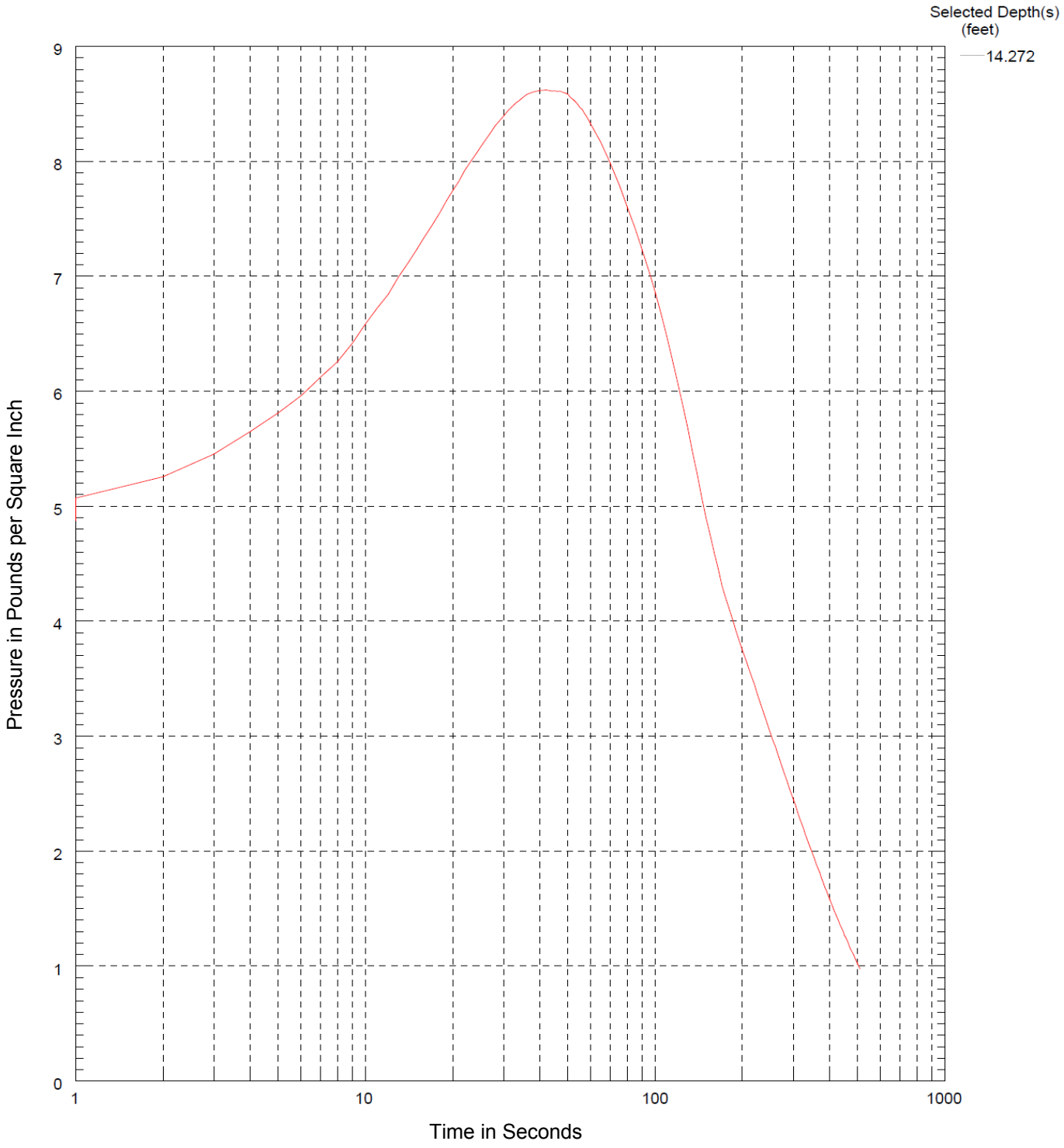
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
UT-CPT-5 - 4.6 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-35



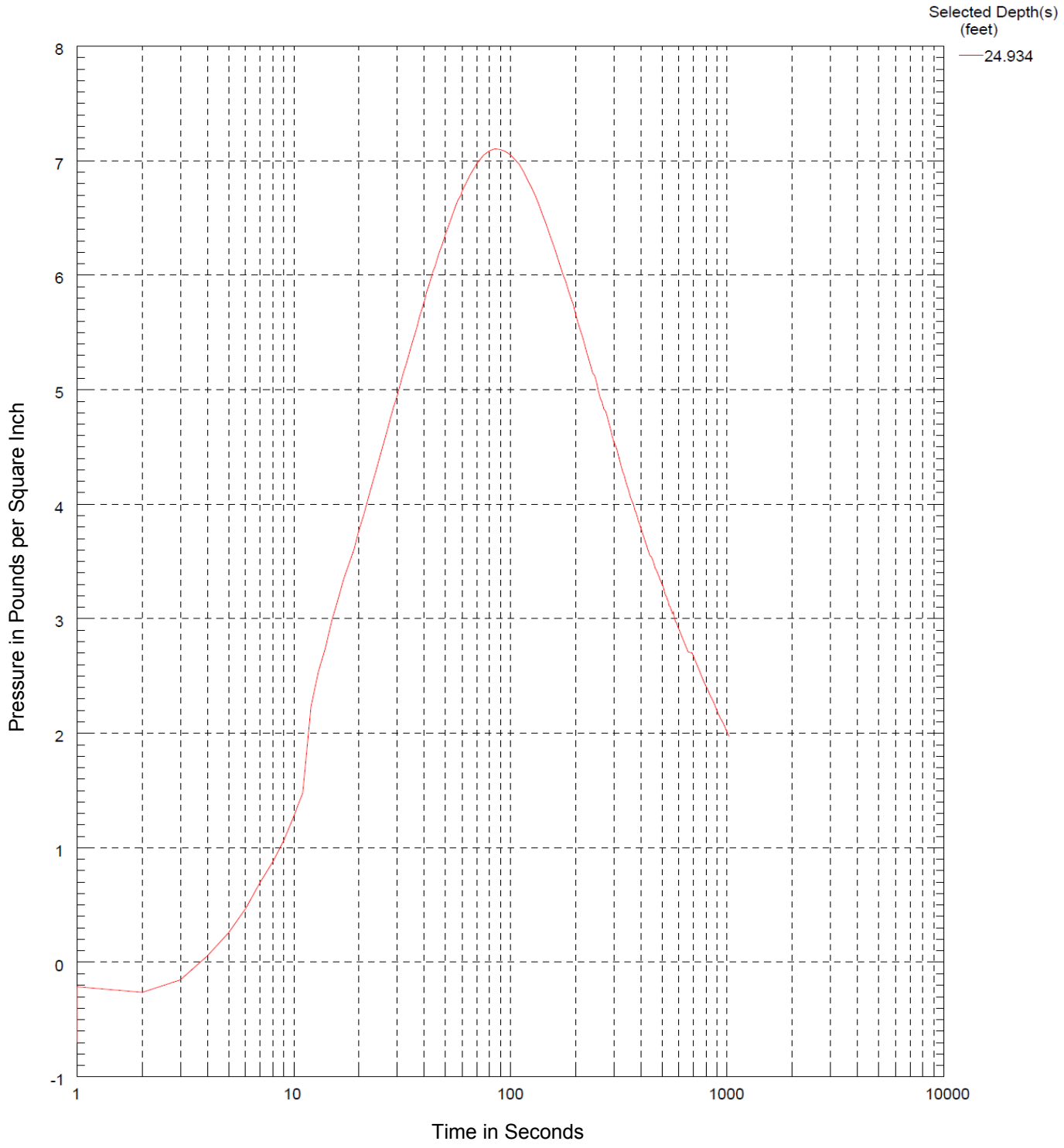
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
UT-CPT-5 - 14 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-36



Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
LT-CPT-6 - 25 Foot Depth

17800-11 02/13

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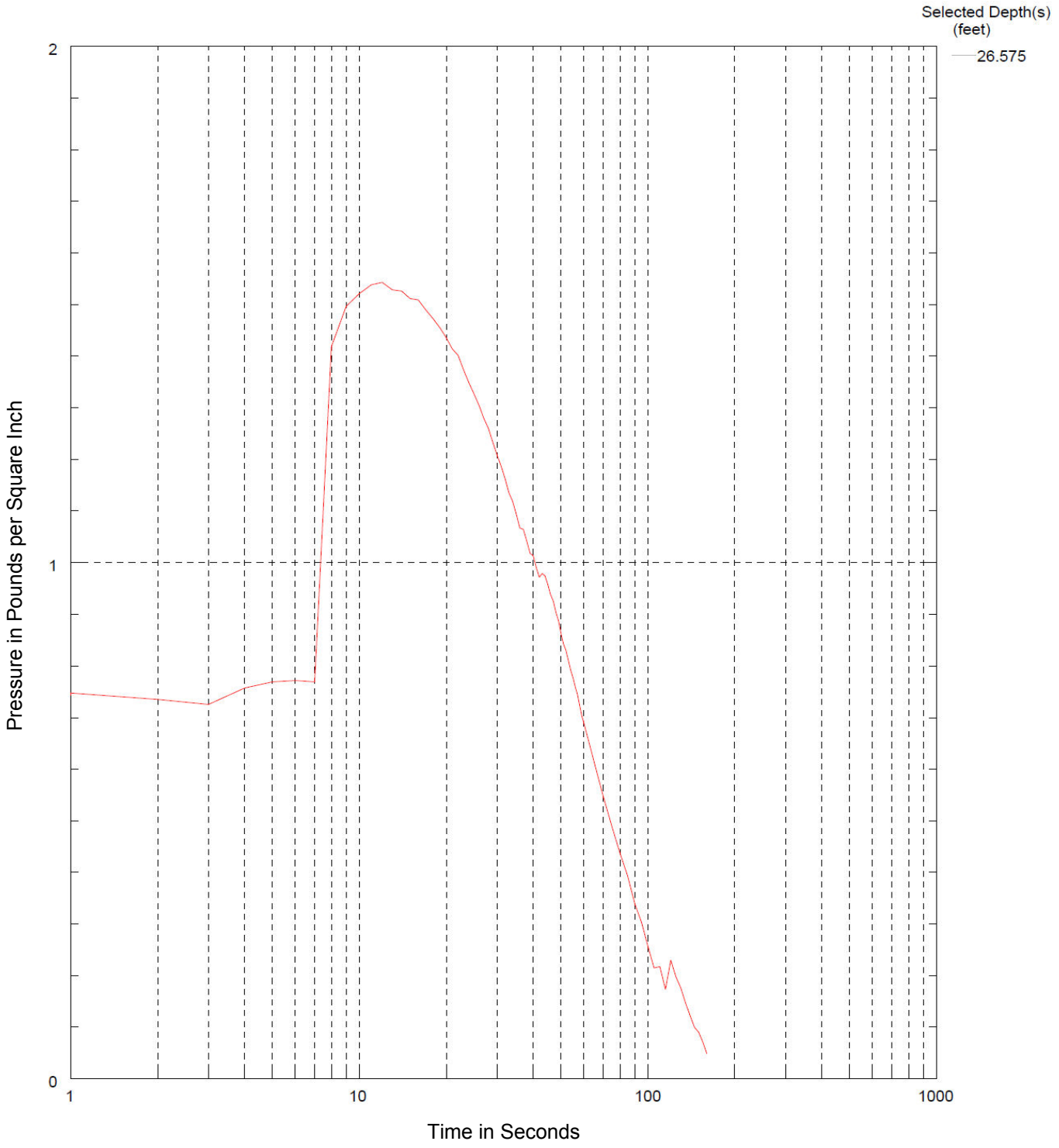
Figure
A-37



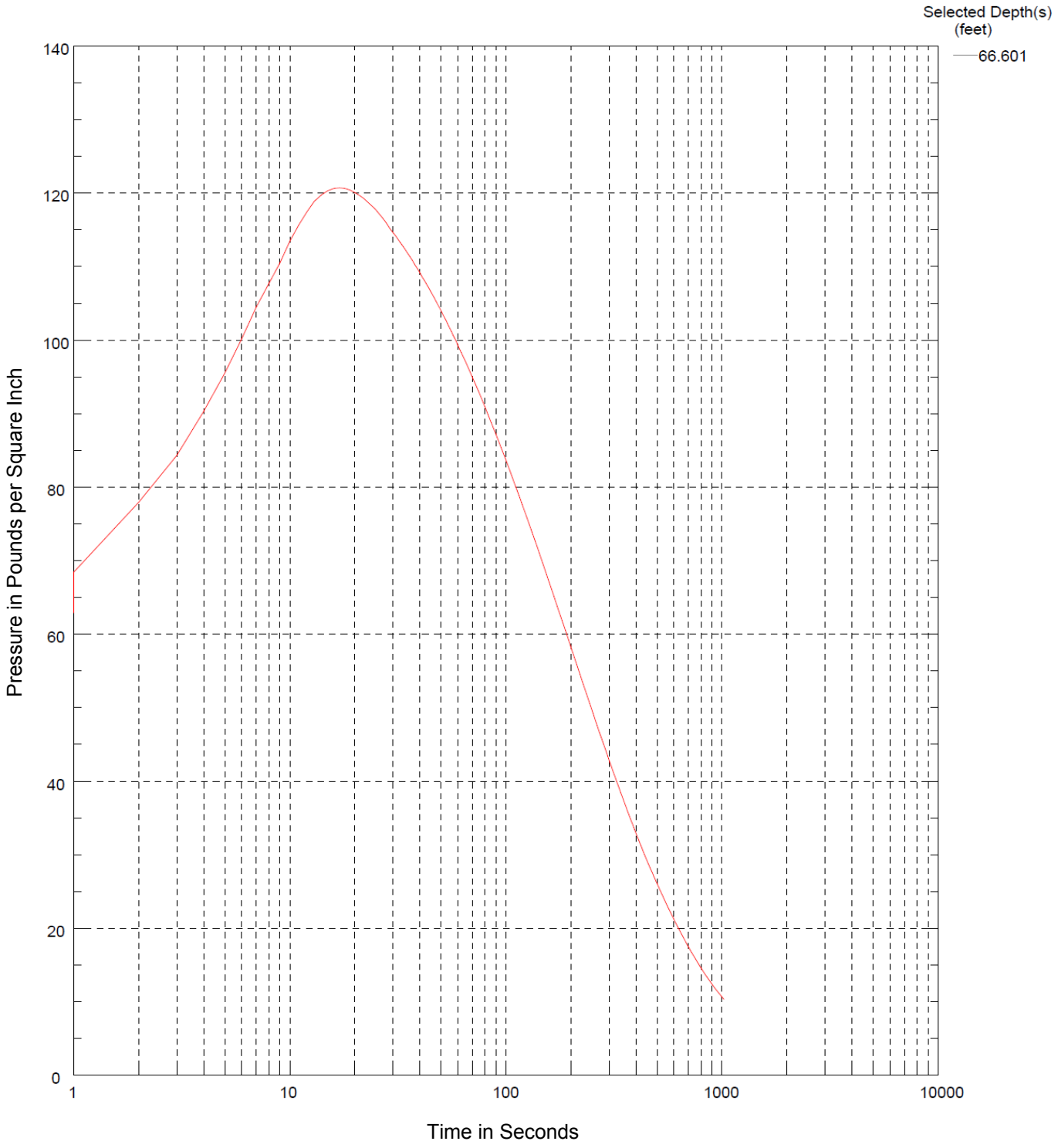
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
LT-CPT-6 - 27 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-38



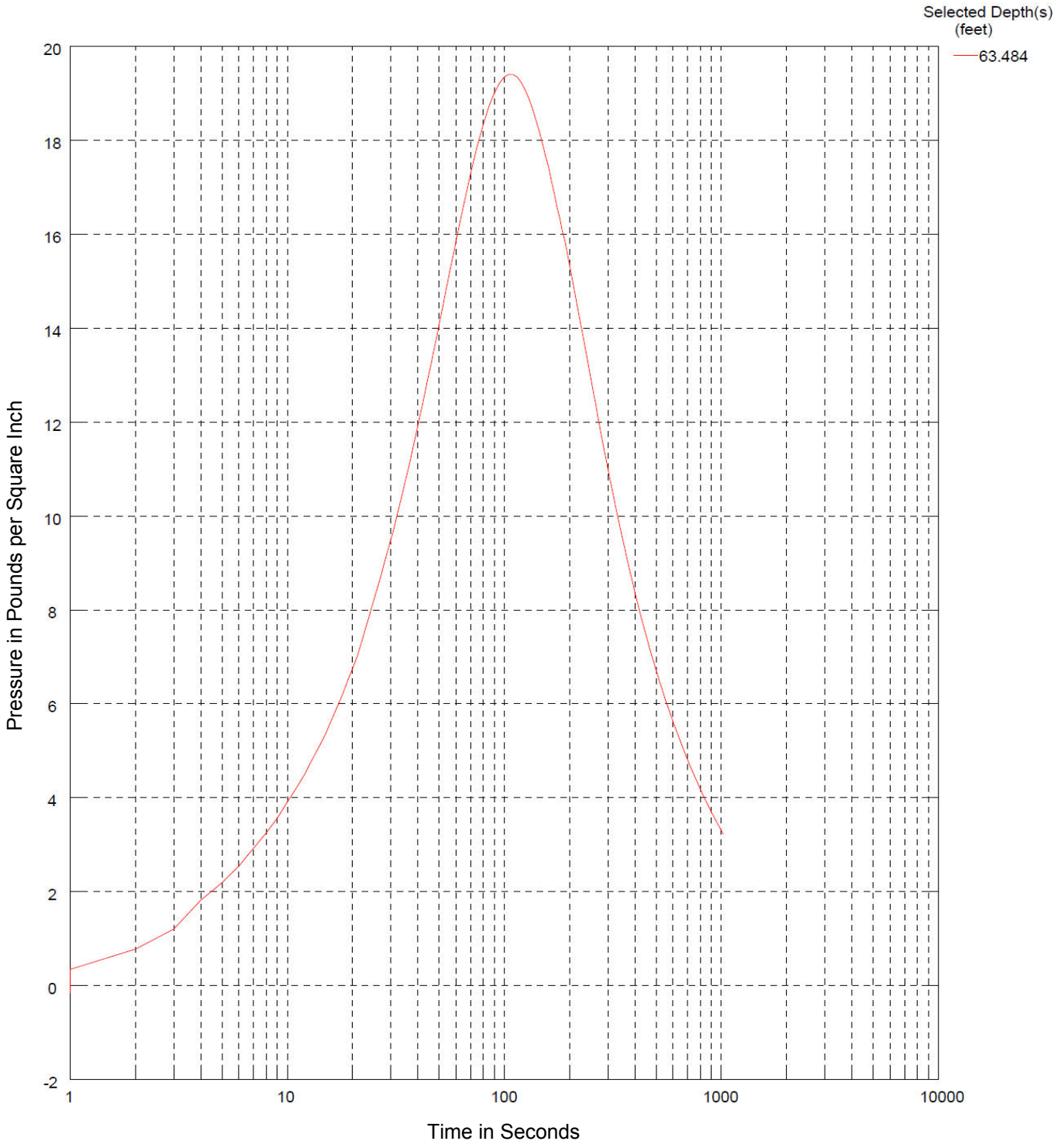
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
LT-CPT-6 - 67 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-39



Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
LT-CPT-7 - 63 Foot Depth

17800-11 02/13

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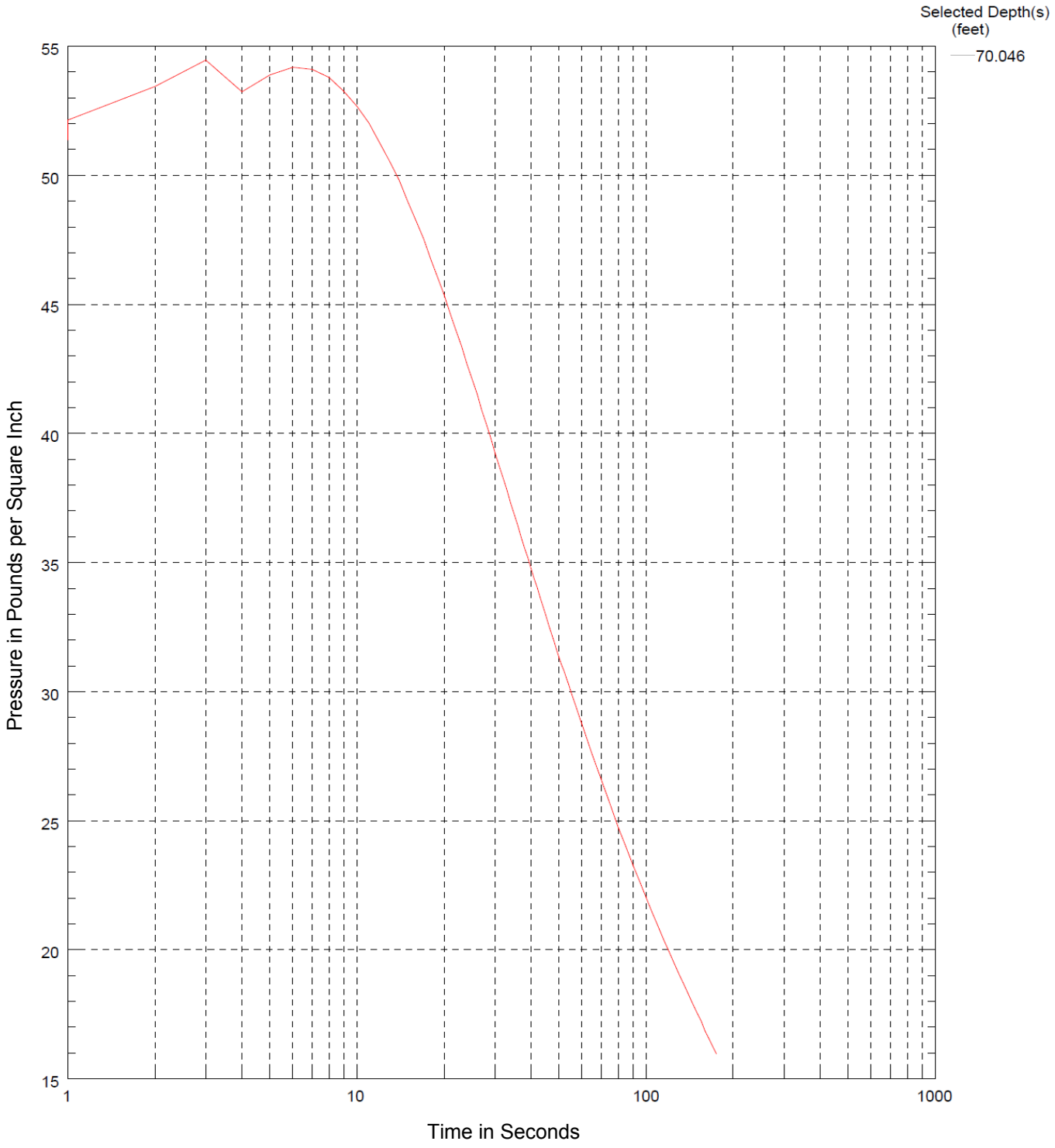
Figure
A-40

MKH 8/28/2012 L:\Project Notebook\1780011_Van Stone Mine\REMEDIAL INVESTIGATION REPORT\Appendix A - RI-FS Field Investigation Procedures\Appendix A Figures\response to



Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
LT-CPT-7 - 70 Foot Depth

17800-11 02/13

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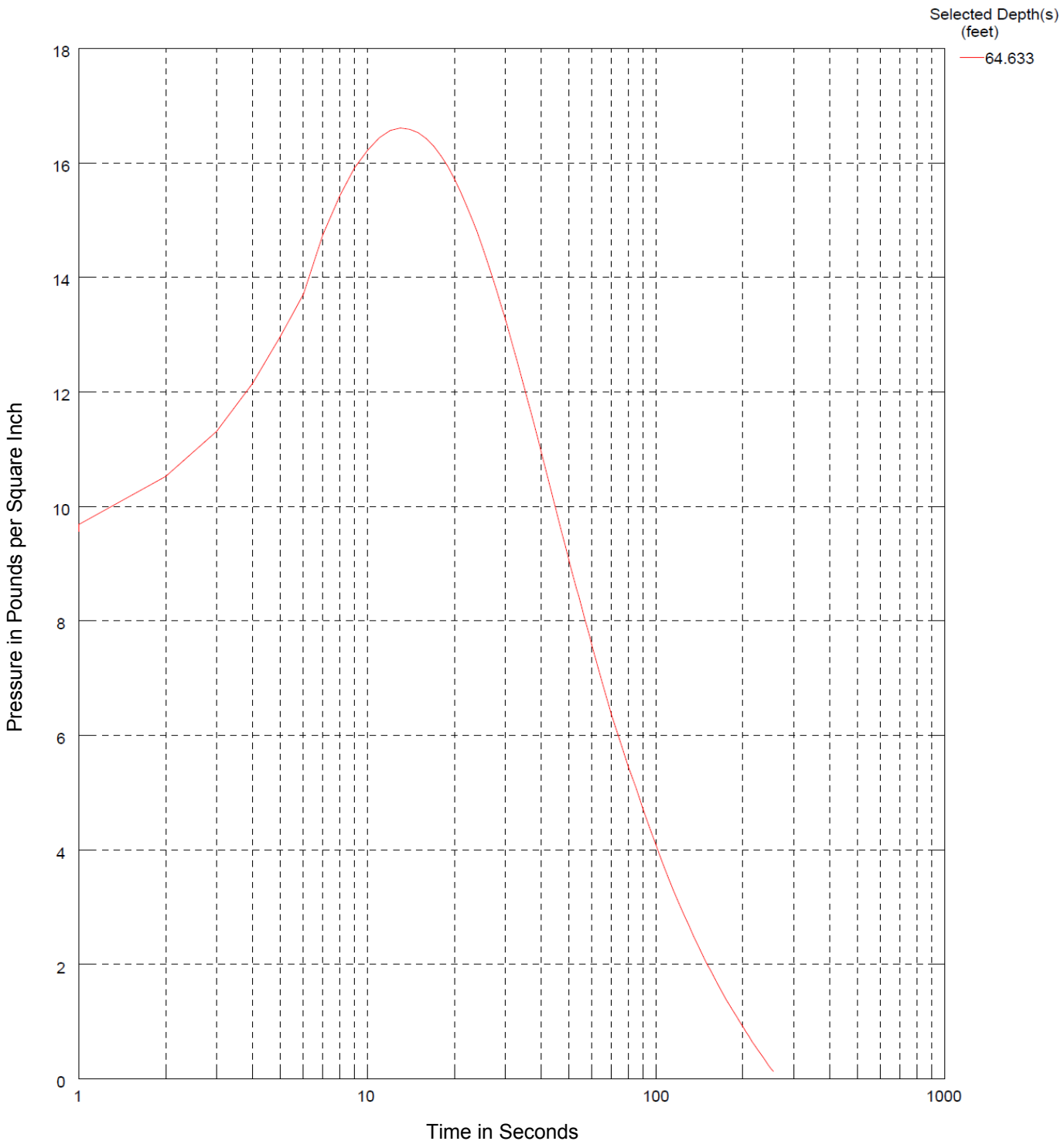
Figure
A-41

MKH 8/28/2012 L:\Project Notebook\1780011_Van Stone Mine\REMEDIAL INVESTIGATION REPORT\Appendix A - RI-FS Field Investigation Procedures\Appendix A Figures\response to



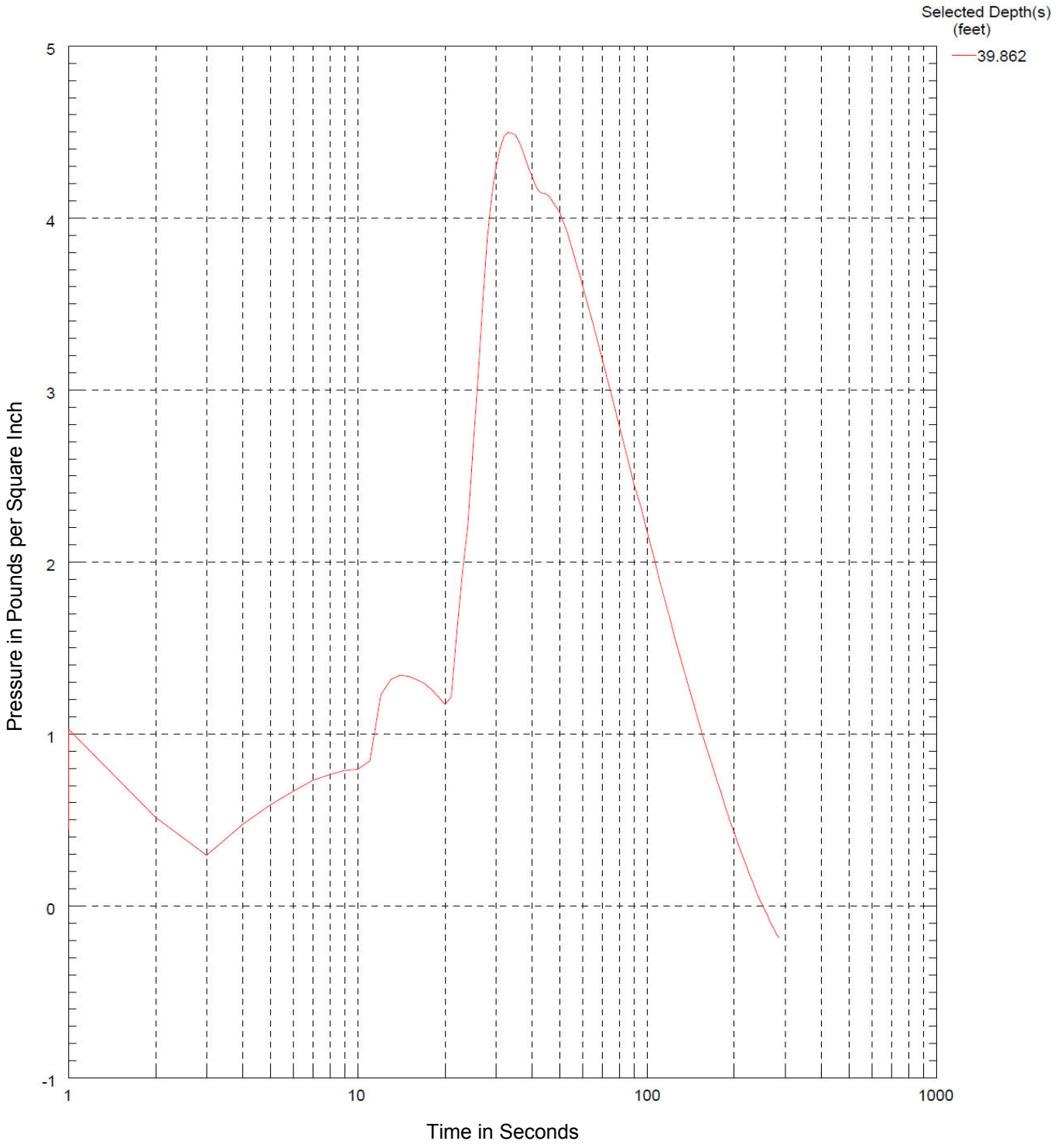
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
LT-CPT-8 - 65 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-42



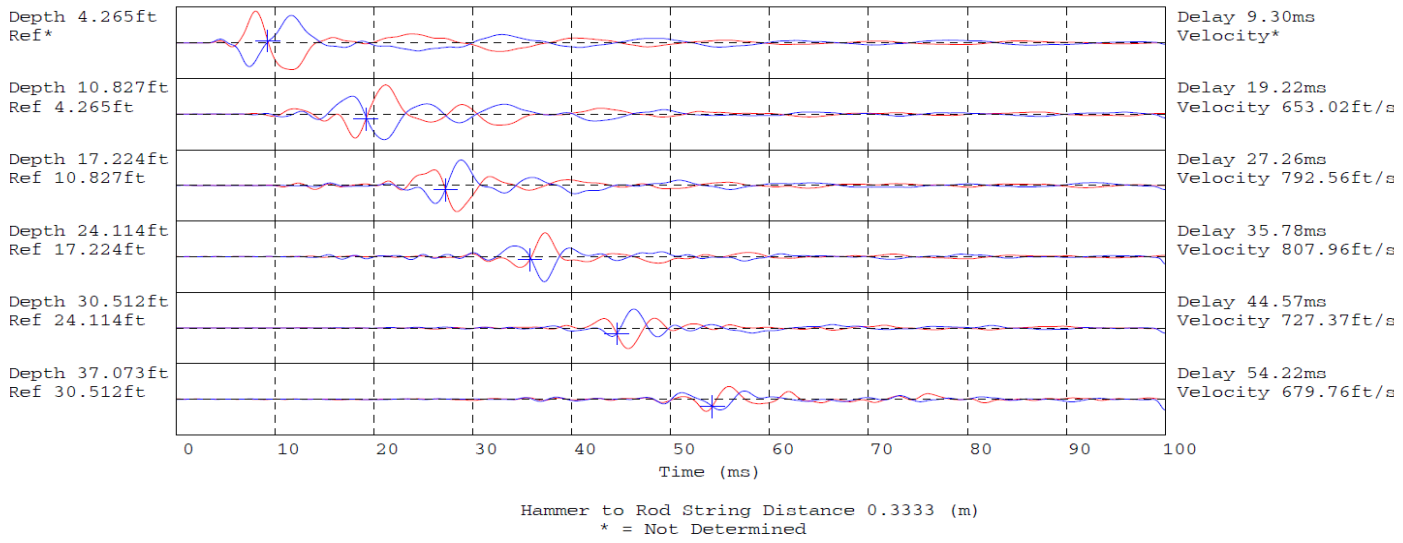
Van Stone Mine
Onion Creek, WA

Pore Pressure Dissipation Plot
LT-CPT-9 - 40 Foot Depth

17800-11 02/13

HARTCROWSER

Figure
A-43



Hammer to Rod String Distance 0.3333 (m)
* = Not Determined

Van Stone Mine
Onion Creek, WA

Shear Wave Velocity Plots
UT-CPT-1

17800-11 02/13

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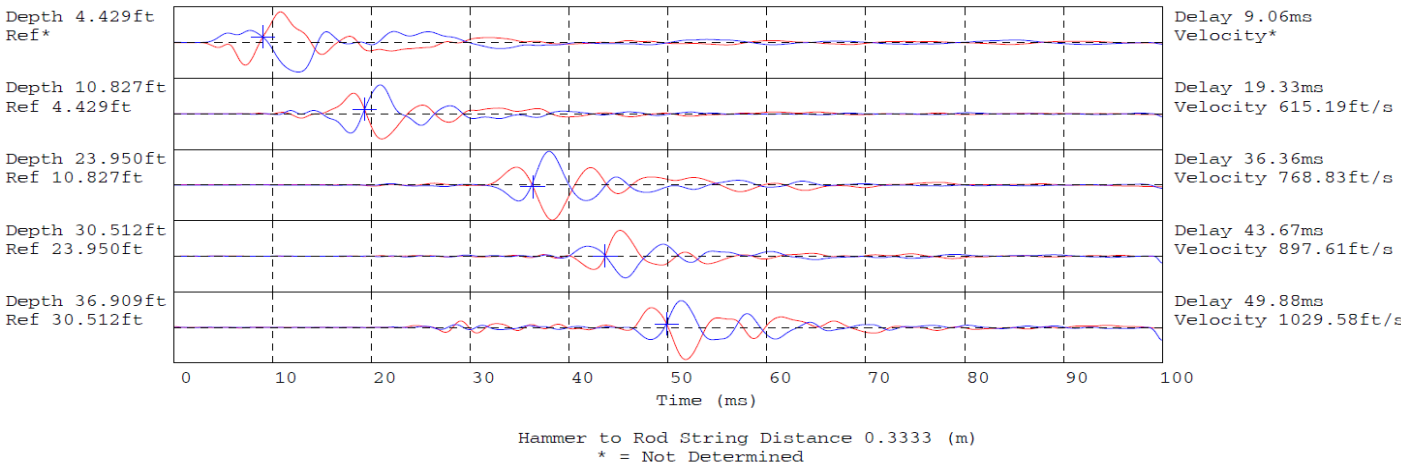
Figure
A-44

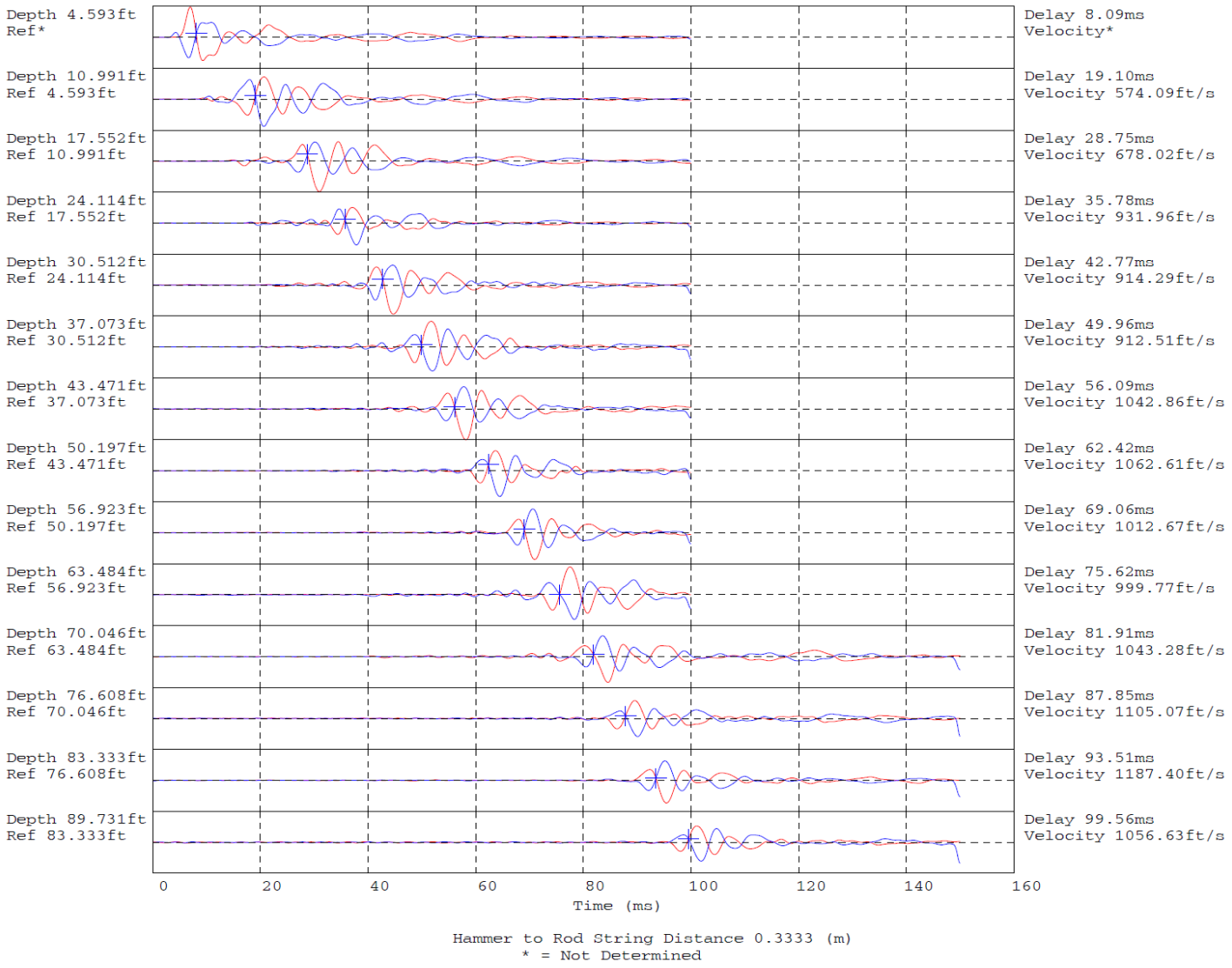
MKH 8/28/2012 L:\Project Notebook\1780011_Van Stone Mine\REMEDIAL INVESTIGATION REPORT\Appendix A - RI-FS Field Investigation Procedures\Appendix A Figures\response to



Hammer to Rod String Distance 0.3333 (m)
* = Not Determined

Van Stone Mine Onion Creek, WA	
Shear Wave Velocity Plots **UT-CPT-4**	
17800-11 02/13	
HARTCROWSER	Figure **A-45**

MKH 8/28/2012 L:\Project Notebook\1780011_Van Stone Mine\REMEDIAL INVESTIGATION REPORT\Appendix A - RI-FS Field Investigation Procedures\Appendix A Figures\response to



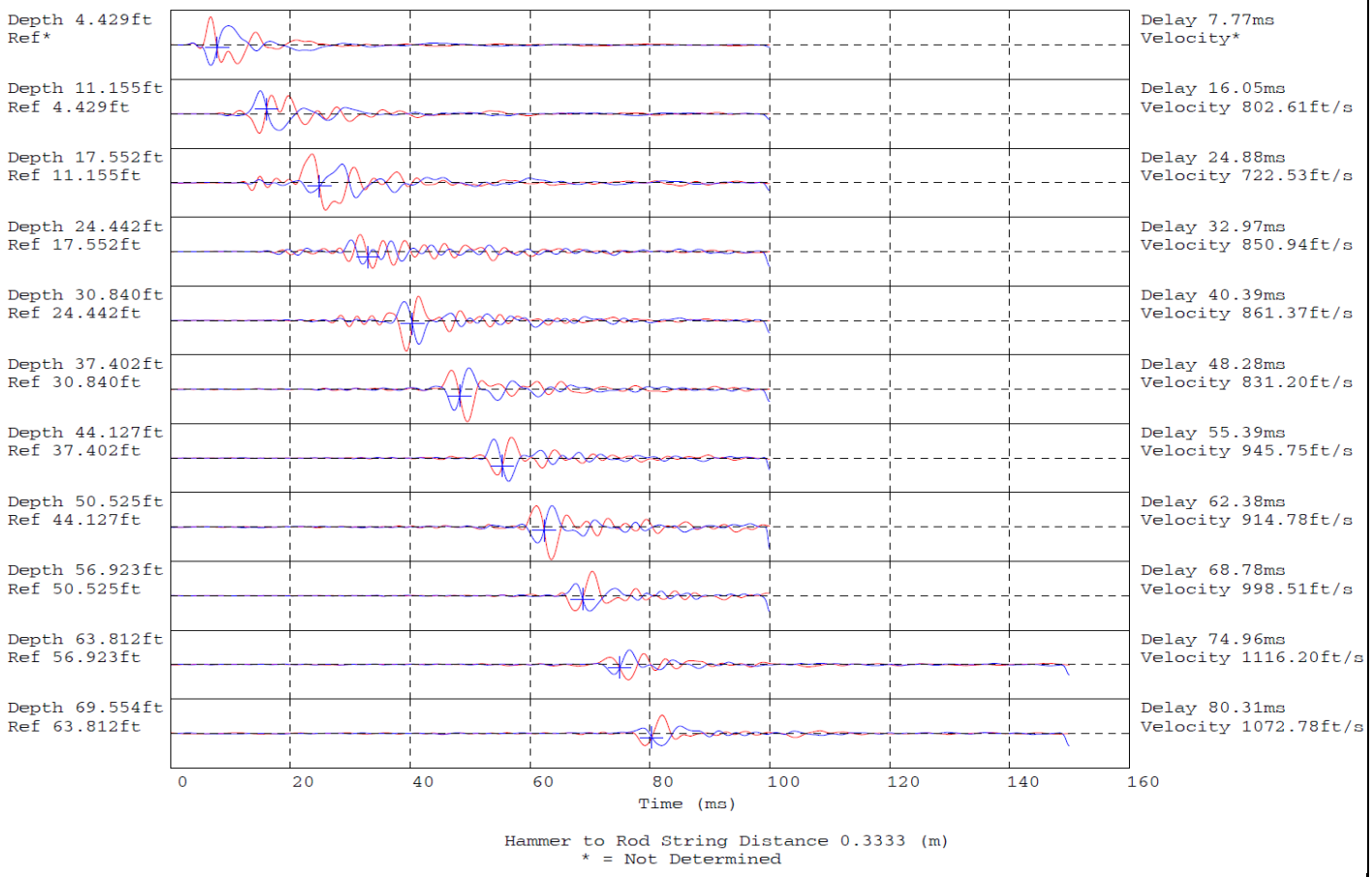
Van Stone Mine
Onion Creek, WA

Shear Wave Velocity Plots
LT-CPT-8

17800-11 02/13

HARTCROWSER

Figure
A-46



Van Stone Mine
Onion Creek, WA

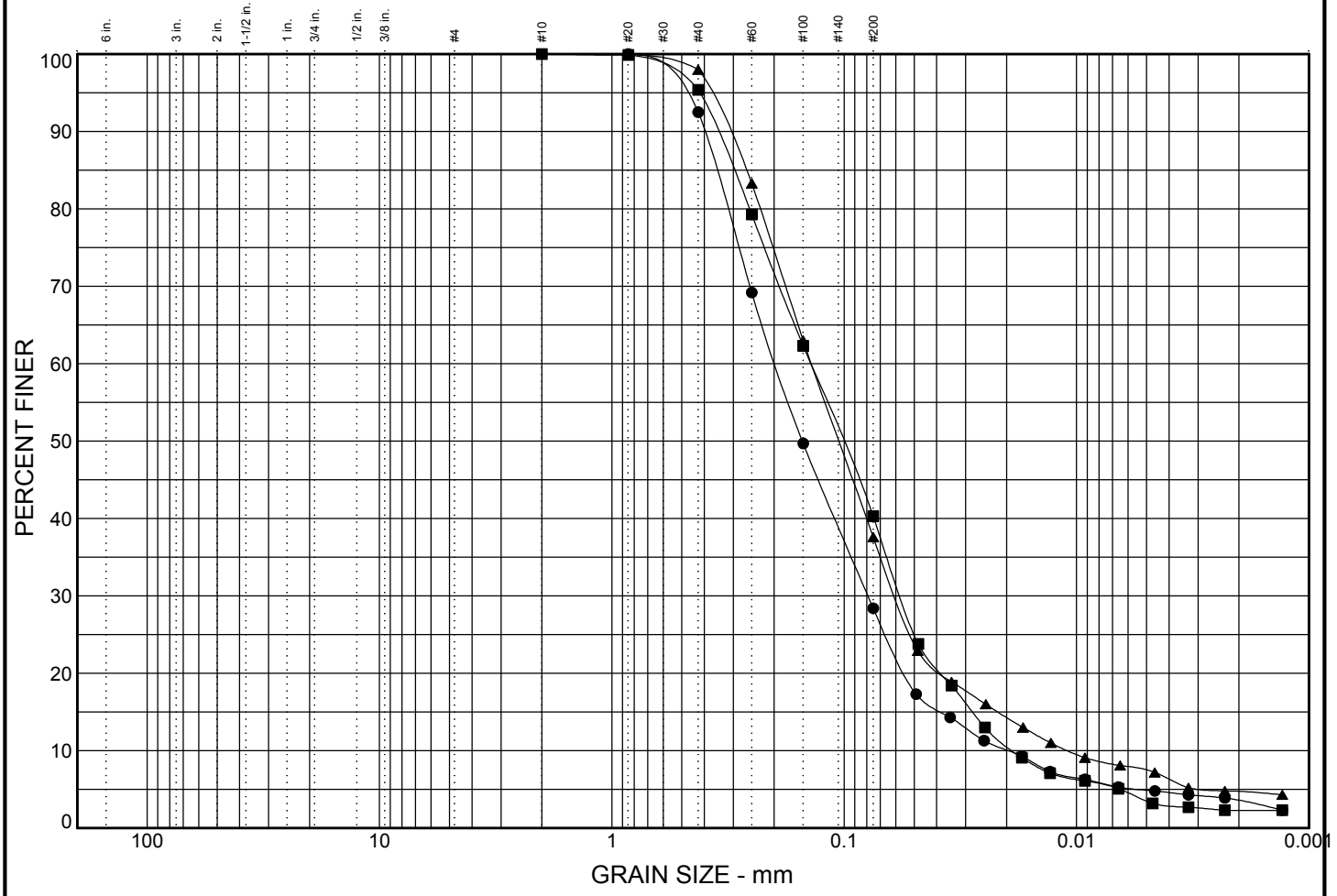
Shear Wave Velocity Plots
LT-CPT-11

17800-11 02/13

HARTCROWSER

Figure
A-47

Particle Size Distribution Test Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	71.6	28.4	
■	0.0	0.0	59.7	40.3	
▲	0.0	0.0	62.4	37.6	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.358	0.196	0.151	0.079	0.038	0.02	1.62	10.02
■			0.302	0.14	0.102	0.057	0.028	0.019	1.23	7.45
▲			0.266	0.138	0.105	0.06	0.022	0.011	2.39	12.80

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● silty SAND, trace clay	SM	18.6%
■ very silty SAND, trace clay	SM	18.0%
▲ slightly clayey, very silty SAND	SM	18.4%

Remarks:

●

■

▲

Project: Van Stone

Client: Washington Department of Ecology

● Source: LT-HC-3 Sample No.: S-4 Depth: 21.0 to 22.5
■ Source: LT-HC-3 Sample No.: S-10 Depth: 51.0 to 52.5
▲ Source: LT-HC-4 Sample No.: S-1 Depth: 5.0 to 6.5

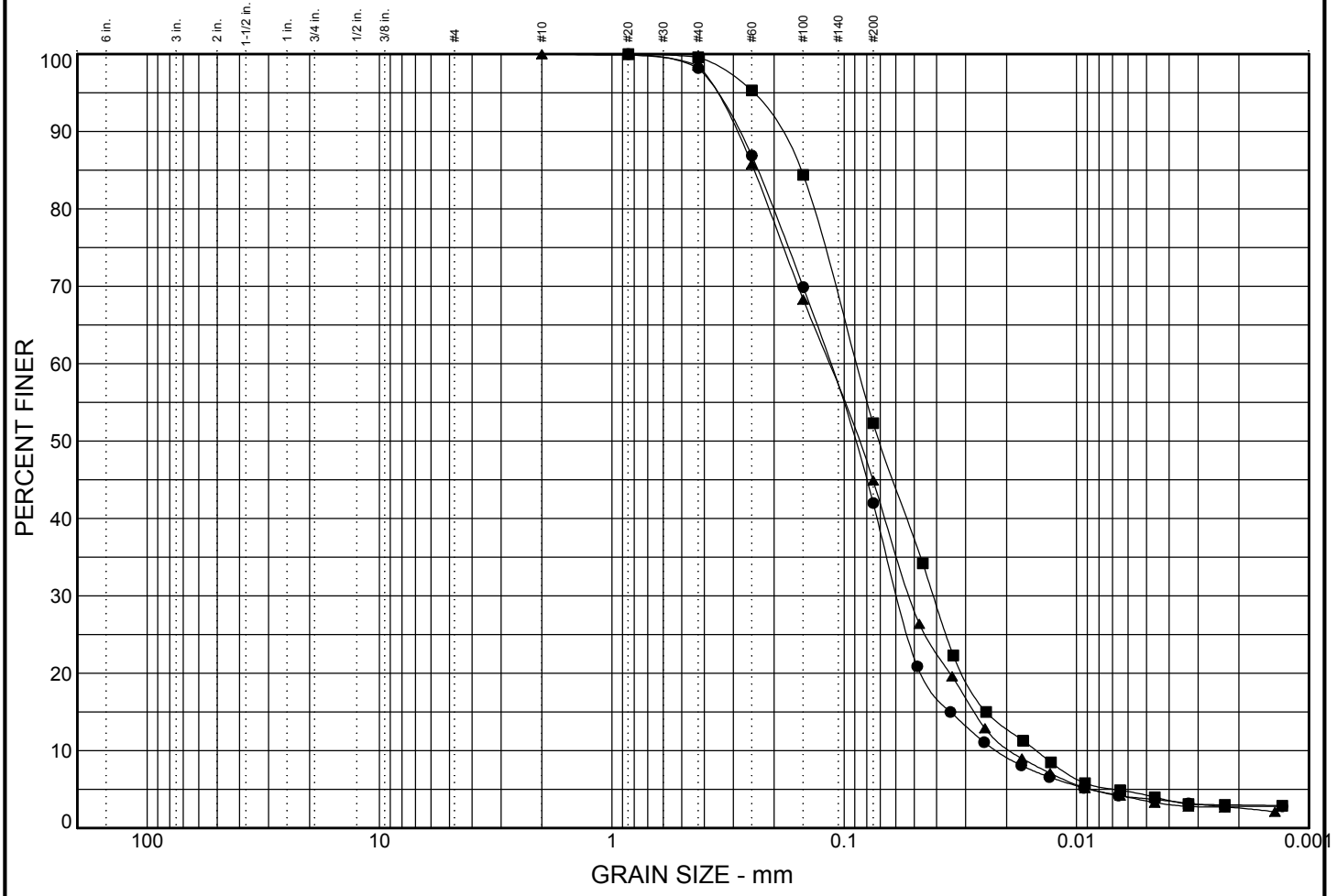
HARTCROWSER

17800-11 *11/11*

Figure A-48

GRAIN SIZE 17800011-BL.GPJ HC_CORP.GDT 12/28/12

Particle Size Distribution Test Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	58.0	42.0	
■	0.0	0.0	47.7	52.3	
▲	0.0	0.0	55.1	44.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.236	0.117	0.091	0.059	0.035	0.022	1.34	5.37
■			0.154	0.089	0.07	0.041	0.025	0.015	1.28	5.92
▲			0.244	0.117	0.087	0.052	0.027	0.019	1.22	6.21

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● very silty SAND, trace clay	SM	19.3%
■ very sandy SILT, trace clay	ML	21.9%
▲ very silty SAND, trace clay	SM	27.6%

Remarks:

●

■

▲

Project: Van Stone

Client: Washington Department of Ecology

● Source: LT-HC-4 Sample No.: S-8 Depth: 40.0 to 41.5
■ Source: UT-HC-1 Sample No.: S-3 Depth: 15.5 to 17.0
▲ Source: UT-HC-1 Sample No.: S-6 Depth: 30.5 to 32.0

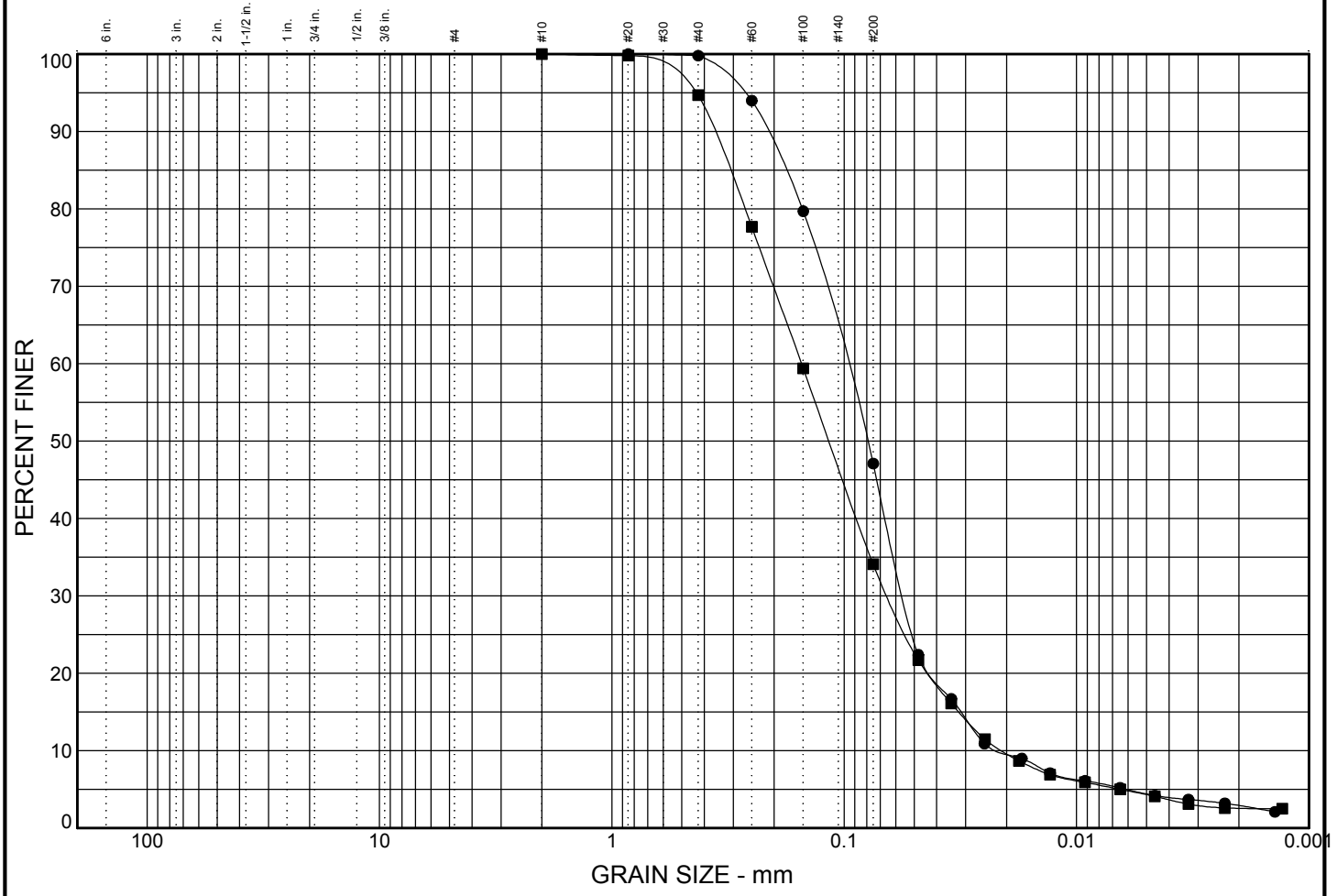
HARTCROWSER

17800-11 *11/11*

Figure A-49

GRAIN SIZE 1780011-BL.GPJ HC_CORP.GDT 12/28/12

Particle Size Distribution Test Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	52.9	47.1	
■	0.0	0.0	65.9	34.1	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.181	0.099	0.08	0.055	0.031	0.021	1.47	4.72
■			0.314	0.153	0.116	0.065	0.032	0.021	1.33	7.37

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● very silty SAND, trace clay	SM	11.5%
■ silty SAND, trace clay	SM	13.2%

Remarks:

●

■

Project: Van Stone

Client: Washington Department of Ecology

● Source: UT-HC-2 Sample No.: S-2 Depth: 10.5 to 12.0

■ Source: UT-HC-2 Sample No.: S-4 Depth: 20.5 to 22.0

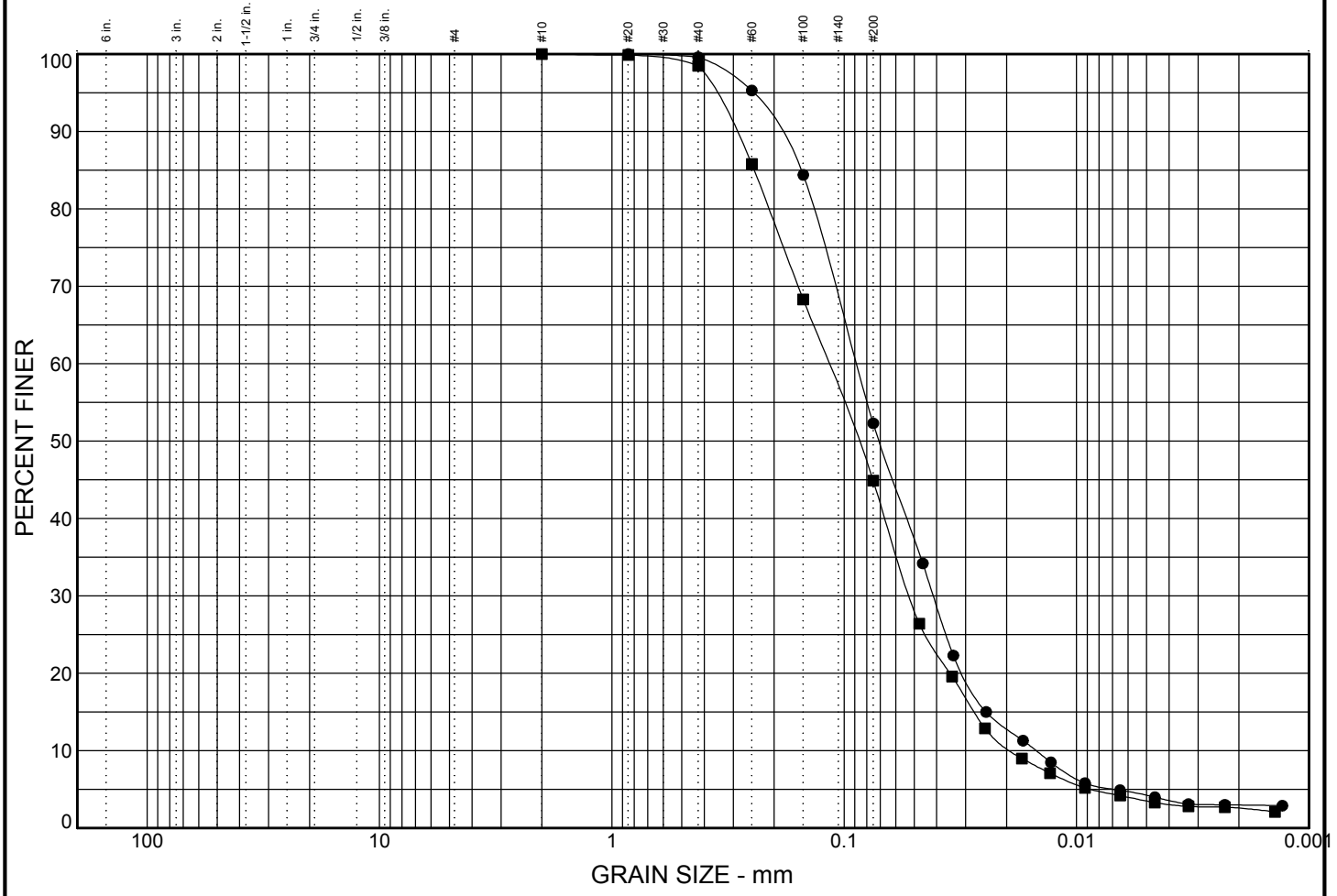
HARTCROWSER

17800-11 *11/11*

Figure A-50

GRAIN SIZE 17800011-BL.GPJ HC_CORP.GDT 12/28/12

Particle Size Distribution Test Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
●	0.0	0.0	47.7	52.3	
■	0.0	0.0	55.1	44.9	

	LL	PI	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
●			0.154	0.089	0.07	0.041	0.025	0.015	1.28	5.92
■			0.244	0.117	0.087	0.052	0.027	0.019	1.22	6.21

MATERIAL DESCRIPTION	USCS	NAT. MOIST.
● very sandy SILT, trace clay	ML	21.9%
■ very silty SAND, trace clay	SM	27.6%

Remarks:

●

■

Project: Van Stone

Client: Washington Department of Ecology

● Source: MW-1 Sample No.: Depth: to

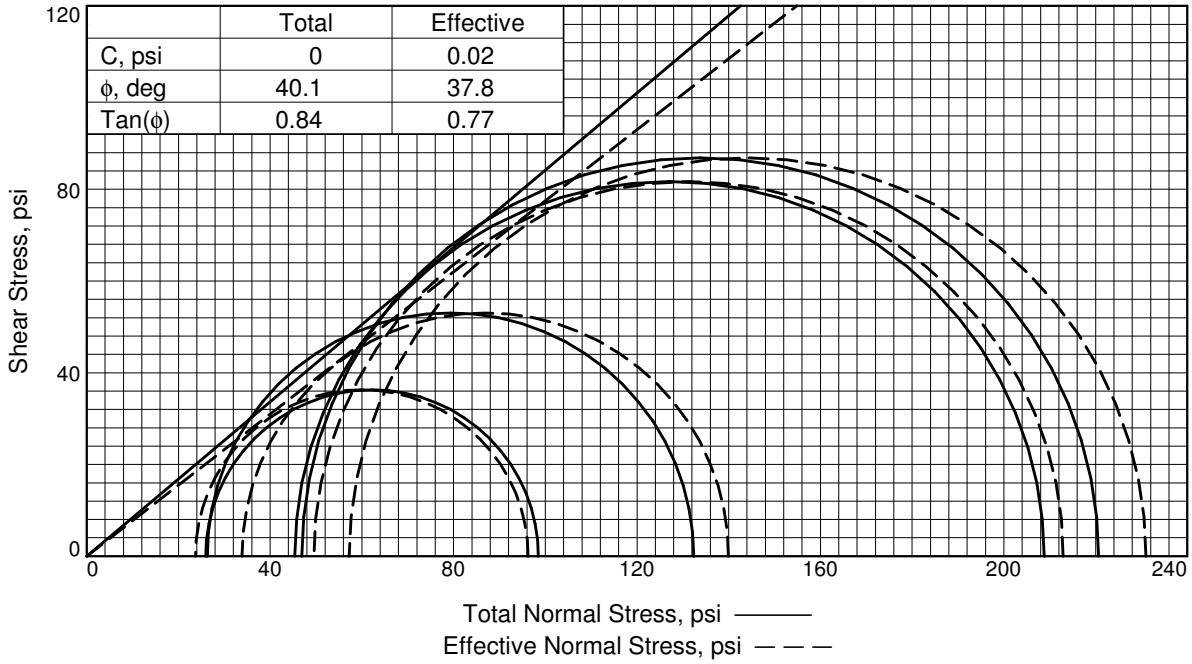
■ Source: MW-1 Sample No.: Depth: to

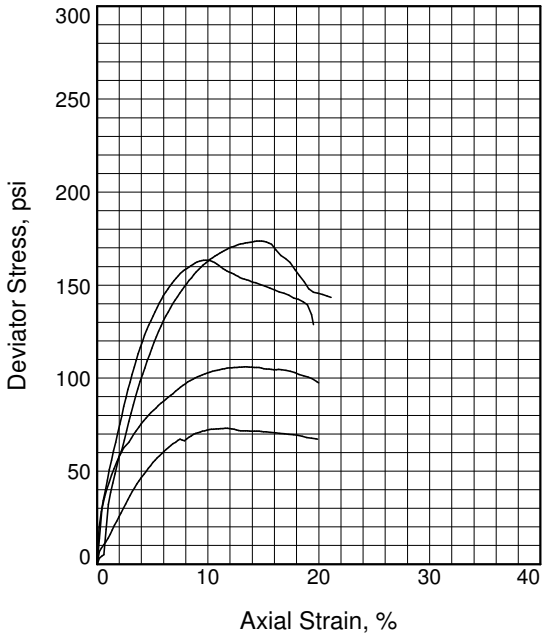
HARTCROWSER

17800-11 *11/11*

Figure A-51

GRAIN SIZE 17800-11-MW.GPJ HC_CORP.GDT 12/28/12





Sample No.		1	2	3	4
Initial	Water Content, %	23.3	23.2	18.6	17.0
	Dry Density, pcf	97.9	100.4	107.8	107.2
	Saturation, %	83.2	92.2	81.6	75.6
	Void Ratio	0.7854	0.6787	0.6499	0.6303
	Diameter, in.	2.85	2.83	2.85	2.85
	Height, in.	5.72	6.62	6.10	6.93
At Test	Water Content, %	26.3	24.4	22.7	22.1
	Dry Density, pcf	100.7	101.6	108.0	107.9
	Saturation, %	100.0	100.0	100.0	100.0
	Void Ratio	0.7359	0.6589	0.6474	0.6201
	Diameter, in.	2.82	2.82	2.85	2.84
	Height, in.	5.71	6.58	6.09	6.92
Strain rate, in./min.		0.01	0.01	0.01	0.01
Eff. Cell Pressure, psi		26	26	45	47
Fail. Stress, psi		73	106	163	174
Total Pore Pr., psi		30	42	16	32
Strain, %		10.5	13.5	9.8	14.4
Ult. Stress, psi					
Total Pore Pr., psi					
Strain, %					
$\bar{\sigma}_1$ Failure, psi		96	140	213	231
$\bar{\sigma}_3$ Failure, psi		24	34	50	57

Type of Test:
CU with Pore Pressures

Sample Type:

Description:

Specific Gravity= 2.8

Remarks: Sample No. 1 = HC-2 ST-2 A
Sample No. 2 = HC-1 ST-3 A
Sample No. 3 = HC-1 ST-4 C
Sample No. 4 = HC-1 ST-4 A

Figure A-52 1 of 2

Client: Washington Department of Ecology

Project: Van Stone Mine

Source of Sample: Upper Tailings

Sample Number: Upper Tailings CU

Proj. No.: 17800-11 **Date Sampled:** 11/9/11

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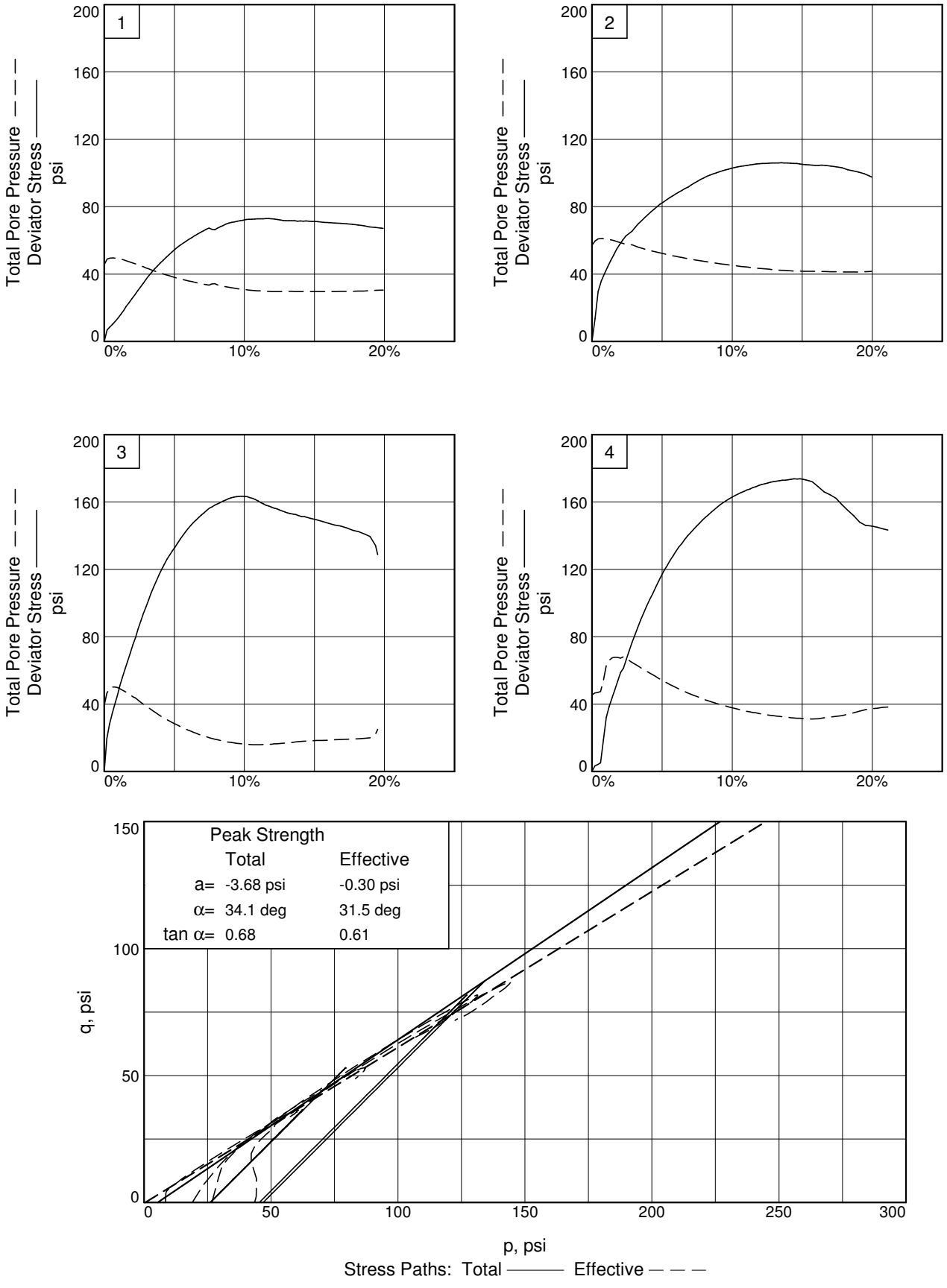

Client: Washington Department of Ecology
Project: Van Stone Mine
Source of Sample: Upper Tailings **Sample Number:** Upper Tailings CU
Project No.: 17800-11 **Figure** A-52 2 of 2

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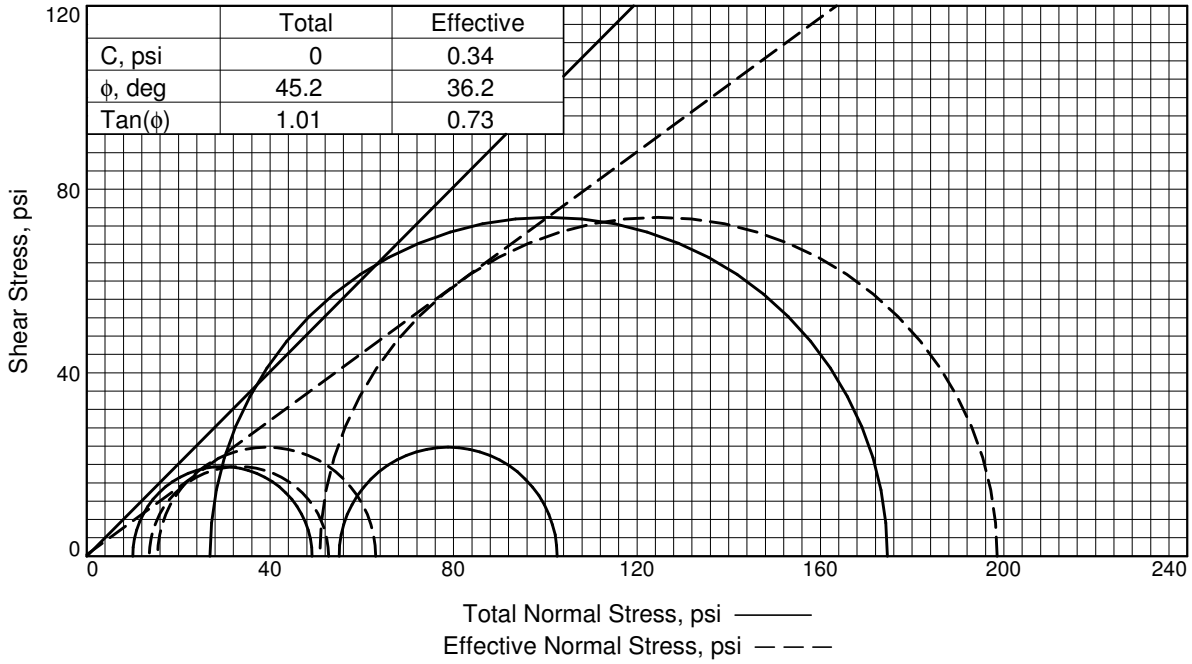

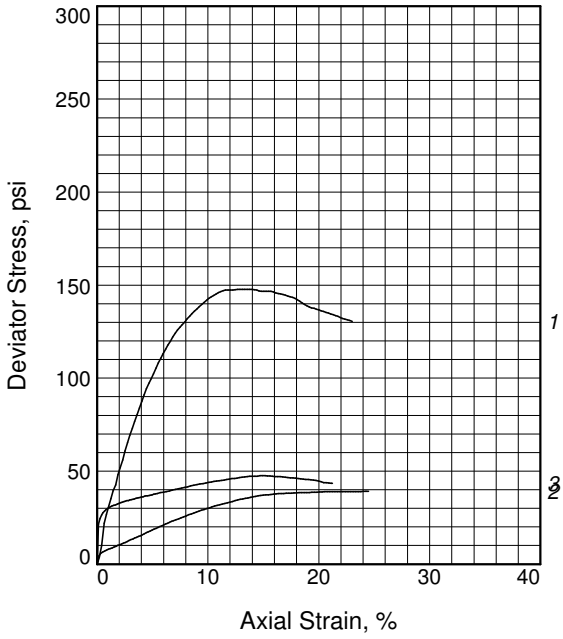

Sample No.		1	2	3
Initial	Water Content, %	19.1	27.3	22.3
	Dry Density, pcf	100.6	96.7	94.9
	Saturation, %	74.3	94.1	74.0
	Void Ratio	0.7061	0.8138	0.8424
	Diameter, in.	2.82	2.89	2.81
	Height, in.	6.89	5.06	6.45
At Test	Water Content, %	24.6	25.9	29.5
	Dry Density, pcf	102.4	101.6	95.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6768	0.7266	0.8260
	Diameter, in.	2.80	2.83	2.84
	Height, in.	6.88	5.00	6.29
Strain rate, in./min.		0.01	0.00	0.00
Eff. Cell Pressure, psi		27	10	55
Fail. Stress, psi		148	39	48
Total Pore Pr., psi		25	10	50
Strain, %		12.9	24.5	14.9
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		199	53	63
$\bar{\sigma}_3$ Failure, psi		51	14	15

Type of Test:
CU with Pore Pressures

Sample Type:

Description:

Assumed Specific Gravity= 2.75

Remarks:
Sample No. 1 = HC-3 ST-12 C
Sample No. 2 = HC-3 ST-12 A
Sample No. 3 = HC-3 ST-12 B

Figure A-53 1 of 2

Client: Washington Department of Ecology

Project: Van Stone Mine

Source of Sample: Lower Tailings

Sample Number: Lower Tailings CU

Proj. No.: 17800-11 **Date Sampled:** 11/10/11

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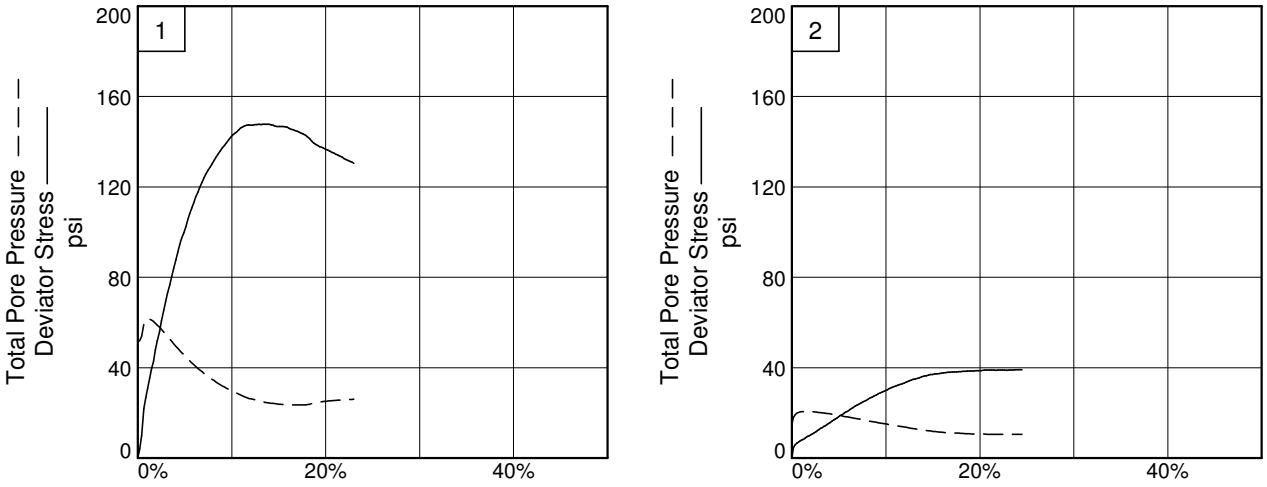
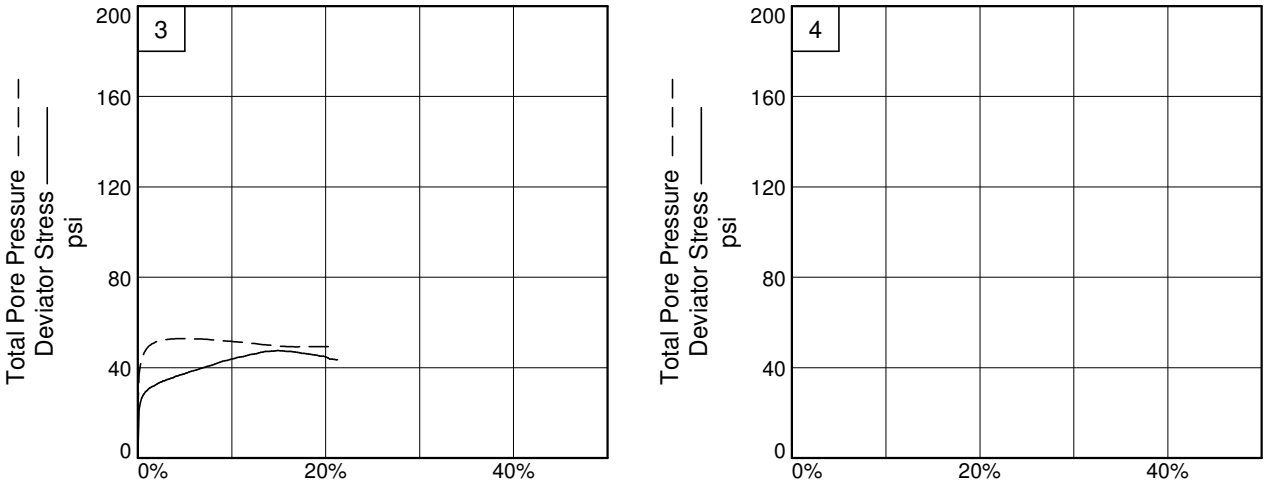
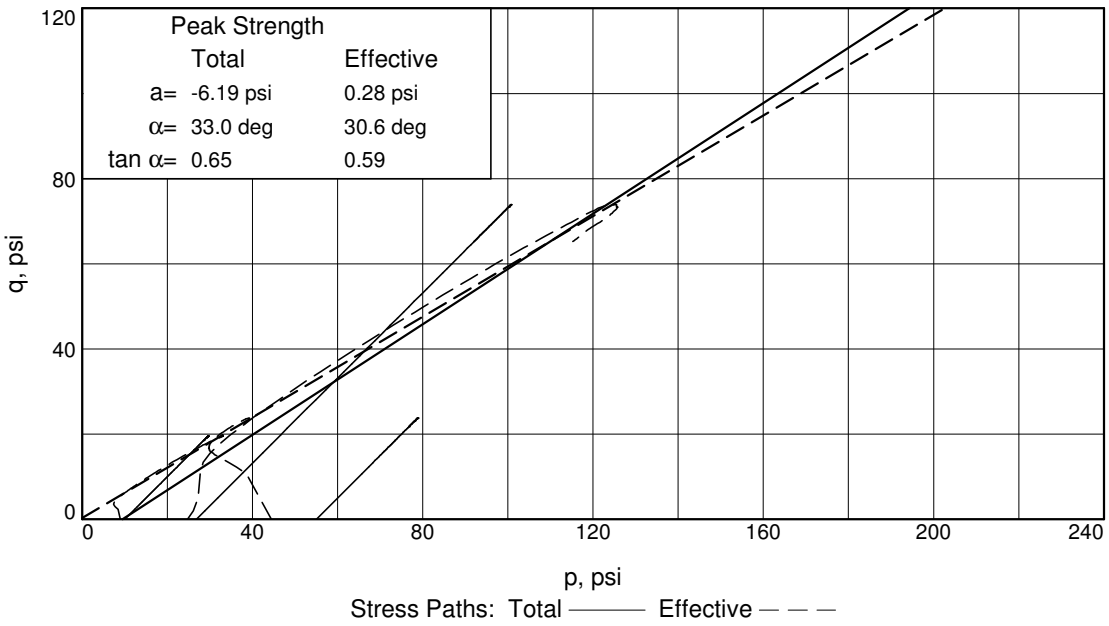


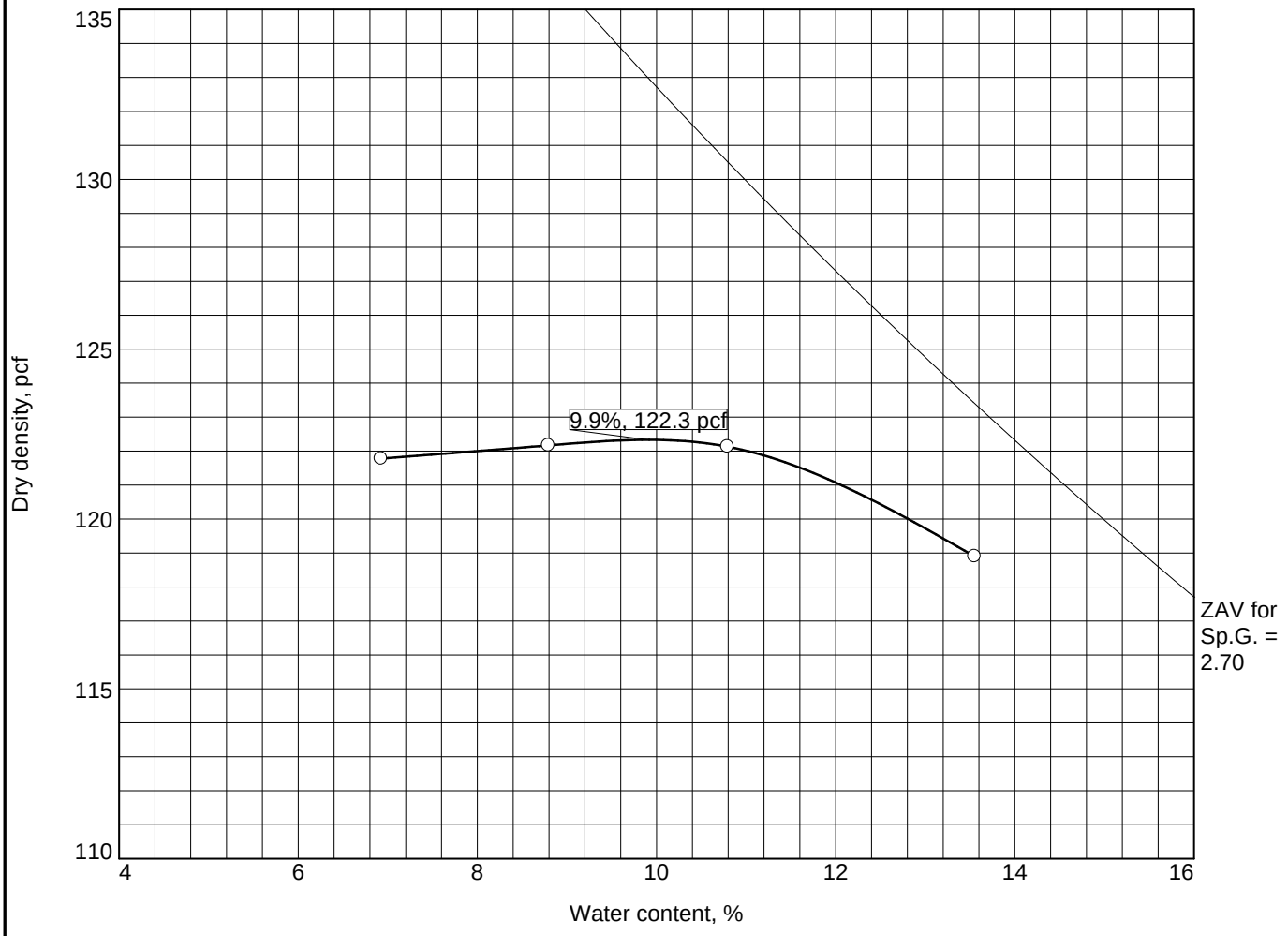




Client: Washington Department of Ecology
Project: Van Stone Mine
Source of Sample: Lower Tailings **Sample Number:** Lower Tailings CU
Project No.: 17800-11 **Figure** A-53 2 of 2

Hart-Crowser, Inc.

COMPACTION TEST REPORT



Test specification: ASTM D 1557-02 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
			13.6	2.7	NA	NA	0	

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 122.3 pcf Optimum moisture = 9.9 %	silty SAND; Composite from Shelby remnants

Project No. 17800-11 **Client:** Washington Department of Ecology
Project: Van Stone

○**Source:** Composite Shelby Sample 072412 **Sample No.:** Composite

Remarks:

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Figure A-54